JULY 1997

WATERSHED MANAGEMENT PROGRAM

Final Environmental Impact Statement
DOE/EIS-0265

BONNEVILLE POWER ADMINISTRATION

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WATERSHED MANAGEMENT PROGRAM
FINAL ENVIRONMENTAL IMPACT STATEMENT

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Bonneville Power Administration Watershed Management Program Final Environmental Impact Statement (DOE/EIS-0265)

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

Cooperating Agencies: Bureau of Reclamation, Natural Resources Conservation Service

Title of Proposed Action: Watershed Management Program Standards and Guidelines

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

Abstract: Under the Northwest Power Act, BPA is responsible for mitigating the loss of fish and 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 Federal agencies. Future watershed management actions with potential environmental impacts are expected to include in-channel modifications and fish habitat enhancement structures; riparian restoration and other vegetation management techniques; agricultural management techniques for crop irrigation, animal facilities, and grazing; road, forest, urban area, and recreation management techniques; mining reclamation; and similar watershed conservation actions. BPA needs to ensure that individual watershed management projects are planned and carried out with appropriate consistency across projects, jurisdictions, and ecosystems, as well as over time. BPA proposes to standardize the planning and implementation of individual watershed management programs and 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 aquatic habitat objectives. Alternative 4 would emphasize cost and administrative efficiency in achieving watershed management objectives. Alternative 5 (environmentally preferred) would emphasize protection and improvement of general environmental resources in addition to watershed management objectives. Alternative 6 (BPA-preferred) would balance watershed management objectives, cost and administrative efficiency, and protection and improvement of general environmental resources. Decisions to be made are which strategies, goals, and procedural requirements, if any, should regularly apply to BPA-funded watershed management projects.

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BONNEVILLE POWER ADMINISTRATION

WATERSHED MANAGEMENT PROGRAM FINAL ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

Purpose of and Need for Action

Bonneville Power Administration (BPA) is responsible for mitigating impacts on fish and wildlife habitat from development of the Federal Columbia River Power System. BPA meets this responsibility primarily 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 Federal agencies. Future fish mitigation and watershed conservation and rehabilitation actions with potential environmental impacts are expected to include in-channel modifications and fish habitat improvement structures; riparian restoration and other vegetation treatment techniques; agricultural management techniques for crops, animal facilities, and grazing; road, forest, urban area, and recreation management techniques; mining reclamation; and similar watershed 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 Fish and Wildlife Program's aquatic habitat objectives through an ecosystem-based approach for watershed management projects to be funded by BPA;
- Achievement of cost and administrative efficiency;
- Compliance with all 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 management projects. With such a program in place, BPA implementation of individual watershed management projects would change in two fundamental ways.

- First, BPA's site-specific involvement would be greatly reduced as project proponents take the lead in preparing Project Management Plans according to the program requirements.

- Second, because this environmental impact statement (EIS) explores, identifies, and discloses many of the environmental impacts expected from watershed management projects, environmental review of individual projects would have a narrower, more project-specific focus, so long as project managers follow the program requirements. Additional broad environmental analysis would be required only if anticipated impacts or project components were to differ substantially from those evaluated in this EIS.

No Action

Alternative 1, No Action, would continue the current case-by-case approach to project implementation. The eight-step process (see below) would not be formally adopted to implement watershed management projects. Environmental review and decisionmaking would be conducted at the individual project level through separate categorical exclusions, environmental assessments, or EISs. BPA would continue to maintain a high level of involvement in making site-specific decisions.

Action Alternatives

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 watershed management projects funded by BPA. All action alternatives are based on a standard, interactive eight-step planning process (described below, under Alternative 2). Each alternative contains prescriptions (goals, strategies, and procedural requirements) that would be applied to BPA-funded watershed management projects under a standardized program.

Alternative 2, Base Response, would standardize the planning and implementation of individual watershed management projects funded by BPA, but only with respect to those prescriptions required by regulation or law. **Note that Alternatives 3 through 6 include all prescriptions listed under Alternative 2 as part of their actions**. These required prescriptions are described below, under the appropriate process step.

1. <u>Define the Area of Concern/Interest.</u> In the first step, project proponents/project managers delineate the affected watershed boundaries and project issues.

Under all action alternatives, project managers would:

- Identify watershed(s) potentially affected by the proposed project.
- 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.
- Contact the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Services (NMFS) to determine whether threatened or endangered species are known to occur or potentially occur in the vicinity of the project area.

- Identify any minority and/or low-income populations that may be adversely affected by the management project being considered (Environmental Justice).
- For projects involving ground-disturbing activities, make preliminary identification of the presence of historic and archeological resources.
- For project involving soil disturbance or channel relocation. make preliminary identification of the presence of hazardous and toxic wastes.

2. **Involve Stakeholders.** In the second step, managers gather input from affected agencies, landowners, tribes, individuals, and organizations. This step is similar to the project scoping and public involvement that occurs in a National Environmental Policy Act (NEPA) analysis. Interested parties may include individuals; interest groups; tribes; local governments; and county, state, regional, or Federal agencies.

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.

Under all action alternatives, project managers would:

- Identify a desired future condition that responds specifically to achievement of aquatic habitat objectives.

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

Under all action alternatives, project managers would:

- 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 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 streams and wetlands, whether for maintenance or improvement, including (1) the Clean Water Act, Section 401, Section 404; (2) Protection of Wetlands, Executive Order 11990; (3) Floodplain Management, Executive Order 11988; and (4) Rivers and Harbors Act of 1879 (Section 10).
- 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 streambank and habitat structures from sensitive viewing locations or develop designs that comply with Wild, Scenic, or Recreational River management guidelines, as appropriate.
- 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.
- Incorporate a cultural resource management plan or other SHPO-approved actions where deemed necessary.
- Ensure that barriers are not created that unduly restrict access for physically disabled persons where public access is allowed.
- Specify that new public-use facilities be free of barriers to persons with physical disabilities.
- Ensure that the project does not shift problems to another watershed or portion of a watershed.

- Consider the results of similar, previous projects, and consult the literature and other people doing similar types of projects to incorporate adaptive management strategies as the plan develops.

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 other four action alternatives described below. Additional prescriptions for each individual alternative can be found in the EIS itself, as noted below.

Alternative 3, Aquatic Habitat Objectives Emphasis, would standardize the planning and implementation process by supporting primarily those management projects with an aggressive habitat restoration approach. Funding priority would be given to improvement of in-stream habitats and of immediately adjacent riparian areas that contribute to the poor quality of those habitats. Projects in upland and urban areas might be approved where relationships between identified non-point-source pollution and fish and fish habitat are clear. Projects funded under this alternative might generally provide immediate and long-term habitat improvement through projects of larger scope, both in areas of greatest need and in areas known as aquatic refugia (strongholds of high habitat quality).

Project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the aquatic objectives of the project. (Specific management techniques are listed in Appendix A in the EIS.) Comprehensive watershed management objectives, such as protection or improvement of natural ecosystems and general species diversity, would be advanced through implementation of this Aquatic Habitat Objectives Emphasis alternative. However, benefits to non-aquatic resources, such as wildlife, would be purely coincidental to the accomplishment of aquatic objectives. **See EIS pages 14 to 17 for additional prescriptions for this alternative.**

Alternative 4, Cost and Administrative Efficiency Emphasis, would standardize the planning and implementation process by supporting only the least costly approach(es) to achieving the project's aquatic habitat objectives. Achievement of more comprehensive watershed-scale objectives, such as protection or improvement of natural ecosystems and general species diversity, would occur only incidentally to achievement of the priority objectives.

As with Alternative 3 (Aquatic Habitat Objectives), BPA would support only those actions directly aimed at achieving the goals of the Watershed Management Program. However, whereas Alternative 3 placed an emphasis on aggressive (and generally more expensive) in-stream and riparian habitat improvement, projects funded under the management style of Alternative 4 could occur across the watershed. No preference would be given to in-stream, riparian, or upland areas, or to any one land use. Project managers would focus on minimizing administrative costs and maximizing site-specific application of watershed management funds. Managers would also be restricted to the least costly techniques available. Projects funded under this alternative would therefore provide more gradual habitat improvement through projects of smaller scope that might be removed from direct influence on aquatic habitat. Sustained, cumulative benefits would result in slow, steady improvements in fisheries and aquatic habitat, meeting only the minimum aquatic habitat objectives. **See EIS pages 17 to 20 for additional prescriptions for this alternative.**

Alternative 5, General Environmental Protection (environmentally preferred alternative), would standardize the planning and implementation process and provide coincidental benefits for fisheries, water quality, wildlife, recreation, local economic productivity (related to the natural or physical environment, and including, for instance, agricultural or forestry uses), and other resources. Projects would focus equally on fish habitat and other ecological needs throughout the watershed. Habitat improvements would occur in step with other ecological improvements.

Although all techniques addressed in this assessment could be used to improve fisheries and aquatic habitat, some would be more aggressive or "invasive" during implementation, and some might preclude benefits to other resources. Project managers would apply either selected or multiple, complementary techniques and program-wide measures as appropriate to protect all environmental resources, including soils, fish and water resources, wildlife, vegetation, and air quality. These measures would also be implemented in a manner that would avoid or reduce adverse impacts on land use and local economies dependent on agriculture, forestry, and recreation. This alternative would minimize even the immediate and short-term disturbances of implementation. **See EIS pages 20 to 24 for additional prescriptions for this alternative.**

Alternative 6, Balanced Action (BPA's preferred alternative) would 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 (3, 4, and 5): (1) meeting the aquatic habitat objectives of watershed management projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources, when these actions would support watershed management.

Under Alternative 6, BPA would support a wide range of actions to support fisheries, fish habitat, and aquatic ecosystems consistent with Council's goals and priorities. BPA would strongly emphasize achieving aquatic habitat objectives in the least costly manner. The preferred alternative would accept the environmental disturbances of project implementation, while planning for the prevention or control of unforeseen consequences and environmental responses through pre-project surveys, modeling of project parameters, and post-implementation monitoring. Habitat improvements would be moderate in quantity, but high in quality and sustained in benefit.

Fish habitat improvement would also be recognized as the project priority, but those projects that favor multiple resource benefits would receive funding. Project managers would apply program-wide measures as appropriate to provide maximum benefit practicable to other resources, including soils, vegetation, wildlife, and air quality. These measures would also be implemented in a manner that would avoid or reduce adverse impacts on land use and local economies dependent on agriculture, forestry, and recreation.

Alternative 6 is most similar to the current situation in terms of maintaining the balanced management strategy under which proposed management projects are funded. The primary difference between this 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 watershed management programs more efficiently and with greater consistency than under the current case-by-case approach. **See EIS pages 25 to 28 for additional prescriptions for this alternative.**

Areas of Controversy

The following major issues were brought up during the scoping process.

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.

Social and economic concerns. People are concerned that, because our focus is on improving conditions for fish and wildlife, human concerns would be ignored. Others are concerned about the impact on farmers of additional taxes and restrictions that would affect their profitability. Some feel that there should be direct compensation for economic impacts (takings of property). Environmental studies should include land use, cultural, and historic practices.

Scope of EIS. The complete watershed needs to be covered. For example, upland range and dryland farming need to be addressed, not just the riparian zone. Some stress that the focus should be on whole aquatic ecosystems, not just specific species. Others hold that the EIS should address how the individual watersheds would be cumulatively and programmatically linked together in order to address Columbia River Basin issues such as the hydroelectric and navigation operations and configurations in the mainstem Columbia and Snake rivers.

Who to Involve. Concerns focused on the importance of positively involving local landowners who live on the lands in the watershed, and the importance of seeking out agencies/groups with special expertise and/or information to help us. Some people hold that any watershed management program must be driven by and acceptable to the residents who live and work in the watershed.

Major Conclusions

- Watershed mitigation activities may have short-term adverse impacts on soils and water quality, with increasingly beneficial impacts in the long-term.
- Fish species and species with similar habitat needs would benefit most from watershed mitigation activities.
- Watershed mitigation sites are generally compatible with cultural resources. Ground-disturbing activities near streams and rivers often have a high probability of adversely affecting historic and cultural resources because those resources are more likely to be found there. Impacts can usually be avoided through surveys and avoidance of identified sites.

Issues to Be Resolved

Bonneville Power Administration must decide:

- whether to adopt a set of management principles to guide all watershed management 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 of funding types of watershed mitigation actions.
2. Whether BPA should eliminate any watershed mitigation techniques from future funding consideration.
3. What role(s) might be most appropriate for public, tribal, and agency participation in planning proposed watershed management projects.

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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

Bonneville Power Administration (BPA) must mitigate for fish and wildlife habitat that was lost during development of the Federal Columbia River Power System: it does so in part by funding individual watershed programs and projects recommended by the Northwest Power Planning Council. (Watershed is defined as an area(s) drained by a specific stream.) At present, Bonneville addresses all watershed project issues and impacts on a site-specific basis: project by project and watershed by watershed. This approach is inefficient, because BPA must readdress many common issues that arise repeatedly with each successive project, and because it does not foster consistency across projects, jurisdictions, and regions, or over 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. Figure 1-1 shows the Columbia River Basin watersheds.

Development of this hydropower system has had far-reaching effects on wildlife and fish, and their habitats. Many floodplains and riparian habitats important to fish and wildlife were inundated when reservoirs filled behind dams. These developments have acted to change or eliminate fish and wildlife habitat. The Bonneville Power Administration (BPA) is responsible for mitigating the loss of fish and wildlife habitat caused by the construction and operation 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 Columbia River Basin Fish and Wildlife Program (Fish and Wildlife Program). BPA's proposed approach to the watershed planning process and this EIS is designed to be fully consistent with the Council's Fish and Wildlife Program. The EIS anticipates future refinements to the Council's Fish and Wildlife Program by providing flexibility through a wide array of techniques, and through a planning approach that does not dictate site-specific solutions. Potential actions addressed under this EIS cover 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 fish mitigation and watershed conservation and rehabilitation actions with potential environmental effects are expected to include the following:

- in-channel modifications and fish habitat improvement structures;
- riparian restoration and other vegetation treatment techniques;
- agricultural management techniques for crops, animal facilities, and grazing;
- road management techniques;
- forest management techniques;
- urban area techniques;
- recreation management techniques;
- mining reclamation; and
- similar watershed conservation actions.

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

1.2 PURPOSES

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

- Achievement of the Fish and Wildlife Program's aquatic habitat objectives through an ecosystem-based approach for watershed management projects to be funded by BPA. Reports by at least three independent scientific panels (Independent Scientific Group, National Research Council, and the National Marine Fisheries Service Salmon Recovery Team) have called for ecologically oriented approaches to restoration of fish and wildlife habitat. While the primary emphasis of the watershed program is to address anadromous and resident fish habitat impacts. BPA realizes the importance of looking for ways to address mitigation from an ecosystem standpoint, not focusing just on fish;
- Achievement of cost and administrative efficiency;
- Compliance with all laws and regulations; and
- Environmental protection.

See Council's Fish and Wildlife Program (sections 7.6A, Habitat Goal, and 7.6D, Habitat Objectives) for more detailed information on the program's aquatic habitat objectives.

1.3 USES OF THIS DOCUMENT

This environmental impact statement (EIS) is being prepared to help meet BPA's goals by establishing a process and protocols to standardize and coordinate the environmental decision and

BPA Watershed Management Program - Fig. 1-1: "Columbia River Basin Watersheds"

compliance processes needed to approve watershed projects within various watershed management plans. This EIS, and the processes within it, will be used by BPA staff to meet their National Environmental Policy Act (NEPA) compliance requirements as they make decisions about funding proposed projects. We anticipate that projects could fall into two categories:

- Proposed projects that do not adhere to the guidance and procedures discussed in this EIS. They will either be denied (if they are contrary to the preferred alternative) or will be evaluated under a separate and project-specific NEPA process.
- Proposed projects that follow the general procedures and protocols discussed in the EIS. They are more likely to be funded and are more likely to be processed promptly if their techniques and impacts are considered consistent with this EIS.

Watershed Plans developed through the Watershed Management Planning Process for specific watersheds in the basin are expected to contain many concepts, policies, and individual projects. It is not anticipated that the Plans themselves would be submitted to BPA for approval and funding; rather, specific projects *within* such Plans would be submitted. Therefore, this EIS has no direct relationship to future Watershed Plans except to provide guidance as to the types of steps that BPA expects that proposers will follow in order to receive funding approval for the projects within those Plans and to do so in a coordinated NEPA process.

In the future, BPA expects to continue to receive applications for funding watershed improvement projects in various watersheds. To receive approval, the projects must have been evaluated by sponsors using the eight-step process (described in Chapter 2). BPA further expects that such projects will have been proposed and evaluated within a Watershed Management Plan that would have examined numerous projects—some near term, and some for future consideration. BPA will consider projects proposed individually or collectively, use this EIS as appropriate to help satisfy the NEPA process for funding those projects, and make funding decisions on those projects. BPA considers Watershed Management Plans to be a vehicle for proposing and evaluating watershed projects by the authors of the Plans. Thus, this EIS may assist in plan development, but it is not intended to be used as a NEPA compliance document for plans. This EIS will be used as a NEPA compliance document for projects only.

1.4 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 recovery efforts for fish and wildlife in the Columbia River Basin.

Since 1992, BPA has funded a number of small demonstration projects under the Model Watershed Program. The intent of these projects was to design a restoration plan and begin to carry out some of the activities on a small scale. The model watersheds include the Grande Ronde River and its sub-basins in Oregon (Board of Directors of the Grande Ronde Model Watershed Program 1994); the Tucannon River and Pataha Creek watersheds (which currently have plans in the draft stage in Washington); the Asotin Creek watershed (Asotin Creek

Conservation District 1995), also in Washington; and the Lemhi River, Pahsimeroi River and East Fork Salmon River watersheds in Idaho (Idaho Soil Conservation Commission 1995).

In addition to the Model Watershed Program, the Council approved (April 1996) a number of "Early Action" watershed projects for implementation with FY 1996 funds earmarked for Endangered Species mitigation. The goal of these projects is to assist recovery efforts for anadromous and resident fish in the Columbia River Basin.

The Council has incorporated the principle of adaptive management as part of its Fish and Wildlife Program:

> In forging a program to address the needs of fish and wildlife in the Columbia Basin, the region faces the problem of resolving these facts: 1) prompt action must be taken to arrest the declines in many populations; and 2) the scientific basis for many actions is limited and often conflicting. This conflict is recognized in the (Northwest) Power Act. Congress directed the Council to use the best *available* scientific information and not to await scientific certainty prior to acting.
>
> Reflecting this charge, the Council has taken, and will continue to take, a number of significant actions on the basis of the available, and often limited, scientific information. The Council continues to recognize the need for prompt action despite scientific uncertainty. . . . The Council emphasizes the need to improve the scientific basis for the program and to *learn* from the implementation of the program. [Council 1995, pages 2-5]

With planning completed for many of the model watersheds and with the potential to expand the watershed program, BPA decided to prepare this Watershed Management Program EIS to evaluate the potential environmental impacts, both positive and negative, of establishing a guidance framework for all future watershed projects.

1.5 RELATIONSHIP TO OTHER DOCUMENTS

1.5.1 Other BPA Watershed Mitigation Program Environmental Analysis

Planning for several watershed management projects, and associated environmental review, has proceeded during preparation of this EIS. These projects are as follows:

- Watershed Management Program Early Actions Projects (Categorical Exclusion or CX), covering several projects throughout the Columbia River Basin in the states of Washington, Oregon, Idaho, and Montana.
- Methow Valley Irrigation District Project (Environmental Assessment or EA), covering a specific project to provide in-stream flows for fish in the Methow and Twisp rivers in the state of Washington.

BPA decisions regarding these projects have been covered by separate NEPA compliance documents; these are independent of this EIS and will not in any way dictate its outcome.

1.5.2 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 hydro system operating strategies, including impacts on fish resources. Appendices C and K of the EIS focus on resident and anadromous fish and recommended mitigation measures that may be included in future Fish and Wildlife Program amendments.

1.5.3 Wildlife Mitigation Program EIS

In March 1997, BPA published a Final EIS (DOE/EIS - 0246) on its Wildlife Mitigation Program. As with the Watershed Management Program, BPA proposes to establish standards and guidelines for planning and implementing wildlife conservation and rehabilitation projects throughout the Columbia River Basin. Although the underlying need of the Wildlife Mitigation Program is mitigation for the loss of wildlife habitat caused by the construction and operation of Federal hydroelectric projects in the Basin, many of the program's techniques are similar (but not identical) to those for watershed mitigation. Much of the environmental impact analysis and many of the potential standards and guidelines addressed in the Watershed Management Program EIS have also been included in the Wildlife Mitigation Program EIS (BPA 1997).

1.5.4 Coordination with Other Federal Agency Ecosystem EISs

BPA has attempted to integrate this EIS with other Federal ecosystem-type EISs, such as the U.S. Forest Service(USFS)/Bureau of Land Management (BLM) Interior Basin Ecosystem Management Project EISs, by proposing to adopt the watershed-based project planning process developed for the USFS Ecosystem EISs. The eight-step planning process proposed in the Watershed Management Program EIS is adapted from *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies* (Interagency Ecosystem Management Task Force, 1995). Several of the steps from this report further integration by the following means:

- requiring coordination with other stakeholders, which would include Federal agencies (Step 2); and
- requiring a characterization of the historical and present site conditions and trends, which would include ongoing ecosystem management activities by other agencies and entities (Step 3).

Each of these steps in this EIS has been modified according to the respective emphasis of each alternative. Watershed groups would be encouraged to consult with other agencies regarding management direction that might apply in their watersheds, and to use the database of information developed for these EISs wherever it appears to be useful.

1.6 DECISIONS TO BE MADE

Preparation of this document is intended to fulfill BPA's NEPA requirements. Two decisions will be made from this document.

BPA must decide:

- whether to adopt a set of management principles to guide all watershed management 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 watershed mitigation actions.
2. Whether BPA should eliminate any watershed mitigation techniques from future funding consideration.
3. What role(s) might be most appropriate for public, tribal, and agency participation in planning proposed fish and wildlife management projects.

If BPA were to adopt a set of watershed governing principles, individual projects could then be undertaken (once approved for funding) with the development and implementation of a Project Management Plan and a tiered, more focused project-specific 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.

1.7 SCOPING

A Notice of Intent (NOI) to prepare an EIS for the Watershed Management Program EIS was issued on March 18, 1996. 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 Salmon, Idaho; Missoula, Montana; Elgin, Oregon; and Asotin, Starbuck, and Pomeroy, Washington. About 50 people attended these meetings in all, and 48 letters and comment sheets 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, fish and wildlife; weeds/chemicals;
- fire management;
- issues related to public versus private land ownership; and
- government "taking" of private property.

Many of these issues were also identified for and addressed in the Wildlife Mitigation Program EIS.

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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 watershed management 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 watershed management projects under a standardized program.

As described in Chapter 1, BPA needs to mitigate for fish and 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 and submit them to the Council for consideration. Following independent review, the 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/or 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 watershed management projects. With such a program in place, BPA implementation of individual watershed management projects would change in two fundamental ways.

- First, BPA's site-specific 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 watershed management projects, environmental review of individual projects would have a narrower, more project-specific focus, so long as project managers follow the program requirements. Additional broad environmental analysis would be required only 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 and the No Action alternative. While each of the five action alternatives identifies a different approach to standardizing the planning and implementation of individual watershed management 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 (together called "management prescriptions") to be applied to BPA-funded projects. Following the descriptions of these alternatives, Section 2.1.8 refers to the actual site-specific techniques that might be used under any of the alternatives to support watershed management activities (Appendix A contains detailed information on these techniques.)

2.1.1 The Process for Project Implementation Common to All Alternatives

Each action alternative is developed from a watershed-based project planning process[1], and is quite similar to a 6-step planning approach developed for the Grande Ronde Watershed as part of the Model Watershed Program (Mobrand et al. 1995). The process seeks to solve problems in terms of **watersheds** (areas drained by a specific stream) rather than in terms of ownerships and jurisdictional land parcels. The goal of this process is to encourage actions that support both a sustainable environment and a sustainable economy. Watershed-based management would provide coordinated management of soil and aquatic resources over the entire area, on a ridge-top-to-ridge-top basis.

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 and flexible. Steps may occur "out of sequence" or simultaneously, and there may be many feedback loops between steps. For example, the results of one step may require that managers re-evaluate earlier steps. Project Management Plans may also become more detailed over time, as projects develop increasing definition and more is known about project boundaries, stakeholder interests, biological resources, and other project-specific issues.

The steps are as follows:

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

2. **Involve Stakeholders.** In the second step, managers gather input from affected agencies, landowners, tribes, individuals, and organizations. This step is similar to the project scoping and

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[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.

public involvement that occurs in a NEPA analysis. Interested parties may include individuals; interest groups; tribes; local governments; 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.

4. **Characterize the Historical and Present Site Conditions and Trends.** Project managers identify current and past conditions 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 Alternative 1: No Action

Alternative 1, No Action, continues the current case-by-case approach to project implementation. The eight-step process would not be formally adopted to implement watershed management projects. Environmental review and decisionmaking would be conducted at the individual project level through separate CXs, EAs, or EISs. BPA would continue to maintain a high level of involvement in making site-specific decisions.

2.1.3 Alternative 2: Base Response

This alternative proposes to standardize the planning and implementation of individual watershed management projects funded by BPA, but only with respect to those prescriptions (i.e., goals, strategies, and processes) required by regulation or law. Many Best Management Practices (BMPs), for instance, are not required by law. This alternative would thus offer fewer solutions than the others. These required prescriptions are described below, under the appropriate process step. **Note that Alternatives 3 through 6 include all prescriptions listed under Alternative 2 as part of their actions.**

1. Define the Area of Concern/Interest

Under all action alternatives, project managers would:

- Identify watershed(s) potentially affected by the proposed project.
- 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.
- Contact the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Services (NMFS) to determine whether threatened or endangered species are known to occur or potentially occur in the vicinity of the project area.
- Identify any minority and/or low-income populations that may be adversely affected by the management project being considered (Environmental Justice).
- For projects involving ground-disturbing activities, make preliminary identification of the presence of historic and archeological resources.
- For project involving soil disturbance or channel relocation, make preliminary identification of the presence of hazardous and toxic wastes.

2. Involve Stakeholders

Under all action alternatives, project managers would:

- Consult with affected local governments, adjacent landowners, tribes, and Federal and state agencies regarding fish, wildlife, habitat, or other issues.

3. Develop a Statement of the Desired Future Condition

Under all action alternatives, project managers would:

- Identify a desired future condition that responds specifically to achievement of aquatic habitat objectives.

4. Characterize the Site Conditions and Trends

Under all action alternatives, project managers would:

- 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 (ESA).[2]
- 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 streams and wetlands, whether for maintenance or improvement, including (1) the Clean Water Act, Section 401, Section 404; (2) Protection of Wetlands, Executive Order 11990; (3) Floodplain Management, Executive Order 11988; and (4) Rivers and Harbors Act of 1879 (Section 10).
- Avoid activities that might adversely affect threatened and endangered species or their habitat. Document compliance with Section 7 of the ESA.
- Use only Environmental Protection Agency (EPA)-approved pesticides and herbicides, and use only in the manner specified by EPA. For projects involving use of herbicides/pesticides, prevent use of herbicides/pesticides in or near surface water, unless the herbicide has been EPA-approved for such use.
- Screen streambank and habitat structures from sensitive viewing locations or develop designs that comply with Wild, Scenic, or Recreational River management guidelines, as appropriate.
- For projects involving prescribed bums, obtain required permits and use state-defined smoke management guidelines 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.
- Incorporate a cultural resource management plan or other SHPO-approved actions where deemed necessary.
- 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 be free of barriers to persons with physical disabilities.

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

- Ensure that the project does not shift problems to another watershed or portion of a watershed.
- Consider the results of similar, previous projects, and consult the literature and other people doing similar types of projects to incorporate adaptive management strategies as the plan develops.

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: Aquatic Habitat Objectives Emphasis

Under this alternative, in addition to those prescriptions under Alternative 2, BPA would standardize the planning and implementation process by supporting primarily those management projects with an aggressive aquatic habitat restoration approach. Funding priority would be given to improvement of in-stream habitats and of immediately adjacent riparian areas that contribute to the poor quality of those habitats. Projects in upland and urban areas might be approved where relationships between identified non-point-source pollution and fish and fish habitat are clear. Projects funded under this alternative might generally provide immediate and long-term habitat improvement through projects of larger scope, implemented both in areas of greatest need and in areas known as aquatic refugia (strongholds of high habitat quality).

Project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the aquatic habitat objectives of the project. (Specific management techniques are listed in Appendix A.) Comprehensive watershed management objectives, such as protection or improvement of natural ecosystems and general species diversity, would be advanced through implementation of this Aquatic Habitat Objectives Emphasis alternative. However, benefits to non-aquatic resources, such as wildlife, would be purely coincidental to the accomplishment of aquatic objectives.

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

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

   - Identify priority watersheds as those with the greatest potential to benefit from techniques to meet aquatic habitat objectives of watershed management.

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, in addition to prescriptions required under Alternative 2, BPA would support desired future conditions that focus exclusively on aquatic habitat objectives of watershed management. Social, economic, and other resource conditions would be considered only as they relate to supporting aquatic habitat objectives.

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

With the focus on achieving aquatic habitat objectives, BPA would support characterization of environmental elements that project managers need to understand in order to achieve those objectives 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 watershed management projects.
- Establish baseline information for habitat and species against which change can be measured (related to the "measurable aquatic habitat objective" standard included in step 5).

5. Establish Project Goals (Alternative 3)

Project managers would undertake the following:

- Establish measurable aquatic habitat objectives (e.g., number of habitat units, length of stream, acres of habitat types, list of indicator species, water quality standards).
- Include, as a project goal:
  - * protection of soil and aquatic resources:
  - * 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 fish and wildlife;
  - * mitigation of water quality and aquatic 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, state and Federal fish and wildlife agencies, and private landowners.

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

Under Alternative 3, BPA would support a wide range of mitigation techniques but would favor those plans that place a strong emphasis on in-stream habitat and riparian restoration. These projects would generally realize immediate and long term habitat improvements, and would likely achieve the aquatic objectives of the Watershed Management Program most rapidly. Although these plans might contain a conservative element in their use of pre-implementation surveys, modeling of proposed improvements, and post-implementation monitoring, they would often be aggressive in their approach and might allow soil disturbance or noise generation in greater proportions during construction than other alternatives. Management techniques outside of the aquatic and riparian environments (upland and urban areas), or those intended to provide other resource benefits would be considered only as they relate to achieving the aquatic habitat objectives.

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

- Consider the full range of management techniques avaiable, including adaptive management strategies, and use the methods that best achieve the aquatic habitat objectives, as determined on a case-by-case basis; preferred techniques would include those involving in-channel modification, special vegetaion management, and perhaps road management; other techniques, including some agricultural and forestry practices, might be supported on an as-appropriate basis as descrbed in Appendix A.

7. Monitor Conditions and Evaluate Results (Alternative 3)

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

Project managers would undertake the following:

- Monitor specific performance standards for status and trend of progress toward aquatic habitat objectives (established under Steps 4 and 5).
- File as-implemented and 1-year monitoring reports with BPA's Watershed Management Program.

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 aquatic habitat objectives.

Project managers would undertake the following:

- Use monitoring information to guide annual management priorities and activity planning.
- Consult the literature and obtain peer review during the development of adaptive management strategies.

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 aquatic habitat objectives. Achievement of more comprehensive watershed-scale objectives, such as protection or improvement of natural ecosystems and general species diversity, would occur only incidentally to achievement of the priority objectives.

As with Alternative 3 (Aquatic Habitat Objectives), BPA would support only those actions directly aimed at achieving the goals of the Watershed Management Program. However, whereas Alternative 3 placed an emphasis on aggressive (and generally more expensive) in-stream and riparian habitat improvement, projects funded under the management style of Alternative 4 could occur across the watershed. No preference would be given to in-stream, riparian, or upland areas, or to any one land use. Project managers would focus on minimizing administrative costs and maximizing site-specific application of watershed management funds. Managers would also be restricted to the least costly techniques available. Projects funded under this alternative would therefore provide more gradual habitat improvement through projects of smaller scope that might be removed from direct influence on aquatic habitat. Sustained, cumulative benefits would result in slow, steady improvements in fisheries and aquatic habitat, meeting only the minimum aquatic habitat objectives.

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 actions required to achieve watershed management goals.

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

   - Select projects requiring a minimum financial output.
   - If possible, obtain financial or land management partnerships for achieving project objectives, including agreements with non-electric power development management programs, to ensure coordinated and expeditious 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).

Efforts would focus on identifying stakeholders that could enter cooperative planning and share administrative and implementation costs. BPA staff would be much less involved than under the other alternatives, deferring almost completely to project proponents to develop and administer project-specific plans.

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, Bureau of Land Management (BLM), or State lands near the management 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 on watershed management 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 aquatic habitat objectives.

In addition to the required prescriptions, 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 with non-governmental stakeholders.
- 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 aquatic habitat 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 Watershed Management Program administrative costs. BPA would encourage project plans to include self-sustaining or low-maintenance management areas, and goals would emphasize developing low-maintenance projects with smaller budgets (or lower amounts of initial trust funds established by BPA to fund the project). Social, economic, and other resource conditions would be considered only as they support the least costly approach to achieving aquatic habitat objectives.

Project managers would undertake the following:

- Identify low-maintenance project areas that provide aquatic habitat benefits for a minimum investment.
- 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 (larger-scale) prescribed burns across agency boundaries. The report also directs agencies to seek opportunities to enter into partnership 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 operations and maintenance (O & M) costs, consistent with aquatic habitat objectives.

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

Under Alternative 4, BPA would support a more passive strategy for achieving the objectives of the Watershed Management Program. Project managers would have to select the lowest-cost techniques that could achieve stated objectives.

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

- Rely primarily on natural regeneration rather than active restoration to achieve objectives for vegetative cover.
- Develop management plans that do not require the more costly techniques such as engineered bank-protection structures, wetland creation, cropland terracing, alternative water supply systems, slope stabilization structures, and improvements or alterations to waste water management systems, unless use of such methods would clearly result in the least costly approach to achieving aquatic habitat objectives.
- Use partnerships with volunteer organizations and individuals as well as agencies for the implementation of many projects, particularly those requiring manual labor.
- 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).

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

   Because emphasis would be placed on passive land management, natural regeneration of vegetation, and self-sustaining improvement projects, no specific monitoring requirements would be established under this 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 and provide coincidental benefits for fisheries, water quality, wildlife, recreation, local economic productivity (related to the natural or physical environment, and including, for instance, agricultural or forestry uses), and other resources. Projects would focus equally on fish habitat and other ecological needs throughout the watershed. Habitat improvements would occur in step with other ecological improvements.

Although all techniques addressed in this EIS could be used to improve fisheries and aquatic habitat, some would be more aggressive or "invasive" during implementation, and some might preclude benefits to other resources. Project managers would apply either selected or multiple, complementary techniques and program-wide measures as appropriate to protect all environmental resources, including soils, fish and water resources, wildlife, vegetation, and air quality. These measures would also be implemented in a manner that would avoid or reduce adverse impacts on land use and local economies dependent on agriculture, forestry, and recreation (see program-wide management measure discussions under each resource in Chapter 4). This alternative would minimize even the immediate and short-term disturbances of implementation.

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. The area of concern would be defined by watershed boundaries. A comprehensive and rigorous analysis of economic, social, cultural, and ecological conditions within each watershed boundary would be used to evaluate the management techniques that could be used to improve or maintain conditions in the watershed.

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

   - Identify those areas adjacent to or downstream from project sites that might be affected by or that might benefit from restorative actions, including adjacent landowners and uses, local economic bases (to the county level), tribal and other traditional uses, wildlife or fish travel corridors, downstream habitat, flow regime, and water quality.

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

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:

- 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 lay persons.
- 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 so as to complement or increase efficiency of watershed management projects.

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

- Identify a desired future condition that considers existing social and economic conditions.
- Identify a desired future condition that includes those principal benefits that the watershed provides to stakeholders, consistent with the primary goal of an effective Watershed Management Program.

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 watershed management projects protect and improve general environmental resources.

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 relevant 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 soil conservation and aquatic resource protection goals of watershed management.

Project managers would undertake the following:

- Identify, as a project goal, protection and improvement of environmental resources other than water quality and aquatic habitat.
- Establish specific performance standards (goals) for relevant economic, social, cultural, and other environmental resources systems and features (e.g., wildlife, soils).
- 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 Upper Columbia River Basin draft EISs (USFS and BLM 1997a, 1997b).
- 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 could benefit water quality, fish, and wildlife;
    * mitigation of habitat or water quality 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 fisheries, wildlife, aquatic resource agencies, and private landowners.

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

Under Alternative 5, BPA would support certain actions providing coincidental benefits for wildlife, 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:

- Support watershed management activities with coincidental benefits for wildlife (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 Upper Columbia River Basin EISs; USFS and BLM 1997a, 1997b).
- Encourage economic uses consistent with aquatic habitat 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 watershed management activities. For example, encourage construction contractors to use the local employment security office to hire staff for positions that involve on-the-job training.
- Encourage public use consistent with watershed management objectives; identify safe public recreational opportunities that do not jeopardize project aquatic habitat objectives or significantly alter local social settings.
- Maintain existing primary access roads open for public vehicular travel as practicable.
- Identify scientific educational opportunities.
- Conduct weed control programs using joint multi-agency planning.
- Promote the use of fertilizers with the lowest environmental cost, but 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 watershed ecosystems, processes, and management 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., soils and wildlife, in addition to fish, fish habitat, and 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 watershed management.

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-preferred)

BPA's preferred alternative would 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 (3, 4, and 5): (1) meeting the aquatic habitat objectives of watershed management projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources when those actions would support watershed management.

Under Alternative 6, BPA would support a wide range of actions to support fisheries, fish habitat, and aquatic ecosystems consistent with Council's goals and priorities. BPA would strongly emphasize achieving aquatic habitat objectives in the least costly manner. The preferred alternative would accept the environmental disturbances of project implementation, while planning for the prevention or control of unforeseen consequences and environmental responses through pre-project surveys, modeling of project parameters, and post-implementation monitoring. Habitat improvements would be moderate in quantity, but high in quality and sustained in benefit.

Fish habitat improvement would also be recognized as the project priority, but those projects that favor multiple resource benefits would receive funding. Project managers would apply program-wide measures as appropriate to afford the maximum benefit practicable to other environmental resources, including soils, vegetation, wildlife, and air quality. These measures would also be implemented in a manner that would avoid or reduce adverse impacts on land use and local economies dependent on agriculture, forestry, and recreation (see section on program-wide mitigation measures under each resource discussed in Chapter 4).

Alternative 6 is most similar to the current situation in terms of maintaining the balanced management strategy under which proposed management projects are funded. The primary difference between this 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 Watershed Management Programs or projects 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 those watersheds that would benefit most from management techniques (Appendix A). These watersheds would be defined as those that:

- are significantly degraded and need to be improved to an acceptable level of water and aquatic habitat quality, or
- contain habitat of exceptional quality that should be protected from degradation, or
- are at special risk of becoming degraded if watershed management actions are not implemented.

Project managers would seek to establish projects that can take advantage of existing land management systems or that could eliminate existing management inefficiencies.

If possible, establish partnerships for achieving project objectives, including agreements with non-electric power development management programs, to ensure coordinated and expeditious program implementation.

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:

- Develop an effective public involvement program that includes a variety of ways to solicit public input: mailings, public notices and public meetings and workshops both early in and throughout the planning process; notices in the local paper of record and in BPA's monthly newsletter; and alternative means 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, in addition to the required prescriptions, 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), including the development of a sense of responsibility and "ownership" in the general public for watershed conditions.
- Consider concepts that include sustainable revenue generation (e.g. crop production, timber harvest) to reduce initial or long-term Federal costs, consistent with aquatic habitat objectives.

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

With the primary focus on achievement of aquatic habitat objectives, BPA would support the collection of the information necessary to achieve watershed management objectives and to monitor results.

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

- Identify and map basic physical conditions such as soil conditions, topography, hydrology, vegetation, and biological information within the proposed areas for watershed management projects.
- Establish baseline information for watersheds against which change can be measured (related to the "measurable aquatic habitat objective" standard included in step 5).

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

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

Project managers would undertake the following:

- Establish measurable aquatic habitat and physical habitat objectives (e.g., water quality standards, number of habitat units, list of indicator species).
- Include, as project goals:
  - * protection and improvement of a variety of fish habitats, including spawning beds, overwintering and rearing areas, resting pools, and protective cover, especially of high-quality native or other habitat for species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
  - * development of riparian habitat that could benefit water quality, fish, and wildlife;
  - * protection of high-quality native species or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
  - * mitigation of habitat losses in-place, in kind, wherever possible;
  - * protection or improvement of natural ecosystems and species diversity over the long term;
  - * development of habitat that complements the activities of the region's tribes and state and Federal fish, wildlife, water resource agencies, and private landowners; and
  - * a future condition that is self-sustaining after initial improvements have been completed.

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 watershed management objectives.

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

- Consider the full range of management techniques available, including adaptive management strategies, and use the methods that best achieve the aquatic habitat objective in a cost-effective manner, as determined on a case-by-case basis. See Appendix A for a complete list of techniques.
- Apply the potential program-wide mitigation measures in Chapter 4, as appropriate, to protect the environment.
- 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).
- Favor watershed management activities with coincidental benefits for wildlife, 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 watershed management 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, conduct weed control programs using joint multi-agency planning. Protocols could be adapted from the USFS Final EIS for Managing Competing and Unwanted Vegetation (USFS 1988).
- 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 watershed management 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 aquatic habitat objectives (established under Steps 4 and 5).
- File as-implemented and 1-year monitoring reports with BPA's Watershed Management Program.

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

Under Alternative 6, 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 aquatic habitat objectives.

Project managers would undertake the following:

- Use monitoring information to guide annual management priorities and activity planning.
- Consult the literature and obtain peer review during the development of adaptive management strategies.

2.1.8 Available Management Techniques

While the alternatives present a range of possible strategies, goals, and procedural requirements for watershed management projects, Project Management Plans would need to include actual site-specific techniques to support activities and achieve goals. The standardized requirements would influence technique implementation. Table 2-1 lists techniques that may be employed under some or all of the alternatives. The techniques are generally organized by land use and land management practice. In most cases, several complementary techniques could be included in a Project Management Plan. For example, techniques requiring ground disturbance might be accompanied by techniques aimed at vegetative restoration and other erosion control on the site. Appendix A provides a description of each technique.

Table 2-1. Relative Use of Techniques Among Alternatives (10 pages)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environmental Protection	Alt 6: Balanced Approach
IN-CHANNEL MODIFICATIONS AND HABITAT IMPROVEMENT TECHNIQUES						
Modeling the Effects of River Channelization	-	-	+	-	+	★
Prohibit Further Channelization	★	★	+	+	★	+
Restoration of Channelized River and Stream Reaches	-	-	+	-	+	★
Pre-implementation Evaluation of Proposed Improvements	★	★	+	-	★	+
Install Grade Control Structures and Check Dams	★	★	+	-	+	★
Install Large Woody Debris Structures	+	+	+	-	★	+
Install Other Habitat Complexity Structures	+	+	+	-	★	★
Bank Protection through Vegetation Management	+	+	+	★	+	+
Structural Bank Protection Using Bioengineering Methods	+	+	+	★	+	+
Structural Bank Protection using Engineered Structures	★	+	+	-	★	★
Remove Debris Functioning as Barriers to Passage	-	-	★	-	★	-
Hardened Fords	-	★	★	★	+	★
Culvert Removal/Replacement to Improve Fish Passage	★	★	+	-	+	+
Reduce Scour and Deposition at Hydraulic Structures	★	★	+	★	★	+
Fish Passage Enhancement—Fishways	★	-	+	-	★	★
Spawning Habitat Enhancements	★	★	+	-	★	★
Rearing Habitat Enhancements	★	★	+	-	★	★

+ = frequent use **★ = moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't))

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
SPECIAL VEGETATION TREATMENT TECHNIQUES, INCLUDING TECHNIQUES FOR WETLANDS AND RIPARIAN AREAS						
Maintain Healthy Riparian Plant Communities	+	+	+	+	+	+
Plant/Protect Conifers in Riparian Area	+	+	+	★	+	+
Creation of Wetlands to Provide Near-Channel Habitat and Store Water for Later Use	-	-	+	-	+	★
Provide Filter Strips to Catch Sediment and Other Pollutants	★	★	+	★	+	+
Plant Windbreaks	-	-	-	★	+	★
Native Seeds Inventories	★	★	★	★	+	★
Avoid Exotic Species	+	+	+	+	+	+
Construct Wetlands Treatment Systems	-	-	★	-	★	★
Mechanical Vegetation Removal	-	-	+	★	-	+
Biological Vegetation Control	-	-	★	-	★	★
Hand Pulling	-	-	+	-	+	+
Prescribed Burning	-	-	+	★	★	★
Reduce Shade to Increase Primary Food Production	x	x	-	x	x	x
Enhance Large Woody Debris Recruitment	-	★	+	-	★	★
Acquisition of Sensitive Riparian Resources	-	★	+	★	★	★
AGRICULTURAL MANAGEMENT TECHNIQUES--CROPS AND GENERAL						
Plant/Protect Vegetative/Conservation Cover	+	+	+	★	+	+
Conservation Cropping Sequence	+	+	★	★	+	★
Conservation Tillage	★	★	★	★	+	★
Contour Farming	+	+	★	★	+	★
Contour Orchards and Fruit Crops	-	-	★	-	+	★

+ = frequent use **★ = moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
AGRICULTURAL MANAGEMENT TECHNIQUES--CROPS AND GENERAL (con't)						
Cover and Green Manure Crop	-	-	★	-	+	★
Critical Area Planting	★	★	+	★	+	+
Delayed Seed Bed Preparation	★	★	★	★	+	★
Grasses and Legumes in Rotation	+	+	★	★	+	★
Contour Stripcropping	+	+	★	★	+	★
Field Stripcropping	+	+	★	★	+	★
Terracing	+	+	★	-	★	★
Diversion Ditch	+	+	★	-	+	★
Field Border	★	★	★	★	+	+
Filter Strip	★	★	+	★	+	+
Grassed Waterway	★	★	+	-	+	+
Sediment Basins	+	+	+	★	+	+
Sediment and Water Control Basins	+	+	+	★	+	+
Zoning/Land Use Planning	★	★	★	★	★	★
Plant Windbreaks	-	-	-	-	+	★
Avoid Impounding Needed Flushing Flow	-	-	+	★	+	★
Release Impounded Water to Flush Gravels	-	-	+	-	★	★
Chemical Management Plans	+	+	★	+	+	+
Fertilizer Application: Rates and Timing	+	+	★	★	+	+
Fertilizer Recovery and Stabilization	★	★	★	★	+	+
Evaluate Field Limitations	★	★	★	★	+	★
Equipment Calibration and Use	★	★	★	★	+	★
Alternative Pest Management Strategies	-	-	★	★	+	★
Herbicide/Pesticide Application	★	★	★	+	-	★
Apply Herbicides/Pesticides Selectively	★	★	★	+	+	★

+ = frequent use **★ = moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environmental Protection	Alt 6: Balanced Approach
AGRICULTURAL MANAGEMENT TECHNIQUES--CROPS AND GENERAL (con't)						
Herbicide/Pesticide Application Rates	+	+	★	+	+	★
Anti-Backflow Devices on Hoses	+	+	★	+	+	★
Enforce Current Herbicide/Pesticide Use Regulations	+	+	+	+	+	+
Aerial Spray Applications: Buffer Zones	★	★	★	★	+	★
Aerial Spray Applications: Atmospheric Conditions	+	+	★	+	+	★
Slow-Release Fertilizers	+	+	★	★	+	★
Spill Contingency Planning	★	★	+	+	+	+
AGRICULTURAL MANAGEMENT TECHNIQUES--IRRIGATION						
Irrigation Water Management	★	★	+	★	+	+
Water Measuring Devices	★	★	+	★	+	★
Soil and Crop Water Use Data	-	-	+	-	+	★
Soil Water by Tensiometers	-	-	+	-	+	★
Drip or Trickle Irrigation	-	-	★	-	+	★
Sprinkler Irrigation	★	★	+	-	★	★
Irrigation by Surface or Subsurface Means	+	+	-	+	★	★
Water Conveyance: Ditches and Canals	+	+	-	+	★	★
Water Conveyance: Ditch and Canal Lining	-	-	★	-	★	★
Water Conveyance: Pipeline	★	★	+	★	★	★
Tailwater Recovery	★	★	+	★	+	+
Filter Strip	★	★	+	★	+	+
Surface Drainage Ditch	★	★	-	★	★	★
Subsurface Drainage Collection	★	★	-	★	★	★
Water Table Control	★	★	+	-	★	★
Backflow Safety Devices	★	★	-	★	+	★

+ = frequent use **★ = moderate use** **- = infrequent use** **X = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
AGRICULTURAL MANAGEMENT TECHNIQUES–IRRIGATION (con't)						
Limit Interwatershed Diversions and Returns	-	-	+	★	+	+
Purchase/Negotiate Water Right	-	-	+	-	+	+
File for In-stream Water Right	-	-	+	★	+	+
Well Construction for Primary Water Source	★	★	+	-	+	+
Impoundments for Water Source	-	-	-	-	-	-
Avoid Excess Irrigation Flows	★	★	+	★	+	+
Intake and Return Diversion Screens	+	+	+	+	+	+
Protect Springs	★	★	+	★	+	+
Consolidate/Replace Irrigation Diversion Dams	★	★	★	-	★	★
AGRICULTURAL MANAGEMENT TECHNIQUES--ANIMAL FACILITIES						
Heavy Use Area Protection	★	★	+	★	+	+
Manage Runoff from Impervious Surfaces	★	★	+	★	+	+
Waste Management Plan	★	★	+	★	+	+
Waste Storage and Treatment	★	★	+	★	+	★
Land Application of Wastes	+	+	★	★	-	★
Composting Facility	-	-	-	-	+	★
Constructed Wetlands for Treatment of Agricultural Wastes	-	-	+	-	+	★
Commercial Disposal Service	-	-	★	-	★	-
Landfill Burial of Wastes	-	-	-	-	-	-
Incinerate Wastes	-	-	-	-	-	-
Hardened Fords for Livestock Crossings of Streams	-	-	+	-	+	+
Seasonal Use of Fords and Surface Waters	★	★	+	★	+	+
Alternative Water Sources	★	★	+	★	+	+

+ = frequent use ★ **= moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
AGRICULTURAL MANAGEMENT TECHNIQUES--GRAZING						
Deferred Grazing	★	★	★	★	+	★
Planned Grazing System	★	★	+	+	+	+
Control Grazing Intensity	★	★	+	★	+	+
Pasture and Hayland Management	+	+	+	+	+	+
Water Supply: Pipeline	-	-	+	-	★	★
Water Supply: Ponds	+	+	+	+	★	★
Water Supply: Trough	+	+	+	+	+	★
Water Supply: Well	★	★	+	★	+	★
Water Supply: Spring Development	★	★	+	★	★	★
Access: Fencing	★	★	+	★	+	★
Access: Trails/Fords at Stream Crossings	★	★	+	★	+	+
Vegetation Stabilization: Pasture Planting	★	★	-	★	+	+
Vegetation Stabilization: Range Seeding	★	★	-	★	+	★
Vegetation Stabilization: Critical Area Planting	★	★	+	★	+	+
Vegetation Stabilization: Brush/Weed Management	+	+	-	+	+	+
Monitor Wildlife	★	★	-	★	+	★
Wildlife Harvesting	-	-	-	-	-	-
Heavy Use Area Management	★	★	+	★	+	+
ROAD MANAGEMENT TECHNIQUES						
Pre-plan Road Location	+	+	★	+	+	+
Install Hydraulic Structures at Low Streamflows	★	★	+	-	+	★
Minimize Erosion and Sedimentation During Stream Crossing Construction	+	+	+	★	+	+

+ = frequent use **★ = moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
ROAD MANAGEMENT TECHNIQUES (con't)						
Divert Water Around Construction of Larger Structures	★	★	+	★	-	+
Avoid Stream Crossings Outside of Construction Windows	+	+	+	+	+	+
Reduce Risk of Road-Related Mass Failures	+	+	★	+	+	+
Reduce Risk of Road-Related Surface Erosion	★	★	★	★	+	+
Drainage Control to Minimize Erosion and Sedimentation	★	★	★	★	+	+
Avoid Construction During Inclement Weather	★	★	★	★	+	+
Erosion Control and Revegetation at Project Completion	★	★	★	★	+	+
Slash Management	+	+	+	+	+	+
Intersections with Paved Roads	★	★	★	★	★	★
Grade Road	★	★	★	★	+	+
Ditch and Culvert Cleaning	★	★	+	★	+	+
Grassed Road Surface Management	-	-	★	-	+	★
Remove Temporary Stream Crossings	★	★	+	★	+	+
Access Management	★	★	★	★	+	+
Road Closure	★	★	★	★	+	+
Water Bars	★	★	★	★	+	+
Inspect Closed Roads	★	★	★	-	+	+
Relocate Roads	★	★	★	★	★	★
FOREST MANAGEMENT TECHNIQUES						
Streamside Mgmt Areas (SMA) Widths	+	+	+	+	+	+
Minimize Disturbances within SMA	+	+	+	★	+	+
Locate Landings and Roads Outside SMA	+	+	★	+	+	+

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Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
FOREST MANAGEMENT TECHNIQUES (con't)						
Appropriate Chemical Usage in SMA	+	+	+	★	+	+
Directional Falling of Trees	+	+	-	★	+	+
Harvesting Restrictions	★	★	-	★	+	+
Removal of Introduced Trees and Slash	★	★	-	-	★	★
Timber Harvest Unit Design	+	+	-	-	★	+
Determining Guidelines for Yarding Operations	+	+	-	-	+	+
Stream Channel Protection During Timber Harvest	+	+	★	-	+	+
Equipment Servicing	+	+	-	+	+	★
Prescribed Burning	★	★	-	★	★	★
Stand Thinning	+	+	-	★	★	★
Plant/Preserve Trees in Understocked Areas	★	★	-	★	+	+
Manage Stands to Improve Snowpack	-	-	+	-	-	★
Study Reward/Penalty System	★	★	-	★	★	★
Seed and Species Selection	+	+	★	★	+	★
Priority Areas	+	+	+	+	+	+
Optimum Seeding Periods	+	+	★	+	+	+
Mulching	-	-	-	-	★	★
Fertilization	★	★	-	★	★	★
Site Protection	+	+	-	★	+	+
Monitor Revegetated Areas	★	★	-	★	+	★
Vegetate Steep Slopes	★	★	★	★	+	★
Interim Stabilization Methods	★	★	-	★	+	★
Aggressive Fire Suppression	+	+	-	★	+	★

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Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environmental Protection	Alt 6: Balanced Approach
FOREST MANAGEMENT TECHNIQUES (con't)						
Natural Fire Control	★	★	+	+	+	+
Prescribed Burning to Reduce Fuels	★	★	-	-	+	★
Seasonal Grazing Management to Reduce Fuels	-	-	-	★	★	★
Wildfire Contingency Watershed Restoration Plans	★	★	★	+	+	+
URBAN AREA TECHNIQUES						
Zoning/Land Use Planning	★	★	-	★	★	★
Urban Runoff Facilities	★	★	★	★	+	★
Limit Future Development of Sewer Systems	-	-	-	-	★	-
Improve Existing Sewer Systems	★	★	-	-	+	★
Industrial/Construction Chemicals/Fuels	★	★	-	★	+	★
Prohibit Further Channelization	★	★	+	★	+	+
Avoid Building on Floodplains	★	★	+	★	+	+
Public Education Programs	★	★	★	-	+	+
Recycling Programs	★	★	-	-	+	+
Lawn Care and Landscaping	★	★	-	-	+	★
Encourage Onsite Recycling of Yard Trimmings	★	★	-	★	+	★
Biodegradable Cleaners	+	+	-	★	+	★
Pet Excrement	-	-	-	★	+	★
Storm Drain Stenciling	★	★	-	★	+	+
Parking Lot Design and Street Maintenance	★	★	-	★	+	★
Water Conservation Programs	★	★	★	★	+	+

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Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
URBAN AREA TECHNIQUES (con't)						
Septic System Additives	★	★	-	★	+	★
Litter Control	★	★	-	★	+	+
Adopt-a-Stream Programs	-	-	+	★	+	+
Direct Pollutants Away from Bridges	-	-	★	★	+	★
Restrict Use of Bridge Scupper Drains	-	-	★	★	+	★
Construction: Erosion and Sediment Control Plans	+	+	★	★	+	+
Construction: Erosion and Sediment Control Structures	+	+	★	★	+	+
Construction: Inspect Erosion and Sediment Control Structures	+	+	-	★	+	+
Construction: Minimize Runoff to/from Site	★	★	+	-	+	+
Road Salt Storage and Application	★	★	-	-	★	★
Alternative Deicing Materials	-	-	-	-	+	★
Accumulated Snow Disposal	-	-	-	-	★	★
RECREATION MANAGEMENT TECHNIQUES						
Relocate Trails and Campgrounds	-	-	-	-	★	★
Implement Recreational Permit System	-	-	-	-	+	★
Improve Campground Design	★	★	-	★	+	★
Outdoors Education Program	★	★	★	★	+	+
Fence Sensitive Areas from Recreationists	★	★	+	-	+	★
Implement Pack In/Pack Out Policy	+	+	-	★	+	★
Sanitation Services	+	+	-	★	+	★
Install Pump or Self-Composting Toilets	★	★	-	★	+	★

+ = frequent use **★ = moderate use** **- = infrequent use** **x = not used**

Table 2-1. Relative Use of Techniques Among Alternatives (con't)

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Aquatic Habitat Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
RECREATION MANAGEMENT TECHNIQUES (con't)						
Close Stream to Fishing to Protect Sensitive Fish Species	+	+	+	+	+	+
Seasonal Sport Fishery Closures	+	+	+	+	+	+
Provide Alternative Sport Fishing Locations	★	★	★	-	+	★
Construct Well to Provide Water to Recreationists	+	+	-	-	+	★
Management of Off-Road Vehicle Use	★	★	★	★	★	★
MINING AND MINE RECLAMATION TECHNIQUES						
Rainfall Management	-	★	★	-	+	★
Surface Water Control	-	★	★	-	+	★
Fish and Wildlife Protection	-	★	★	-	+	★
Treatment of Mine Waste	-	★	★	-	+	★
Treatment of Mine Waste Runoff	-	★	★	-	+	★
Revegetation of Waste Disposal Sites	-	★	★	-	+	★
Monitoring Mine Waste Disposal Sites	-	★	★	-	+	★
Leaching for Remediation	-	-	-	-	★	-
Gravel Mining Window	+	+	+	+	+	+
Regulate Stream Dredging	-	-	+	+	+	★

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2.1 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 watershed management projects funded by BPA.

Under **Alternative 1, No Action**, BPA would continue to implement each watershed management 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 watershed management projects. Alternatives 3 through 6 also contain these minimum requirements.

Under **Alternative 3, Aquatic Habitat Objectives Emphasis**, BPA would support only those actions intended specifically to achieve fish and fish habitat (aquatic habitat) objectives; however, project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the aquatic habitat 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 aquatic habitat 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 coincidental benefits for wildlife, recreation, local economic productivity (related to the natural or physical environment), or other resources. Project managers would also apply potential program-wide 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 aquatic habitat objectives.

Alternative 6, Balanced Response, BPA's preferred alternative, seeks to achieve balance among the purposes individually emphasized in Action Alternatives 3 through 5: (1) meeting the aquatic habitat objectives of watershed management projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources when such action would support aquatic resource objectives. Alternative 6 would result in new management 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 measures as appropriate to protect other environmental resources. These two differences would allow BPA to implement watershed management 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 aquatic habitat objectives, cost and administrative efficiency, 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 (three pages)

Environ-mental Resource	Existing Conditions	Alternative 1: No Action	Alternative 2: Base Response (Impacts Common to All Action Alternatives)	Alternative 3: Aquatic Habitat Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environ-mental Protection (Environmentally preferred	Alternative 6: Balanced Action (BPA-preferred)
Soils	Diverse across the Columbia River 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. Potential problems higher than under Action Alterna-tives due to less planning and data collection.	Minor soil disturbances with project implemen-tation; soil conditions improve as adopted planning process assures identification and protection of problem soil areas.	Relatively high amounts of short-term erosion might occur, particu-ularly in riparian areas, during initial project phases; however, over the long-term, soil conditions would greatly improve over existing conditions.	Minor, short-term soils impacts might occur with project imple-mentation; impacts occur across watershed, including upland areas, with less emphasis on riparian areas.	Soils are protected with only minor, short-term construction impacts. Some revegetation efforts, where distur-bance is helpful to establishment, may be slow to restore site.	Generally beneficial to soils. A moderate level of short-term soil erosion would occur at some new sites as projects are imple-mented, followed by increasing stability in both riparian and upland areas.
Fish/Water Resources and Quality	The Columbia River 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.	Initial implementation of some projects may cause temporary exceedences of state water quality (sediment) standards due to construction disturbance of soils and channels. Overall, fish and water quality would benefit as aquatic and riparian habitat is restored and/or protected.	Ground- and channel-disturbing activities potentially reduce water quality and fish habitat in the short term; consistent planning process identifies and protects high-value fish habitat and water quality reaches.	Aggressive in-channel and riparian focus has greatest potential to generate short-term water quality exceedences and disturb fish. However, benefits to fish are often immediate, rapid, and sustained increases in a variety of habitats.	Minor, short-term impacts on fish and water quality due to less aggressive in-channel work; some immediate but primarily gradual improvements in fish habitat and water quality.	Short-term construc-tion-related impacts are minor and few as emphasis on multiple resource benefits and protection promotes projects that are smaller in size and scope (least aggressive). Fish habitat increases gradually, in step with other environmental improvements.	Moderate improvements in fish and riparian habitat, including immediate and sustained benefits to fish. Short-term, construction-related impacts are mitigated to the extent practicable.
Wildlife	Many sensitive wildlife species in the Columbia River Basin are associated with native shrub-steppe and old growth forests. Wetlands, riparian areas, cliffs, talus, and caves are other important habitat types.	Some wildlife disturb-ance would occur when projects first begin, though Sensitive and T&E species are protected. Coincidental wildlife benefits accrue with aquatic/riparian habitat restoration.	Some wildlife disturb-ance occurs with project implementation/con-struction: consistent planning process, pro-gram-wide require-ments identify, protect high-value wildlife habitat, water quality.	Greatest disturbance assoc. with project im-plementation relative to other alt's. Emphasis on aquatic and riparian habitat improvement yields greatest coincidental wildlife benefits, long-term.	Low potential for initial disturbance to wildlife because of overall emphasis on passive, rather than active management tech-niques. Lowest potential for long-term coincidental benefits.	No significant adverse impacts expected, as multiple environmental benefits are emphasized.	Some minor wildlife impacts associated with project implementation. Moderate potential for long-term coincidental benefits, primarily from riparian habitat improvements.

Environmental Resource	Existing Conditions	Alternative 1: No Action	Alternative 2: Base Response (Impacts Common to All Action Alternatives)	Alternative 3: Aquatic Habitat Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environmental Protection (Environmentally preferred)	Alternative 6: Balanced Action (BPA-preferred)
Vegetation	The Columbia River Basin contains three general vegetation zones: coniferous forest, sagebrush, and perennial grassland. Crop production, grazing, forestry, and hydroelectric projects have greatly altered Basin vegetation types, and native plant communities are relatively rare.	Native plant communities would continue to benefit (after initial disturbance), particularly in planted or seeded riparian areas.	Native plant communities benefit as planning process and program requirements help identify the best approaches to vegetation management.	The emphasis on in-channel and riparian improvements increases potential for construction-related damage. In the long-term, healthy riparian communities are increased relative to other alternatives.	Minor construction disturbance of riparian vegetation areas; natural and assisted revegetation and less aggressive mitigation methods result in gradual improvements in vegetation.	Minor construction disturbance on riparian vegetation areas; natural and assisted revegetation and less aggressive mitigation methods result in gradual improvements in vegetation.	Relatively minor initial disturbance of vegetation, including in riparian areas. In the long-term, riparian communities experience moderate improvements in stand structure and composition.
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 use impacts decrease relative to No Action because planning approach identifies land use issues and concerns.	Land use changes, if any, are most likely in riparian areas due to influences of channel and riparian improvements on water flow, water tables, and riparian changes.	Low potential for significant changes in land or shoreline uses due to project scope.	Low potential for significant changes in land and shoreline uses due to project scope and program-wide mitigation measures.	Minor risk of land use changes due to influences of channel and riparian improvements on water flow, water tables, and riparian changes mitigated by program-wide mitigation measures.
Cultural and Historic Resources	Most identified cultural resources in the Columbia River 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 resources would be directly related to the amount of ground disturbance that would occur. This alternative presents the minimum level of protection required by law.	Highest potential for ground-disturbing activities related to riparian habitat improvement and correspondingly high potential for disturbing unknown cultural resources.	Relatively minor potential for impacts; new ground disturbance minor because of projects of smaller scope and greater emphasis on projects in previously disturbed areas.	Extra efforts to minimize ground disturbance and protect cultural resources reduce the potential for impacts. Recreational, economic, and other post-implementation uses may result in some disturbances.	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.

Environmental Resource	Existing Conditions	Alternative 1: No Action	Alternative 2: Base Response (Impacts Common to All Action Alternatives)	Alternative 3: Aquatic Habitat Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environmental Protection (Environmentally preferred)	Alternative 6: Balanced Action (BPA-preferred)
Economics	Major sources of employment in the Columbia River 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.	Projects employ temporary and/or seasonal employment; planning approach identifies opportunities for incorporating local skills and resources consistent with local, generally natural-resource-based, economies.	Similar to Alternative 2; greatest potential for short-term economic benefits because of emphasis on aggressive projects.	Similar to Alternative 2; small potential for short-term economic benefits; greatest use of volunteer efforts.	Similar to Alternative 2; moderate benefits because providing coincidental benefits to local economies would be a project goal.	Similar to Alternative 2; moderate benefits to local economies.
Recreation and Visual	The Columbia River Basin provides a variety of outdoor recreational opportunities. Many people from the more populated western Oregon and Washington visit rural Basin areas for recreation.	Recreational opportunities developed on a case-by-case basis as they support aquatic habitat objectives; some construction-related impacts.	Recreational experiences and opportunities identified and protected by consistent planning approach; some construction-related impacts.	Improvements to recreational facilities and experiences purely incidental to the achievement of aquatic habitat objectives; greatest potential for short-term recreation impacts in riparian areas.	Coincidental benefits to recreation coincident with achievement of aquatic habitat objectives; variable but short-term impacts on recreational facilities.	Benefits to recreation greatest and in step with achievement of aquatic habitat objectives; least potential for disturbance to recreational facilities and experiences.	Improvements to recreational facilities and experiences purely incidental to the achievement of aquatic habitat objectives; some potential for minor, short-term recreation impacts in riparian areas.
Air Quality	Most of the Columbia River Basin is rural and generally has fewer air quality problems than do the population centers. Smoke from field burning and wind-borne dust sometimes create air quality problems in the Basin.	Exhaust emissions and noise from heavy equipment, smoke emissions from prescribed burning, and wind drift of applied herbicides and pesticides would vary on a case-by-case basis.	Local reductions in air quality and visibility. State and local regulations would be followed.	Relatively few impacts (noise, dust, exhaust emissions) due to emphasis on in-channel and riparian enhancements.	Greatest potential use of prescribed burning (and smoke emissions) to treat large areas of vegetation; moderate potential for aerial applications of fertilizers and herbicides.	Low potential for impacts due to low level of use for prescribed fire, fertilizers, herbicides, pesticides, and large equipment (dust, emissions).	Minor impacts associated with drifting smoke or applied fertilizers, herbicides, and pesticides. Moderate potential for dust and emissions from construction equipment.

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Table 2-3. Predicted Performance Summary

Decision Factor	Alternative 1: No Action	Alternative 2: Base Response Emphasis	Alternative 3: Aquatic Habitat Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environmental Protection (Environmentally preferred)	Alternative 6: Balanced Approach (BPA-preferred)
Achievement of Aquatic Habitat Objectives	Meets objectives, but without benefit of consistent management direction.	Meets only minimum objectives with minimal consistent management direction.	Greatest predicted achievement of aquatic habitat objectives among alternatives.	Meets only the minimum objectives.	Potentially reduced achievement of objectives, as some funds are directed towards protection or improvement of non-fisheries resources.	Meets objectives.
Cost and Administrative Efficiency	Inefficient because BPA would need to repeatedly 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 aquatic habitat 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 the maximum protection and improvement of environmental resources, consistent with achievement of aquatic habitat objectives.	Provides general environmental protection, consistent with achievement of cost efficiency, aquatic habitat objectives, and legal compliance.

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CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing environment of the area potentially affected by BPA's Watershed Management 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 Watershed Management 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 watershed projects is the United States portion of the Columbia River Basin. The area includes lands in Washington, Oregon, Idaho, Montana, Nevada, Utah, and Wyoming.

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.

Climate consists of cold winters and warm, dry summers east of the Cascade Mountains, with a more temperate climate west of the mountains. Most precipitation falls in winter or spring, although occasional thunderstorms east of the Cascades bring heavy rains during summer and fall. Total precipitation varies greatly, with average annual amounts ranging from 254 centimeters (cm) (100 inches (in.)) per year at the Cascade crest to less than 20 cm (8 in.) per year in the low-elevation basins and plains east of the Cascades. 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 River Basin just east of the Cascades and the Snake River Basin/High Desert of eastern Oregon and southern Idaho.

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, and then 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 WATER RESOURCES AND QUALITY

The Columbia River flows 1,930 kilometers (km) (1,200 miles (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 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, located primarily on USFS lands.

The Columbia River Basin's water resources provide tribal values and use, irrigation, recreation, fish and wildlife habitat, transportation corridors, drinking water, and power. The Columbia River Project provides irrigation to large portions of Washington state; it 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.

3.4 FISH

The Columbia River Basin provides habitat for a wide variety of native and introduced fish species. These include anadromous fish (which migrate from fresh waters to the ocean, returning after several years to spawn), and resident fish species (which remain in fresh waters throughout their life cycle).

Resident fish species (trout, squawfish, whitefish, suckers, chubs, dace, shiners, sculpins, sticklebacks, and other lesser known species) occupy most of the Columbia River Basin. The status of numerous native resident fish species is a concern. These include several isolated populations of trout, white sturgeon, burbot, sandrollers, and sculpin, many of which are currently protected as Federal or state Threatened or Endangered species, or species of concern. Habitat degradation and alteration, barriers that isolate populations, water withdrawals, species introductions, pollution, and fishing have played significant roles in the decline of many of these stocks.

Several anadromous stocks are present in the basin, including spring/summer and fall chinook salmon; coho, chum, and sockeye salmon; summer and winter steelhead trout; sea-run cutthroat trout; American shad; white sturgeon; and Pacific lamprey. Pacific salmon and steelhead trout are of particular importance due to their commercial, sport, and cultural values.

Many salmon and trout stocks in the basin are severely depleted. Consequently, there is much concern for their recovery and continued survival. Several factors have affected and continue to affect anadromous salmonid stocks. Loss of freshwater spawning and rearing habitat, hatcheries, interference with downstream and upstream migration by dams on the river system, harvest practices, and oceanic conditions are all factors.

Salmon and steelhead have four characteristic life history phases: spawning and rearing in fresh water, juvenile migration to the ocean, ocean rearing, and adult upriver spawning migration. Within the context of this EIS, watershed conservation and restoration projects primarily affect the fresh-water adult migration, holding, spawning, rearing, and smolt out-migration phases of these stocks in tributary streams to the mainstem Columbia River.

In response to the declines in salmonid abundance, several actions (including reservoir drawdowns and flow augmentation) are being considered as ways to improve anadromous fish runs (BPA 1995). Additionally, the USFS and BLM have developed guidelines for management activities that may affect both anadromous and resident 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, USFS and BLM 1995a, 1995b, and 1995c); the Decision Notice for the Inland Native Fish Strategy (INFISH, USFS 1995); and the Aquatic Conservation Strategies in the Northwest Forest Plan (USFS and BLM 1994a and 1994b).

3.5 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 (Daubenmeyer 1970, Franklin and Dyrness 1973), 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 Sound valleys, along the Cascade Mountains, in the Blue Mountains of northeastern Oregon, and in the Rocky Mountains of northern Idaho and western Montana.

Shrub-steppe occurs in the Columbia River 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 3-1 shows the extent of cropland.) Because of these disturbances, native, late-successional plant communities (e.g., old-growth forest and native shrub-steppe) generally are rare in the Columbia River 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.

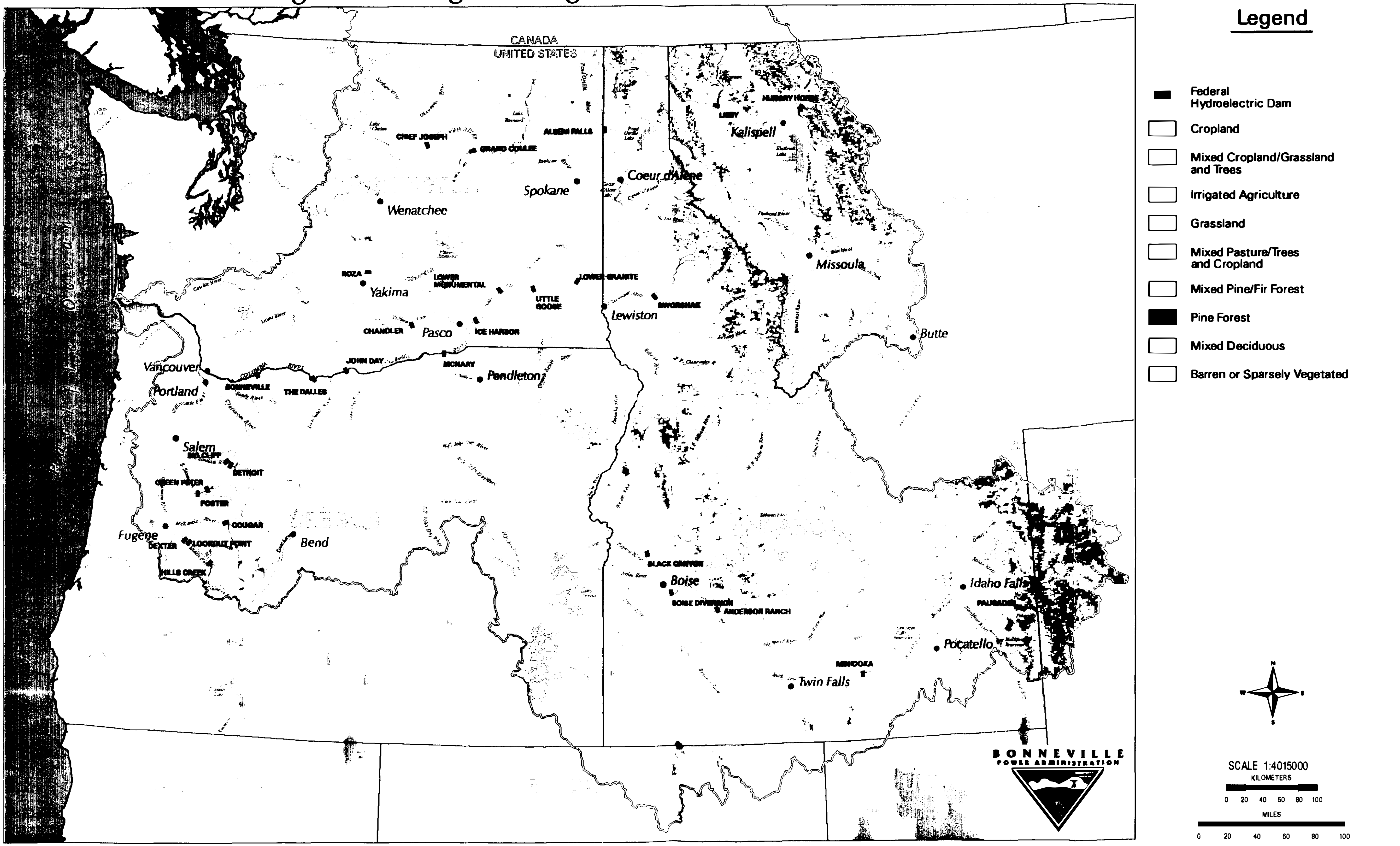
On less arable lands, livestock grazing has greatly reduced native perennials and encouraged the invasion of aggressive exotic annuals (e.g., cheatgrass, mustards, and Russian thistle) that now take the place of native species in most heavily grazed areas (Tisdale and Hironaka 1981). Cheatgrass, the 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 number 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

BPA Watershed Management Program - Fig. 3-1: "Land Cover Characteristics"



fire-sensitive species have survived 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 the original shoreline and floodplain riparian vegetation.

3.6 WILDLIFE

Basin wildlife can be 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 Columbia River 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 have 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 (Oregon Department of Fish and Wildlife 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 (Oregon Department of Fish and Wildlife 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 Columbia River 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 are 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 (Oregon Department of Fish and Wildlife 1993, Washington Department of Fish and Wildlife 1995).

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 able and willing to participate in government and public decisions through local governments. Because most of the Columbia River Basin is rural, counties provide most of the primary regulatory and management authority over land use.

The shorelines of lakes, rivers, and coastal zones are considered sensitive areas for many reasons, including their vulnerability to erosion, the proximity of riparian areas, their critical role in the protection of water quality, high-value fish and wildlife habitat, and important public use.

On non-Federal lands, shorelines are generally regulated at the state or local level through State shoreline management acts and through county and city ordinances. On Federal lands, shorelines are protected under NEPA, as well as under the Clean Water Act and the Rivers and Harbors Act (see Chapter 5).

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 the understanding of 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 as follows:

- Kootenai Tribe
- Shoshone-Bannock Tribes
- Coeur d'Alene Tribes
- Kalispel Tribe
- 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

Tribal Reservations are located throughout the study area. However, tribal interests extend beyond the Reservations. Native American tribes hold and exercise legal rights to activities and resources both within and beyond Reservation boundaries. These rights vary, depending upon the tribe, and can 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.

3.9 ECONOMICS

Major sources of employment include agriculture, forestry, real estate, recreation/tourism, retail, services, and government. The agricultural, forestry, and fishing industries provided 9 percent 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 (e.g., Quincy and Palouse, Washington; McCall, Rigby, and Hollister, Idaho; and Weston and Heppner, Oregon), to small cities (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. 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. The Interior Basin Washington counties comprise 38 percent of the population; southern Idaho counties 27 percent; Oregon counties 12 percent; Montana counties 11 percent; and northern Idaho counties 7 percent. Counties in the Interior Columbia River Basin in Wyoming, Utah, and Nevada comprise the remaining 5 percent 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 (10 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 Columbia River Basin provides a variety of outdoor recreational opportunities, including snow and water skiing, river rafting and kayaking, wind surfing, resort and ranch visitation, photography, birdwatching, camping, hiking, horseback riding, hunting, and fishing. 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; such areas generally have fewer air quality problems than do industrialized areas around large cities. In the rural areas of the Basin, particulates from blowing dust, wood smoke, or field burning cause temporary, short-term air quality problems, but not at sufficient levels to be classified as "non-attainment" areas, as defined by the National Ambient Air Quality Standards (NAAQS).

Most air pollution problems in the Columbia River Basin occur near urban centers where large traffic volumes and congestion can produce high levels of carbon monoxide. Similarly, the presence of major industrial facilities (e.g., coal-fired power plants) can be significant sources of particulates, especially in those areas where local topography can foster air inversions (e.g., Spokane).

Those areas that do not meet Federal standards ("nonattainment areas") are associated with urban population centers , including Bonner (Sandpoint) and Kootenai (Coeur d'Alene) counties in Idaho; Missoula, Columbia Falls, and Kalispell in Montana; Eugene-Springfield, LaGrande, and several other cities in Oregon; and parts of Spokane and Yakima (BPA 1995)

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This chapter links the discussions of Chapters 2 and 3. It describes the impacts that the alternatives (see Chapter 2) would have on the affected environment (see Chapter 3).

Watershed management actions and even restoration activities can affect the human environment (Bisson et al. 1992, Stanford and Ward 1992). The primary objective of the Watershed Management Program is to increase and sustain anadromous and resident fish populations by increasing the amount of high-quality habitat available to these populations. The techniques employed under any of the alternatives, when implemented properly and in conjunction with other techniques, would improve water quality and generally increase fish habitat. The result would be a net benefit to fisheries. Various, undefined improvements to soils (including agricultural and forest soil productivity) and vegetation (including riparian areas and wetlands) would be coincidental benefits. 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 circumstances of each management technique.

The following sections outline possible environmental consequences associated with the alternatives and the impacts of the various management techniques that might be employed under some or all of the alternatives. Impacts are discussed by resource area, such as Soils or Recreation. Four major headings highlight discussion under each resource topic:

- *Context:* Identifies applicable laws, standards, and policies to provide the legal and political framework for managing the specific resources; 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 site-specific management techniques that may be used under any of the alternatives presented in Chapter 2.

- *Potential Program-Wide Mitigation Measures:* Identifies ways to avoid, minimize, reduce, or rectify the potential environmental impacts of the watershed management 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 BMPs to reduce soil loss.

- **Desired Condition.** Project managers will seek to establish a desired future condition of stability and soil conservation 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 runoff is increased; or allowing excess deposition of salts or other materials into soils such that vegetation growth is inhibited.

4.1.2 Impacts of Alternatives: Potential Effects on Soils

<u>Alternative 1: No Action</u>

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

<u>Alternative 2: Base Response (Common to All Alternatives)</u>

Soil conditions would generally improve under Alternative 2 because the adopted planning process would help assure the identification, protection, and mitigation of problem soil areas. Soil would be temporarily eroded, compacted, or displaced whenever the ground is disturbed during habitat improvement and watershed restoration activities; however, in the long term the soil would rebound and be better than ever.

<u>Alternative 3: Aquatic Habitat Objectives Emphasis</u>

Under Alternative 3, short-term soil erosion and compaction would be expected as each new project is implemented. Because Alternative 3 emphasizes in-channel and riparian projects, construction disturbance of soils in streambanks and on floodplains and terraces might be high: heavy equipment can disturb soils and remove vegetation, making soils vulnerable to water erosion during storm rains and associated overbank flows. Heavy equipment can also compact soils and reduce infiltration capacity, resulting in heavier and more intense runoff to streams.

Alternative 3 would likely generate the most in-stream structures. When structures are placed properly, they create an acceptable scour that in turn creates pools, clean spawning gravel, bank cover, and other habitat features. The worst long-term impacts would result in improper or inadvertent in-stream placement of grade control structures, large woody debris, or culverts because they erode riparian soils by directing water scour into stream banks.

Plant propagation efforts would be intensified in riparian areas under Alternative 3. All methods (see Appendix A) are considered. Some soils and sites would require much scarification or planting disturbance; these activities would be carried out with soil erosion protection, in order to regenerate riparian vegetation.

Road management techniques might be used more often under Alternative 3, because many roads directly influence streams at road crossings. For example, ditches and culverts might have to be cleaned to assure adequate road drainage and prevent repeated road failures. Some soils would consequently be disturbed and remain exposed until revegetation.

Other techniques, for agricultural, forested, and urban uplands, would be used less often under Alternative 3 than under other alternatives. Negative soil-disturbance impacts are expected to be minor and short-term.

Over the long term, soil conditions would greatly improve under Alternative 3. Long-term soil stability and productivity would be promoted by establishing vegetation on stream banks, decommissioning or closing roads, and making improvements in forest, agriculture, and other land-use practices. No significant long-term adverse impacts on soils are expected.

Alternative 4: Cost and Administrative Efficiency Emphasis

Under Alternative 4, short-term impacts on soils would be minor, because a variety of smaller and less aggressive projects would be funded in a variety of locations throughout the watershed. Focus on cost and administrative efficiency would give agricultural, forest, and urban non-point source pollution on upland areas as much or more attention than in-stream habitat restoration. Natural regeneration of vegetation would be preferred to active restoration of soil cover.

Moderate-to-frequent use of techniques involving chemical applications (herbicides, pesticides, fertilizers) may occur under Alternative 4, where large areas may be more efficiently treated compared to other techniques. Chemical residues in soil may persist and/or degrade groundwater quality.

No significant long-term adverse impacts on soils are expected through the implementation of Alternative 4. Soil conditions would be slow to improve over the long term.

Alternative 5: General Environmental Protection

Because Alternative 5 would include an emphasis on providing coincidental benefits to all resources (fish, water quality, wildlife, recreation, local economic productivity, etc.), soil protection measures would be a high priority. Major soil-disturbing activities would also be minimized: for instance, in-stream structures would involve smaller-scale designs and more manual work. 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). No significant long-term adverse impacts on soils are expected through the implementation of Alternative 5.

Alternative 6: Balanced Action

Under BPA's preferred alternative, moderate short-term soil erosion would occur as new projects were begun. Techniques that disturb soils (e.g., in-stream structures, road management techniques) would be carried out completely. However, soil disturbance would be less than under Alternative 3. As with Alternatives 4 and 5, projects would be distributed throughout the watershed. Program-wide mitigation measures would be applied, as appropriate, to minimize erosion.

No significant long-term adverse impacts on soils are expected from Alternative 6. This alternative would generally benefit soil productivity and stability.

4.1.3 Impacts of Techniques: Potential Effects on Soils

In-channel Modifications and Habitat Improvement

The erosion potential of streamside soils can generally be reduced by using in-channel modifications intended for habitat improvement, particularly those that strengthen channel-defining stream banks through the use of plant roots and/or engineered structures (Saskatchewan Environment and Resource Management 1995a). Some exceptions might result in short-term erosion and soil loss.

Streambank protection via planting/encouragement of vegetation helps to stabilize soils on stream margins. However, in areas or conditions where vegetation is slower to establish itself, high streamflow may impair or eliminate riparian functions and high-value property through accelerated soil erosion.

Streambank protection via bioengineering and structural techniques disturbs soil during construction. Heavy equipment use both in the stream and along stream banks is often required. Incidental disturbance of riparian vegetation, removal of debris barriers, and the removal or replacement of culverts and bridges loosens riparian soils that may then be transported to streams.

Heavy equipment can compact soils, reduce infiltration capacity, and otherwise degrade soil structure. Increased surface runoff can erode soil particles and transport them off-site. The loss of nutrients and presence of pesticides in the sediment reduces productivity of the remaining soil.

Careless placement of in-stream structures (grade control structures, large woody debris) can erode riparian soil over the long-term by directing hydraulic forces into stream banks. Accelerated bank erosion can cause acres of productive soils to be lost. However, limited scour can improve fish habitat by providing cutbanks for cover and feeding.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Erosion potential can eventually be reduced and soil quality maintained by any of the special vegetation treatment techniques, because all can be used to stabilize stream banks, riparian areas, bare soils, and other areas vulnerable to water and wind erosion.

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

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

Herbicides used to control weeds that compete with desirable, beneficial vegetation generally decompose in the soil (USEPA 1980). Mechanical vegetation removal can disturb soils and make them vulnerable to erosion. Biological (e.g., use of insects) and hand-pulling methods of vegetative control have little direct effect on soils.

Prescribed fires for vegetation control add ash and associated nutrients to soils and protect them from unmanaged wildfire. However, prescribed burning can damage soils if the fire burns too hot: the water-holding properties of soils can be changed, so that they repel water rather than hold it. Erosion potential and water runoff can then increase, and productivity can decrease until vegetation recovers. This risk is much less than that associated with high-intensity wildfires.

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

Site conditions, seed selection, weather conditions, and time of year influence the rate of vegetation establishment on a site. Untimely or otherwise unsuccessful revegetation efforts may cause continued, untreated soil erosion.

Agricultural Management Techniques—Crops and General

Agricultural non-point source pollution stems from large-scale landscape disturbances: removing and controlling vegetation, tilling soil, and applying fertilizers and herbicides. Properly used, most agricultural management techniques would protect soils by reducing erosion rates and maintaining nutrient and chemical cycling in the soil and crops.

Some techniques have to disturb soil. Constructing terraces or diversion ditches to control overland flow, for example, may decrease slope length and gradient, but would make newly re-contoured areas more susceptible to sheet and rill erosion.

Techniques that increase on-site and perimeter vegetation, decrease erodible slope length, and decrease runoff velocity tend to increase the depth and volume of water infiltration into the soil. However, the risk of groundwater contamination by fertilizers, pesticides, and other soluble substances is increased. Where nutrients and chemicals are deposited near frequent wetting fronts and soils with reduced conductivity, nutrients/salts can concentrate in zones, a detriment to groundwater quality and vegetation.

Agricultural Management Techniques—Irrigation

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). Many of the techniques considered reduce the risk of soil erosion by reducing the amount of water applied to soil (irrigation water management, water measuring devices, soil and crop water-use data, avoiding excess flows); by the rate or method of water application (drip irrigation, surface irrigation); and the method of water conveyance (lined ditches, pipeline) (Saskatchewan Environment and Resource Management 1995b).

Irrigation can concentrate salts by leaching them from the top layers of soils or by depositing salts from the irrigation water itself. Excess salts are often removed through flushing, which involves temporary heavy irrigation to leach salts from the crop rooting zone.

Agricultural Management Techniques—Animal Facilities

Agricultural operations that concentrate animals (e.g., holding, feeding, watering, servicing areas) can disturb soils as vegetation is removed, soil compacted, and soil structure and drainage patterns destroyed. Techniques for animal facilities considered in this assessment protect soils by establishing vegetative cover, surfacing facilities with resistant materials, and installing drainage and access structures. Initial construction might cause some short-term erosion and sedimentation.

When wastes are applied to cropland and wetlands constructed for waste treatment, the structure and composition of soils at those sites can be changed. Crop applications typically incorporate wastes into the soil by tilling (soil disturbance). Similar soil disturbance occurs when wastes are buried in area landfills.

Agricultural Management Techniques—Grazing

Planned grazing systems, including deferred grazing for some lands, allow ground cover to increase, ground disturbance to decrease, soil bulk density to improve, and infiltration to increase. As a result, soil erosion can decline.

Where lands are placed in "deferred grazing" status, and where critical erosion and heavy use areas are not monitored periodically, maintenance and restoration needs may go unnoticed and unmet. Chronic erosion areas may develop.

Planting, seeding, and brush and weed management to stabilize rangeland and pasture can reduce soil erosion. Some short-term erosion might occur if ground is scarified before it is seeded.

Soluble substances (including fertilizer used in seeding and planting) and concentrated animal wastes may leach deeper into soils and reach groundwater where infiltration rates are increased.

Construction of water supply projects, especially linear pipelines and larger-scale impoundments, may require large-area soil disturbance and attendant soil erosion risk.

Where streams are forded, streambanks and adjacent soils may be trampled.

Fencing to manage livestock access can reduce soil disturbance in sensitive areas. However, livestock tend to walk along fences, creating soil-worn paths. Fences may concentrate animals by placing many livestock in a smaller area, creating erosion and livestock waste problems.

Road Management Techniques

Road management techniques addressed here focus on forest, agricultural, and other rural roads subject to private and some public maintenance. Road construction and road maintenance increase natural erosion processes through excavation, oversteepening some slopes with uphill cut-slopes, loading slopes subject to mass wasting, and maintaining bared soil surfaces.

Many techniques considered here reduce the risk of soil erosion from slopes and road prisms by selecting preferred road locations, recognizing seasonal and weather-based construction windows, controlling water flow on roads and in ditches, maintaining roads, controlling access of soil-disturbing vehicles, and closing/restoring roads (Saskatchewan Environment and Resource Management 1995a).

While these principles are used to reduce overall sediment generation from roads, many techniques initially disturb soils. For example, roads must be graded to maintain the crown or outslope to assure drainage and prevent rilling down the running surface. Some soil from grading might inadvertently be pushed off the road, perhaps into a ditch where it could be transported toward a stream.

Unmonitored, closed roads may remain chronic erosion sites for long periods of time. Water bars, intended to improve drainage from the road prism, might accelerate water and start rilling or gullying if improperly constructed.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to address NEPA and other regulatory requirements to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances including fire and mass wasting, and human-caused influences (Megahan et al. 1992).

Tree removal and yarding can disturb soils if any part of the log is pulled along the ground. Where brush and organic matter are removed from the soil surface, mineral soil can be eroded by water.

Dry conditions, warm temperatures, excess fuels, and equipment that may generate sparks combine to increase the risk of wildfire during forest operations. The extreme heat of high-intensity wildfires can damage soils severely, changing the properties of soils so that they repel water rather than hold it. Erosion potential and water runoff can be increased, and soil productivity decreased during reclamation.

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

Thinning can improve the vigor and productivity of forest stands and tree roots that increase slope stability. It also allows light to penetrate closed canopies, encouraging the growth of herbaceous ground flora on the forest floor. Pre-commercial thinning may generate excess fuels and increase the risk of wildfire. Commercial thinning may actually decrease forest fuels.

Tree planting, both by hand and machine, would disturb soils. Hand planting affects a much smaller area.

The study, development, and implementation of a reward/penalty system for conscientious forest work may decrease overall soil disturbance. Implementation and effective monitoring of such a system might be difficult to complete.

Revegetation and interim stabilization techniques, such as planting sprigs, cordons, or wattles in rows on slope contours, disturb surface soils. On steep slopes, these soils may fall down-slope. They are also subject to raindrop splash and sheet and rill erosion.

Seasonal livestock grazing to control fire fuels may disturb soils by removing vegetation, compacting soils, and eroding surfaces.

Urban Area Techniques

Constructing infiltration basins, trenches, and other runoff facilities would disturb soils near a project. Similarly, wastewater system improvements (septic or sewer) could extensively disturb and displace soil via trenching and placement of vaults and pipes.

Even building and implementing erosion and sediment control structures would incidentally disturb soils. Erosion and sediment control plans prepared for any construction project would address soil types, site grading details, structural controls, and stabilization measures, and could reduce soil disturbance to less than significant levels.

Land-use practices that reduce human-caused sedimentation may avoid the need for expensive treatment of domestic water supplies.

Recreation Management Techniques

Relocation and redesign of recreational facilities such as campgrounds and trails can reduce soil erosion by concentrating users in less sensitive areas, dispersing users over a wider area, and controlling access. Construction impacts on soils associated with relocation are mitigated with other techniques considered in this EIS.

Mining and Mine Reclamation Techniques

Mine reclamation efforts would generally lead to the stabilization of severely disturbed, bare soils through revegetation and the implementation of erosion control measures.

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.
- Develop and implement project erosion control plans that select and apply several complementary techniques to address all erosion and sedimentation processes. For example, seeding a disturbed area encourages vegetative soil stabilization. Mulching the site not only holds seed in place, but also provides interim soil protection against raindrop splash and sheet and rill erosion.
- Assure quality control of project plans through technical reviews by qualified peers and appropriate agency personnel.
- 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.

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4.2 FISH AND WATER RESOURCES/QUALITY

4.2.1 Context

- **Legal—Water.** Department of Energy requires an assessment of impacts on flood-plains 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 restrict 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 the following:

  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; regulatory authority also includes flood control, dam safety and inspection, water right permitting, and well construction.

  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:** responsible 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 and use of 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 4.3.1**, 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 without a permit from the NMFS or USFWS.

  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, USFS and USBLM 1995a, 1995b, and 1995c). and the Decision Notice for the Inland Native Fish Strategy (INFISH, USFS 1995). In general, these guidelines identify riparian management objectives, standards and guidelines, and monitoring requirements for USFS and BLM activities. These guide- lines 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 Clean Water Act; reducing in-stream flows to the extent that riparian vegetation is likely to be permanently reduced or eliminated; or injuring 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: Potential Effects on Fish and Water Resources/Quality

Alternative 1: No Action

Under No Action, individual projects would continue without a standardized program; impacts on fish and water resources could occur, for example, where extreme climatic events coincide with soil disturbance during project implementation. However, the nature of the mitigation and restoration projects are such that fish and water resources/quality would benefit overall. State water regulations would be followed under all alternatives, so no significant impacts are expected.

Alternative 2: Base Response (Common to All Alternatives)

Under Alternative 2, the risk of short-term water quality and fish habitat degradation would be decreased, relative to the No Action Alternative. A consistent planning approach would help recognize areas of high-value habitat and water quality and the processes that influence them. Fish and water quality would benefit in both the near and long term.

State water regulations would be followed, including regulations for activities in or near wetlands and floodplains. No significant or long-term impacts are expected.

Alternative 3: Aquatic Habitat Objectives Emphasis

Water quality may be impaired as many mitigation or improvement projects are built and implemented, particularly those involving in-channel modifications, such as culvert replacements. Therefore, Alternative 3 would generate more applications for temporary variances from state water quality standards. However, in most instances, water quality would remain impaired in only a short reach of the stream, and usually only for time intervals ranging from hours to a few days. Habitat improvement and other benefits to fish generated by these projects would often be immediate and sustained in their effect.

Alternative 3 would likely generate the most in-stream habitat improvement structures. However, improper placement of grade control structures, large woody debris, or culverts could actually result in a net loss of habitat: for example, local channel gradient could be altered or hydraulic forces directed into stream banks. A result could be wider, shallower streams with a loss of habitats formerly afforded by deep pools and undercut stream banks. Monitoring and mitigation required under the planning process would work to correct such errors in a timely manner.

Most frequently used irrigation techniques (e.g., tailwater recovery, filter strips, and diversion screens) under Alternative 3 could improve water quality and fisheries: water control structures, subsurface drains, and ditches would generally reduce surface runoff. When runoff from fields does occur, water quality could decrease as soluble substances increase in the runoff.

Except for the temporary water-quality impairments during project construction, water quality and fish habitat would improve more under Alternative 3 than under other alternatives. The direct benefit of in-stream habitat improvement, the establishment of riparian habitat and other vegetation communities, the acquisition of sensitive riparian habitats through easements and leases, and the closure of roads and improvement of upland land practices would all support these increases in habitat. No significant or long-term impacts are expected.

Alternative 4: Cost and Administrative Efficiency Emphasis

Short-term impacts on fish and/or water resources/quality would generally be minor under Alternative 4 because in-stream mitigation and improvement projects would be fewer, smaller, and/or less aggressive in their disturbance of the environment. For example, funding that went primarily to in-channel modifications under Alternative 3 would be more likely to be split between in-stream work and public education in Alternative 4. In this example, Alternative 4 recognizes the value of an educated public in reducing water quality degradation, and deems the relative low cost and administrative ease equal in benefit to one or more in-stream structures.

Moderate-to-frequent use of techniques involving chemical applications (herbicides, pesticides, fertilizers) may occur under Alternative 4 where large areas are more efficiently treated, compared to other techniques. Chemical residues may degrade surface and groundwater quality and may be toxic to fish and wildlife.

No significant long-term adverse impacts on water resources/quality or fish habitat are expected. Both immediate and long-term habitat and water quality improvements under Alternative 4 would occur more gradually relative to Alternatives 3 and 6, and the same as or more quickly than under Alternative 5.

Alternative 5: General Environmental Protection

Alternative 5 would require Project Management Plans to provide coincidental benefits to other resources. This alternative treads the most lightly on the land. Projects would be smaller in size and scope, and would generate smaller benefits to fish habitat. Consequently, fish habitat would increase in step with other ecological improvements under this alternative, but at a much reduced rate relative to the other alternatives.

Water quality would improve or remain unchanged. Herbicide application as a special vegetative treatment, and pesticide use on cropland, would be used only when necessary to meet mitigation objectives on critical lands. Fertilizers would be used moderately in upland agricultural areas. Application of program-wide mitigation measures, as appropriate, would minimize impacts on fish and water resources/quality.

No significant long-term adverse impacts on water resources/quality or fish habitat are expected.

Alternative 6: Balanced Action

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. Negative effects are almost entirely associated with soil disturbance during project implementation. However, program-wide measures would be applied, as appropriate, to minimize or avoid such impacts. Fish habitat and water quality at new mitigation sites would increase over the long term as the diversity of in-stream habitats increased and as riparian habitat was established and expanded.

No significant long-term adverse impacts are expected on water resources/quality or fish habitat.

4.2.3 Impacts of Techniques: Potential Effects on Fish and Water Resources/Quality

In-channel Modifications and Habitat Improvement

Stream-channel morphology reflects the combined influence of landform, climate, hydrology, vegetation, and land use in the watershed draining into the channel. Channel forms and controls are generally described as colluvial, bedrock, and alluvial. The form of an alluvial channel, for instance, is determined by the interaction of eight physical variables: 1) width, 2) depth, 3) slope, 4) velocity, 5) discharge, 6) sediment size, 7) sediment concentration, and 8) channel roughness. Changing one variable causes compensating changes in one or more of the other variables. These geomorphric factors, the quality of the streamflow, and the riparian vegetation combine to determine the quantity and quality of fish habitat in a stream.

Channels formed in bedrock and colluvial material respond to the same factors, but are restrained by the landform.

In-channel modifications and habitat restoration projects affect habitat by changing the variables listed above. Under-designed projects can degrade habitat conditions because the interaction of these variables was not considered. Using hydraulic models for channel design can ensure that all variables are adequately addressed.

Using concrete, riprap, and other semi-permanent structures to stabilize stream banks imposes increasing constraints on some channels. Restricting one or more of a channel's geomorphic characteristics hinders its ability to reach equilibrium. Long-term degradation of channel condition and related habitat may result.

Placement of in-stream structures (e.g., large woody debris or large boulders or engineered structures) can improve habitat by increasing channel complexity (channel roughness, local scour pools, self-cleaning spawning gravel, etc.). Grade control structures can control streamflows, stabilize sediments, and improve fish habitat. Installing and replacing culverts and bridges can alleviate chronic road erosion, reduce stream bed scour and deposition, and improve fish passage (Saskatchewan Environment and Resource Management 1995a).

Improper placement of any in-stream structures may affect channel condition, degrade water quality, and decrease fish habitat, as geomorphic factors interact to influence the channel.

Nearly all in-stream work requires the use of heavy equipmenteither on the banks or the bed of the channel. Disturbance within the channel can increase turbidity of the streamflow (which in turn affects all aquatic life), increase fine sediment on the streanbed, fill or destroy pools used by fish, fill or destroy spawning gravels with fine sediment, crush fish eggs in the stream bed, and crush or deter both juvenile and adult fish in the vicinity of construction.

The use of hardened (paved or reinforced) fords, although protecting the channel bed, may encourage animal/equipment contact directly with streamflow. Water quality can be reduced.

Watershed treatments that facilitate natural hydrology may result in available water for other uses.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Any treatments that increase the cover and vigor of vegetationin a watershed, especially in riparian areas, improve the water quality of streams draining that watershed. Vegetation holds soil in place, reducing erosion; organic rich soils develop and retain nutrients in the soil profile, preventing eutrophication of lakes and glide areas; trees (and especially shrubs and herbaceous cover) on floodplains reduce flood flow velocities and encourage deposition of sediments, maintaining spawning gravels and pool habitat downstream; and shading of streams by riparian vegetation maintains water temperatures within a range favorable to fisheries.

Large trees in riparian areas, particularly conifers, serve as a source of large woody debris for the channel. Large woody debris increases the complexity and stability of most channels, and is key to many habitat features they contain. Attempts to accelerate large woody debris re-cruitment should not negatively affect habitat or channel conditions provided it is done on a select, individual tree basis. (See Appendix A, section 2.15, for a discussion of the uses of large woody debris.)

Where constructed wetlands are used as water treatment systems, contaminated storm flows may be discharged from under-designed wetlands before pollutants are stabilized. Downstream water quality would be degraded.

Herbicides used for vegetation control can affect water quality, and are a substantial risk to environmental and human health. Waters contaminated by herbicides can be toxic to fish.

The acquisition of sensitive riparian areas through easements and leases would provide for uses such as short-term grazing that would enhance habitat and water quality, particularly in flood-plains and side channels.

Prescribed fires for vegetation control augment soils with ash and associated nutrients. However, where vegetation is lost, soil may erode. Eroded soils and nutrients often reach streams, and may degrade water quality and increase fine sediment on the streambed. Available spawning area may decrease; increases in turbidity may affect many fish functions.

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

Water level manipulation to control vegetation can affect stormwater storage during rain and groundwater contributions to base (low) stream flows. Where groundwater is increased, less storm flow can be stored in the soil and slowly released as the flood crest passes. Lower groundwater levels during low flow periods (e.g., late summer) decrease the amount of water available to sustain stream flows, maintain water quality, and permit fish passage through channels. During flooding, rising waters may destabilize banks, causing erosion, and deposit loosely consolidated soils that may be further eroded. During reservoir drawdowns, exposed fine sediments can be vulnerable to wind or water erosion.

Agricultural Management Techniques—Crops and General

Agricultural non-point source pollution stems from large-scale landscape disturbances: removing and controlling vegetation, tilling soil, and applying fertilizers and herbicides. Properly applied, most agricultural crop management techniques will protect water quality and fish habitat by reducing erosion and sedimentation rates and maintaining nutrient and chemical cycling in the soil and crops.

Techniques that disturb soils may temporarily increase suspended sediment and turbidity, and increase sediment deposition in pools and spawning gravels for the longer term. Examples include the construction of terraces, diversion ditches, grassed waterways, and sediment basins to control overland flow and sediment runoff. Of course, any cropping practice that tills the soil holds some risk of increased sediment yields in nearby streams.

The common practice of applying fertilizers, herbicides, other pesticides, and other soluble substances to cropland increases the risk of both surface-water and groundwater degradation. All techniques considered here would decrease this risk, and improve water quality for fish and other aquatic life.

Water impounded annually or seasonally for agricultural uses may, collectively and at the watershed scale, affect the water quantity available in streams for necessary fish passage and the natural cleaning of spawning gravel and other habitat features. Wholesale reversal of current impoundment practices can have variable and unpredictable effects on basin hydrology, ranging from no effect to the benefit of improved spawning success to the loss of off-channel stormwater storage and habitat to the loss of eggs and of fine sediment to excessive peak flows.

Agricultural Management Techniques—Irrigation

Irrigation runoff can transport soil, agricultural chemicals, salts, and naturally occurring inorganics leached from soils. Many of these chemicals can be toxic to aquatic organisms (Ohlendorf and Killness 1988, Dwyer and Burch 1992, Ingersoll and Dwyer 1992). Many of the techniques considered reduce the risk of such degradation by reducing soil erosion (minimizing water volume and velocity flowing across soils) and intercepting eroded sediments in surface runoff (subsurface drainage collection, tailwater recovery, filter strips) (Saskatchewan Environment and Resource Management 1995b).

Irrigation can concentrate salts by leaching them from the top layers of soils or by depositing salts from the irrigation water itself. Excess salts are often removed through flushing, which involves temporary heavy irrigation to leach salts from the crop rooting zone.

Water quantity/water rights conflicts can arise where irrigators and other water users vie for limited surface water supplies, particularly during summer low flows when irrigation is critical to crop success. Water supply techniques (water rights applications, limiting inter-watershed diversions, development of alternative sources) and water conservation techniques (water measuring devices, minimizing water loss through conveyance facilities) could reduce water quantity conflicts.

Screens on irrigation intake and return ports can prevent the intake of fish and other aquatic organisms of all lifestages. Fish mortality due to stranding and/or temperature and oxygen stress would be reduced.

Agricultural Management Techniques—Animal Facilities

Agricultural operations that concentrate animals (e.g., holding, feeding, watering, servicing areas) can disturb soils, create impervious areas, concentrate contaminants, and increase the risk of water quality degradation in vicinity surface waters. Runoff from these areas is rich in nutrients, chemicals, oils, bacteria, and organic matter. Techniques for animal facilities considered here would reduce this risk by managing runoff from these facilities, providing safe collection and treatment of wastes, and preventing the destruction and direct contamination of stream channels.

Land application, storage, or landfill burial of wastes may generate leachates (e.g., nitrates) that may percolate and contaminate groundwater. Land application of wastes during wet weather or when storms threaten may cause nutrients, bacteria, and organic matter to run off directly to surface waters.

Under-designed wetlands and other storage areas may contaminate storm flows and then discharge them before the pollutants are stabilized on site.

Agricultural Management Techniques—Grazing

Planned grazing systems, including deferred grazing for some lands, allow vegetative ground cover to increase, ground disturbance to decrease, soil bulk density to improve, and infiltration to increase. As a result, soil erosion and sediment yields to surface waters would decline.

Where lands are placed in "deferred grazing" status, and where critical erosion and heavy use areas are not monitored periodically, maintenance and restoration needs may go unnoticed and unmet. Chronic erosion areas may develop, increasing sediment yields over the long-term.

Planting vegetation, seeding, brush and weed management to stabilize rangeland and pasture would reduce soil erosion. Some short-term erosion might occur if ground is scarified before it is seeded. Whether this erosion affects surface water quality depends on distance and slope characteristics to adjacent water bodies.

Soluble substances (including fertilizer applied with seeding and planting) and concentrated animal wastes may leach deeper into soils and reach groundwater where infiltration rates are increased. During wet weather and on wet sites, nutrients may enrich overland flow and storm runoff. With time, receiving surface waters may become eutrophic systems, especially when surface waters consist primarily of groundwater contributions.

Water supply projects, especially linear pipelines and larger-scale impoundments, may require large-area soil disturbance to construct. The risk of soil erosion and sediment yields to adjacent surface waters during and immediately after construction would be increased.

Using fords at stream crossings may cause trampling of stream banks and adjacent soils. Direct contact of livestock with the stream can degrade water quality, disturb streambeds, and, if fish are present, injure and kill fish. Some fords may reduce spawning success. Frequent activity at fords during adult and juvenile migration may effectively be a barrier to fish passage.

Fences to manage livestock access can reduce soil disturbance in sensitive areas. Fencing is frequently credited as an effective riparian improvement technique. However, livestock tend to walk along fences, creating soil-worn paths. Fences may concentrate animals by placing many livestock in a smaller area, creating erosion and livestock waste problems.

Road Management Techniques

Road management techniques addressed here focus on forest, agricultural, and other rural roads subject to private and some public maintenance. Road construction and road maintenance worsen natural erosion processes through soil excavation, oversteepening some slopes with uphill cut slopes, loading slopes subject to mass wasting, and maintaining bared soil surfaces. Roads are a frequent, chronic source of fine sediment in streams.

Many techniques considered here reduce the risk of sediment yields to streams by selecting preferred road locations, recognizing seasonal and weather-based construction windows, controlling water flow on roads and in ditches, maintaining roads, controlling access of soil-disturbing vehicles, and closing and restoring roads (Saskatchewan Environment and Resource Management 1995a).

While these principles are used to reduce overall sediment generation from roads, many techniques initially disturb the soil. For example, grading is required to maintain road crown or outslope to assure drainage and prevent rilling down the running surface. Some soil from the grading procedure might inadvertently be pushed off the road, perhaps into a ditch where it might be transported to a stream and degrade water quality. Fish are affected when spawning gravel is clogged with fine sediment, when pools used for resting and rearing fill up, and when water quality is reduced.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences (Megahan et al. 1992).

Any forest practice that disturbs soils increases the risk of increased sediment yields in streams and of decreased fish habitat. As discussed under Soils, forest management techniques considered here may disturb soils through log yarding, wildfires started by equipment, prescribed burns, stand thinning, planting of trees and other vegetation by hand and machine, other site stabilization methods, and livestock grazing.

Techniques involving streamside management areas (SMAs) are intended to preserve the integrity of the stream channel and banks, provide a recruitable source of large woody debris for channel structure and habitat diversity, provide the shade and microclimate needed for optimum thermal regulation of streams, improve water quality, and maintain slope stability adjacent to streams, whether the landform be a floodplain or oversteepened slope.

Trees and slash accidentally introduced to channels are removed on a case-by-case basis. Debris may be removed by the least disturbing method, or left in place if removal would worsen channel instability or interfere with SMA functions. Some incidental habitat disturbance might occur, regardless of the approach.

Managing forest stands to improve snowpack in a watershed is difficult due to multiple ownerships, the multitude of factors influencing snowpack development, and the variable successes of previous efforts. Successful management reduces peak flows and extends spring snowmelt later into the summer. Unsuccessful efforts may actually increase peak flows, exhaust the summer water supply in spring, and disturb both forest slopes and stream channels and fish habitat in the process.

Increasing peak flows is an even more untested attempt to provide gravel flushing where available streamflows are declining. The goal is the cleaning or winnowing of sand and fine sediment from the spaces between spawning gravel. Forest practices that increase peak flows during spring runoff may improve the "cleaning ability" of these discharges. Increasing peak flows, however, may erode upland and riparian areas, degrade channel conditions, increase instability, decrease base flows, and provide very short-term benefits to gravel flushing.

Stream-channel protection during forest operations, particularly through recognition and management of SMAs, would maintain and restore channel integrity, water quality, and fish habitat.

Wildfire contingency plans would minimize the intensity and duration of burning observed in aquatic and riparian environments after wildfires. This would minimize the loss of vegetative cover and woody debris, and support channel stability.

Watershed treatments that facilitate natural hydrology may result in available water for other uses.

Urban Area Techniques

By implementing and monitoring erosion and sediment control plans prepared for construction projects, sediment transport off-site would be minimized and sediment yields to urban area streams decreased.

Channelized stream systems are designed to facilitate the greater storm flows of increasingly impervious urban areas. Channel modifications often increase velocities and reduce or eliminate structural diversity, including a reduction in pools and flow diversity, and a loss of spawning gravel through transport or sedimentation. Protecting floodplains and maintaining natural channel processes can restore and maintain channel structure and fish habitat. For example, using bioengineering methods (e.g., vegetative plantings instead of riprap) for streambank protection and preserving floodplains maintains the water quality and fish habitat of both the naturally transitioning channel and overbank stream.

Public programs that encourage reduction in waste (recycling, litter control), non-point water pollution sources (lawn care, pet excrement control), water use (water conservation, land-scaping), and other chemical use (use of biodegradable cleaners, avoiding chemical disposal in household drains) generally favor maintenance of water quality without negative impacts. Similarly, programs that increase public awareness of environmental resources and respon-sibility (public education programs, storm drain stenciling, adopt-a-stream programs) can lead to improvements in water quality and fish habitat in urban areas.

Community transportation and utility management can prevent water quality degradation by cleaning and maintaining parking lots and streets, improving impervious drainage patterns on bridges and culverts near streams, and managing winter road conditions (improved road salt storage, using alternative de-icing materials, using environmentally preferred snow disposal areas).

Accumulated snow along roadsides and in urban areas is usually high in sand, salts, and other debris and pollutants. Depositing plowed snow next to streams can lead to fine sediment deposition in spawning gravels, reductions in water quality, and/or the increase in peak flow volumes and velocities of receiving streams, resulting in the scour of stream bed and banks. Salt storage piles can create saline conditions in shallow aquifers. Use of alternative de-icing or traction control materials on winter roads (e.g., sand or salt substitutes) can increase fine sediment yields in spring runoff.

Recreation Management Techniques

Relocating and redesigning recreational facilities will generally benefit stream systems and fish habitat by protecting stream channels and riparian areas and improving sanitation. Water quality improves through reductions in sediment yields when, for example, eroding streamside trails are rerouted and trampled stream banks are restored, and when dispersed camping areas reduce user traffic in vegetation-sparse areas.

Closure of seasonal sport fisheries and entire streams to fishing would limit recreational opportunities demanded by the public, and might concentrate anglers in other sensitive streams and reaches. Habitat could be further degraded. Providing alternative sport fishing locations and opportunities might relieve or distribute pressure on fish and fish habitat.

Mining and Mine Reclamation Techniques

Mine reclamation efforts would result in improved water quality and fish habitat as metals and compounds that might be toxic to fish are reduced. However, recovery is expected to be a gradual process, with small initial gains.

4.2.4 Potential Program-Wide Mitigation Measures - Fish and Water Resources/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.

- Develop and implement project erosion control plans that select and apply several complementary techniques to address all erosion and sedimentation processes. For example, seeding a disturbed area encourages vegetative soil stabilization. Mulching the site not only holds seed in place, but also provides interim soil protection against raindrop splash and sheet and rill erosion.
- Assure quality control of project plans through technical reviews by qualified peers and appropriate agency personnel.

- Select, implement, and enforce BMPs based on site-specific conditions, technical and economic feasibility, and the water quality standards for those waters potentially affected.
- Isolate in-stream construction from flow, and remove fish above or below the construction site during construction. Coordinate in-channel projects with state, local, and tribal fisheries agencies and obtain permits as needed.
- Monitor water quality downstream from activities with potentially significant adverse effects on water quality, such as those land-disturbing activities occurring within 15 meters (m) (50 feet (ft.)) of the wetted perimeter of a stream or wetland. Take corrective actions for conditions approaching maximum allowable degradation under state regulation.
- Stop application of fertilizer if signs of eutrophication are detected.
- 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.
- 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, obtain water rights for withdrawal of water from the state where the project is being considered, and 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 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.
- Coordinate with adjacent landowners and management agencies to discuss and resolve potential problems.
- Monitor groundwater quality under managed lands and near project areas that may contribute to groundwater contamination by herbicides, nutrients, petroleum hydrocarbons, and other soluble substances. Take corrective actions for conditions found to exceed state groundwater quality standards.
- Use hydraulic models for design of in-stream structures to ensure that all stream-channel morphology variables are adequately addressed.
- Coordinate with state, local, and tribal water resources and water quality agencies or departments to share data collection efforts in project areas.

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4.3 VEGETATION

4.3.1 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 planners to ensure that watershed management 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.

4.3.2 Impacts of Alternatives: Potential Effects on Vegetation

<u>Alternative 1: No Action</u>

Under No Action, mitigation and improvement 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 Watershed Management Program activities, which promote the establishment of natural vegetation communities to secure soils, stabilize slopes, and provide a matrix for wildlife habitat and land use.

<u>Alternative 2: Base Response (Common to All Alternatives)</u>

Activities at or near mitigation and improvement sites under Alternative 2 would initially disturb vegetation as habitat improvements are implemented. Vegetation would be disturbed less than under the No Action Alternative, primarily because a consistent planning approach would help identify the best approaches to vegetation management. Vegetation communities, particularly those associated with riparian/riverine and wetland environments, could increase. No significant or long-term impacts are expected.

Alternative 3: Aquatic Habitat Objectives Emphasis

Because intensive riparian management techniques (e.g., streambank bioengineering, large-scale planting operations) would be used often under this alternative, more land at new mitigation sites would be disturbed under Alternative 3 than under the other alternatives. This increased 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 3 would accelerate the development of riparian and some upland plant communities, including potential changes in existing composition and structure of these communities.

Alternative 4: Cost and Administrative Efficiency Emphasis

Compared to the other alternatives, Alternative 4 would disturb the least amount of vegetation at mitigation and improvement sites because projects would be distributed across the watershed. Less aggressive methods would be used to revegetate disturbed soils and restore riparian areas (e.g., natural revegetation would be preferred over planting). Also, many techniques would be implemented in developed or managed areas with little or no natural vegetation (urban areas, agricultural fields, roads).

Herbicide applications would be considered acceptable for unwanted-vegetation control under Alternative 4, especially where low costs are achieved when large areas need treatment. BMPs would be implemented as mitigation measures to reduce the risk of adverse effects on non-target vegetation, water quality, and so on.

Because native vegetation communities would not always regenerate promptly by themselves, some damaged communities could remain disturbed indefinitely, because cost would prohibit active efforts to restore them. 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

Alternative 5 would include relatively little initial disturbance to vegetation because the more intensive habitat improvement techniques would be seldom used. Program-wide mitigation measures, applied as appropriate, would further minimize impacts. The multiple-use allowance of Alternative 5 would reduce the number of native plant communities protected at mitigation sites where developed recreation or local economic development opportunities exist. More vegetation might be trampled and more unwanted vegetation might be introduced under Alternative 5.

Alternative 6: Balanced Action

BPA's preferred alternative would include program-wide mitigation 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 wde range of techniques that could disturb or alter vegetation (e.g., prescribed burn, clearing/seeding); however, the strong emphasis on revegetation with native species, particularly in riparian areas, would restore the composition and structure of natural plant communities.

4.3.3 Impacts of Techniques: Potential Effects on Vegetation

In-channel Modifications and Habitat Improvement

Riparian area vegetation would be incidentally destroyed during in-channel modifications and habitat improvement projects that require heavy equipment along channel margins. Where vegetation needed to be cleared on access roads, species and condition of post-project regrowth on the road might be altered.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Propagating 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, planting) speed development of desired plant communities compared to passive techniques or no action. 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 could remove threatened or endangered plant species directly.

Transplanting vegetation can be more successful than seeding. Use of this technique in problem areas could accelerate restoration or improvement of native vegetation.

Tilling (to prepare seedbeds) disturbs soils and can allow noxious and other weeds to establish themselves.

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

Control of non-native plants would increase native plant communities. Non-native invasive plant species (e.g., reed canarygrass and Himalayan blackberry) would decrease in watersheds where vegetation control programs are implemented.

The acquisition of sensitive riparian areas through easements and leases would provide for possible uses such as short-term grazing that would enhance habitat and water quality, particularly in floodplains and side channels.

Attempts to accelerate in-stream large woody debris recruitment would result in the slow death of select individual trees.

Each of the techniques available to control vegetation carries some risk of adversely affecting vegetation. Herbicides can incidentally harm desirable plant species. Mechanical removal of vegetation is typically non-selective and is likely to remove desirable plants, possibly including threatened, endangered, or sensitive plant species. Biological control of vegetation can 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.

Agricultural Management Techniques—Crops and General

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

Agricultural Management Techniques—Irrigation

Irrigation would support crop production and continues the annual cycles of soil disturbance and non-native plant growth. Changing irrigation techniques such as converting from seeping unlined ditch systems to closed pipe systems may affect riparian vegetation developed along the ditch.

Agricultural Management Techniques—Animal Facilities

Because animal facilities typically are highly disturbed areas and devoid of natural vegetation, significant impacts of drainage and waste management improvements on vegetation are not anticipated. There is some risk that noxious and other weeds might spread when weed seed incorporated in animal wastes and mire is transported off-site for disposal.

Use of wastes as a soil amendment may increase competition with both crops and desirable native vegetation by encouraging the encroachment of weeds and other undesirable species.

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

Agricultural Management Techniques—Grazing

High levels of grazing can also break and compact vegetation and soils through repeated animal walking, trampling, and lying down.

Because riparian areas provide both palatable plants and a water supply, they are especially vulnerable to negative impacts from frequent livestock use. This impact translates into an increased risk of vegetation impacts wherever watering facilities are constructed.

The use of fences to manage livestock access reduces soil disturbance in sensitive areas, but may generate unintended impacts as well. Livestock tend to walk along fences, creating soil-worn paths devoid of desirable vegetation. Fences may concentrate animals in a smaller area, favoring the propagation of less palatable and undesirable vegetation.

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.

Planned grazing systems, including deferred grazing and allotment rotations, allow vegetative ground cover to increase. Planting or seeding native or adapted perennial or biannual forage plants can improve the quantity and quality of vegetative cover during these rotations.

Road Management Techniques

Road construction directly removes vegetation and results in long-term soil compaction.

Restricting road access with fences and gates can prevent potential vegetation loss from recreational activities and other public uses. Restricting uses could also protect sensitive plant communities, including recently planted areas, riparian areas, and high-quality wetlands.

Building fences and gates requires that minor amounts of vegetation be removed as post holes are dug. Vegetation is trampled and soils compacted by vehicles and equipment and at material staging areas.

After construction or maintenance, native seed mixes are typically used to revegetate disturbed surfaces. Occasionally, rapid-growing, non-native plants would have to be used to secure soil before the wet, winter season. It may then be slow and difficult to change from stands of non-native plants back to native species; more vegetation management techniques might be needed.

Pioneer vegetation on many closed roads may include many less desirable plants, including noxious weeds, unless the roads are intensively managed and monitored.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Forest management techniques considered here, that may disturb vegetation, include the harvest of trees and units, log yarding, wildfires started by equipment, prescribed burns, stand thinning, planting of trees and other vegetation, other site stabilization methods, and livestock grazing.

Log yarding may damage the remaining trees in harvested stands. Understory trees and shrubs and herbaceous ground flora, including threatened, endangered or sensitive plants, may also be stressed, injured, or completely removed.

Wildfires can severely damage soil and vegetation. In these areas, fuel management programs, including prescribed burns at intervals to reduce fuels, present less risk of high-intensity fires; over time, they 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.

Thinning and timber harvest can alter the component species and would change the structure of forest stands.

Revegetation efforts would determine the species of trees in successive forest stands. Where seeding takes places, non-native seed mixtures or live plantings can lead to disease-prone stands and the spread of noxious weeds.

Some non-native seed may be spread through livestock excreta as animals are transferred to various grazing allotments.

Urban Area Techniques

The use of soil-stabilizing seed mixes that contain weed seed may encourage the spread of noxious weeds and other undesirable plants.

Recreation Management Techniques

When campgrounds, trailheads, sanitation facilities, and other recreational facility gates are developed, vegetation is removed through digging for structures, fence posts, tent/trailer pads, trails, and other structures. Vegetation is trampled and soils compacted by vehicles and equipment and at material staging areas.

When recreational facilities are relocated or expanded, vegetation is cleared, possibly removing threatened, endangered, or sensitive plant species. Non-native plants and noxious weeds may encroach on disturbed areas as seeds from distant sources are incidentally transported by recreationists.

<u>Mining and Mine Reclamation Techniques</u>

Mine reclamation efforts would result in the gradual restoration of vegetation communities on sites that were already severely disturbed. The use of seed mixes that contain weed seed might encourage the spread of noxious weeds and other undesirable plants.

4.3.4 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.

- Incorporate a weed control plan in consultation with local weed control officials.
- 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.
- 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 EIS 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.

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4.4 WILDLIFE

4.4.1 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 water-fowl 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).

4.4.2 Impacts of Alternatives: Potential Effects on Wildlife

Alternative 1: No Action

As Watershed Management Program projects continue to be implemented under the No Action Alternative, wildlife habitats and species would continue to be affected. Wildlife disturbance would occur during the implementation of projects that involve heavy machinery and equipment that makes noise. Benefits would occur where, for example, natural and planted vegetation in riparian areas improved riparian wildlife habitat and meets aquatic objectives for shade, cover, and bank stability. As it also administers wildlife mitigation projects, BPA typically requires seasonal restrictions to avoid disturbing sensitive wildlife habitats; however, no standardized program would be established to ensure program-wide mitigation.

Alternative 2: Base Response (Common to All Alternatives)

Alternative 2 presents less risk of wildlife disturbance and degradation of other wildlife habitat than under the No Action Alternative, primarily because a consistent planning approach would help recognize areas of high-value habitat.

Alternative 3: Aquatic Habitat Objectives Emphasis

This alternative has the greatest potential for short-term disturbance, displacement, and habitat loss for wildlife. It also has the greatest potential for long-term gains in riparian habitats and riparian-dependent species. Because Alternative 3 would work aggressively to restore channel structure, streambank stability, and riparian vegetation, wildlife communities that depend on existing riparian areas might be temporarily disturbed by frequent human presence and heavy equipment as channels are modified, and as large-scale vegetation planting and wetland creation take place.

Eventually, however, as fish and water quality benefit from functional aquatic and riparian ecosystems, wildlife would also reap coincidental benefits. No significant or long-term wildlife impacts are expected.

Alternative 4: Cost and Administrative Efficiency Emphasis

Alternative 4 has a low potential to disturb wildlife because it emphasizes passive, rather then active, management techniques. Many techniques would be used across the watershed and/or in developed or managed areas of low-to-moderate value to wildlife (urban areas, agricultural fields, roads). Wildlife would benefit from revegetation efforts, primarily those in riparian areas, but not as much as under Alternatives 3 and 6. No significant or long-term wildlife impacts are expected.

Alternative 5: General Environmental Protection

Under Alternative 5, only minor disturbances to wildlife would be expected because the more intensive habitat improvement techniques would be seldom used. There may be fewer coincidental benefits for wildlife from revegetation (compared to other alternatives) because conservative methods would be used. However, with program-wide mitigation measures applied, no significant or long-term wildlife impacts are expected.

Alternative 6: Balanced Action

Under BPA's preferred alternative, projects would include a wide range of techniques that could disturb wildlife habitat. However, with program-wide mitigation measures applied, no significant impacts are expected.

4.4.3 Impacts of Techniques: Potential Effects on Wildlife

In-channel Modifications and Habitat Improvement

Healthy streams and associated riparian areas are beneficial to wildlife, especially in alluvial systems where floodplains and terraces help provide habitat diversity.

In-channel modifications can disturb or reduce riparian wildlife habitat as heavy equipment is operated during clearing and as materials are placed in streams and near-stream staging areas.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Programs to increase desired plant communities would increase plant diversity and dominance of native plant species and communities. These changes 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.

Creating or expanding wetland areas to provide near-channel aquatic habitat and/or water storage, while also increasing habitat for wetland wildlife species, would decrease habitat for upland species. In some cases, high-quality upland habitats could be removed.

Other control methods may also have impacts. 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. Use of biological methods to control undesirable plant species may disrupt natural wildlife species and systems as well. 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 acquisition of sensitive riparian areas through easements and leases would provide coincidental benefits for riparian-dependent species.

The effects of prescribed burning on wildlife are variable and depend largely on the intensity of the fire, size 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.

Agricultural Management Techniques—Crops and General

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 use conservation farming practices such as no-till or minimum-tillage methods and the establishing of buffer strips. These practices tend to mitigate some of the potential adverse effects that active crop production may have on wildlife.

Agricultural Management Techniques—Irrigation

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

Agricultural Management Techniques—Animal Facilities

Because animal facilities typically are highly disturbed areas devoid of vegetation, and sites of frequent activity, wildlife use is generally low, although some wildlife may be drawn to feeding areas. As most techniques considered address drainage and waste management issues, significant effects on wildlife are not expected. Some improvement in surface water quality near these sites may draw wildlife near to animal facilities, creating a potential for conflict with farm and ranch animals.

Agricultural Management Techniques—Grazing

Intensive grazing can damage habitat by removing desirable plants, by displacing native species, and by decreasing vegetative productivity as soil erosion and compaction increase (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).

Fences used to control livestock access to streams can become barriers to wildlife movements. Fences may also injure wildlife caught or tripped while attempting to cross them.

The development of livestock water supplies, such as the development and protection of springs and/or watering troughs, may provide coincidental benefits to wildlife.

Road Management Techniques

Road construction removes wildlife habitat directly. It can also remove habitat indirectly 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.

Restricting road 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).

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Any forest practice that disturbs vegetation increases negative impacts, or the risk of negative impacts, on wildlife. Forest stand species and structure are integral components of wildlife habitat. Those forest management techniques considered here that may disturb vegetation include the harvest of trees and units, log yarding, wildfires started by equipment, prescribed burns, stand thinning, planting of trees and other vegetation, other site stabilization methods, and livestock grazing.

Techniques involving SMAs are intended to preserve the integrity of the aquatic and riparian environments. Coincidental benefits to wildlife include travel corridors; forage, food and water; thermal cover; and habitat diversity.

The effects of prescribed burning on wildlife are variable and depend largely on the intensity of the fire, size 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.

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).

Livestock grazing may compete with wildlife dependent on similar forage.

Urban Area Techniques

The implementation of urban area techniques for improvements in water resources and fish habitat is not expected to have negative effects on wildlife. Improved water quality would benefit downstream wildlife populations as stress and mortality that may currently result from toxic compounds are reduced.

Recreation Management Techniques

Relocation of some trails and campgrounds into habitat used previously only for undeveloped recreation (e.g., hunting) can increase the frequency of human disturbance of wildlife. Trails, campground access roads, and fences can fragment wildlife habitat and become barriers across wildlife migration routes.

<u>Mining and Mine Reclamation Techniques</u>

Mine reclamation efforts have the potential to disturb wildlife as heavy equipment is operated during project implementation. Wildlife populations in these severely disturbed areas, however, are expected to be low.

Wildlife may eventually repopulate vegetation communities that are gradually restored.

4.4.4 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 custodial 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 (USDA), 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 removal is 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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4.5 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). See Chapter 5.

  Shorelines are protected under the Clean Water Act, as well as by state acts and regulations. See Chapter 5.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: converting to non-agricultural purposes farmland with a rating of 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: Potential Effects on Land and Shoreline Use

<u>Alternative 1: No Action</u>

Without a standardized program, impacts on land and shoreline use could vary widely, depending on the circumstances surrounding each project. Often watershed improvement projects will have no effect on land and shoreline uses. Examples of where projects can negatively affect land and shoreline use include: redirecting, reducing or concentrating streamflow through the use of multiple or alternative channels; prohibiting access to lands, despite easements, through the removal or replacement of hydraulic structures at road crossings; and large-scale application of animal wastes to land over a shallow aquifer, degrading the groundwater used by adjacent properties. 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 (Common to All Alternatives)

Land-use impacts under Alternative 2 would be less than those under No Action, primarily because a consistent planning approach would help identify land use issues and concerns. Large-scale land conversions are not considered to be a typical management practice under the Watershed Management Program.

Alternative 3: Aquatic Habitat Objectives Emphasis

Under Alternative 3, Project Management Plans would focus narrowly on obtaining aquatic habitat objectives rather than on compatibility with local land uses. Therefore, changes to land and shoreline use at mitigation and improvement sites might be greater than under the other alternatives. This would be particularly true where channel modfications affect riparian areas. For example, reclamation of former side-channel depressions (multiple channels, oxbows, etc.) for habitat improvement might affect adjacent land uses (water tables, structures, access). Streambank stabilization might delay natural channel adjustments at a site and transmit them downstream, affecting downstream land uses.

Alternative 4: Cost and Administrative Efficiency Emphasis

Alternative 4 has a low potential for significant changes in land or shoreline use. The number and size of in-channel and riparian habitat improvement projects would be reduced as mitigation efforts are redirected to include upland areas with pre-existing land uses. Large-scale land conversions are not considered to be a typical management practice under the Watershed Management Program.

Alternative 5: General Environmental Protection

Alternative 5 also has a low potential for significant changes in land or shoreline use. 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 Action

In combination with the proposed standard planning process, and with BPA's preferred requirements under Alternative 6, conflicts between in-channel and riparian habitat improvements and 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: Potential Effects on Land and Shoreline Use

In-channel Modifications and Habitat Improvement

In-channel modifications can affect land use by the following means: redirecting, reducing or concentrating streamflow through the use of multiple or alternative channels; increasing downstream sediment yields; and decreasing downstream water quality. Decreases in streambank stability can increase the loss of land adjacent to stream channels.

Channel modifications may alter (increase or decrease) the elevation of the various floodplains (annual, 100-year) and terraces and increase flood damage and water quality degradation; decrease floodprone areas, and/or change suitable land use and land-use regulations.

Land use can be affected through the removal or replacement of hydraulic structures at road crossings.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Recognizing and committing to the importance of riparian areas, wetlands, windbreaks, filter strips, and other vegetation features requires a commitment of land that might otherwise be put to other uses.

Prescribed fire can affect adjacent landowners and land uses 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.

The acquisition of sensitive riparian areas through easements and leases would provide for possible uses such as short-term grazing that can modify existing land use by reducing the intensity of land management practices typical of animal, crop, and timber production. These changes in land use may conflict with local and multi-jurisdictional land-use plans and policies.

If a project were inconsistent with local comprehensive land-use plans, a variance amendment or special use permit might be required, along with public review.

Agricultural Management Techniques—Crops and General

Land-use planning, including re-zoning of county lands withina watershed and the securing of water rights, can alleviate future demands for withdrawal (fresh) and discharge (exhaust) of agricultural water from surface and groundwater sources.

Withdrawing land from crop production, apart from intermittent conservation cropping sequences, may encourage re-zoning to land uses with greateror lesser water demand, soil disturbance, and waste generation.

Agricultural Management Techniques—Irrigation

Major shifts in irrigation practices may affect adjacent landowners by reducing available water or by raising the water table.

Agricultural Management Techniques—Animal Facilities

Drainage improvements and waste management should generaly have favorable (if any) effects on lands adjacent to animal facilities, as surface water and air quality are improved.

Large-scale application of wastes to land may degrade the value of lands over shallow aquifers, through accumulation of nitrates and other contaminants.

Agricultural Management Techniques—Grazing

Implementation of grazing management techniques considered here are not expected to have adverse impacts on land and shoreline uses. However, fencingof sensitive areas may interfere with or preclude other, unknown land uses, including travel and access patterns on the land-scape.

Road Management Techniques

Most road management techniques would not affect land and shoreline uses. Landowner easements must, however, be recognized.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Some forest practices may affect neighboring land and shoreline uses. However, since most techniques considered are for the purpose of forest stand improvements, no significant impacts are anticipated.

Urban Area Techniques

Assuring recognition of near-stream lands as important to the fisheries resource through land-use planning, zoning laws, and state and Federal regulations would determine the land uses and practices by existing and future landowners. No negative impacts are anticipated.

Land-use zoning that restricts development on floodplains generally results in fewer flood impacts on structures.

Recreation Management Techniques

Use of recreation management techniques is not anticipated to affect land and shoreline uses significantly. Most recreational facility relocations are expected to remain near original facilities. Designating alternative fishing locations could create undesirable traffic levels on roads and access routes.

Mining and Mine Reclamation Techniques

Efforts to reclaim abandoned mine waste disposal areas can lead to land-use changes, resulting in alternative uses such as grazing, off-road recreational vehicle (ORV) trails, and other developed uses. Such changes would occur gradually, taking perhaps decades to become effective.

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 (NHPA) 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 newly discovered. The Archeological Resources Protection Act (ARPA) prohibits the purposeful excavation and removal of archeological resources on Federal land without a permit from the Federal land manager. See Chapter 5.

  Section 10(e) of the Northwest Power Act states that nothing in that Act "shall be construed to affect or modify any treaty or other right of an Indian tribe." Because the proposed watershed mitigation measures would be taken pursuant to Northwest Power Act authority, BPA's actions shall not affect or modify the tribes' treaty rights.

  None of the six alternatives would affect or modify the tribes' treaty rights because none of the mitigation measures would change those rights. The treaty rights would remain the same as they were prior to BPA's action. The tribes' ability to exercise their treaty rights would not be diminished. Opportunities for the tribes to exercise their treaty rights could be enhanced by improved fish and wildlife habitat.

- **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: Potential Effects on Cultural and Historic Resources

<u>Alternative 1: No Action</u>

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

<u>Alternative 2: Base Response (Common to All Alternatives)</u>

Watershed Management Program mitigation and improvement projects under Alternative 2, as with all alternatives, are generally compatible with cultural resource protection. Few opportunities for large-scale ground-disturbing activities are likely in previously undisturbed areas.

Most projects seek to improve protective, vegetative cover of soils using methods that minimize ground disturbance.

Potential impacts from ground-disturbing activities would occur to varying degrees under any of the alternatives.

Alternative 3: Aquatic Habitat Objectives Emphasis

Alternative 3 has the highest potential among the alternatives for ground-disturbing activities in channels and riparian areas. It therefore has the highest potential to disturb associated 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 would be implemented.

Over the long term, potential impacts would decrease as revegetation efforts retarded soil loss, roads were decommissioned or closed, and land-use practices on forest and agricultural lands were improved.

Alternative 4: Cost and Administrative Efficiency Emphasis

Potential impacts on cultural resources would be relatively minor under Alternative 4 because mitigation and restoration plans of smaller scope initiate projects across the watershed. Projects in previously disturbed areas (urban areas, cropland, roads) would be emphasized. Most projects also seek to improve protective, vegetative cover of soils using methods that minimize ground disturbance.

Ongoing commercial uses in the vicinity of mitigation and improvement projects (crop, timber, and forage production) would continue the potential to disturb cultural resource sites.

Alternative 5: General Environmental Protection

Alternative 5 proposes the least amount of ground disturbance during project implementation. Program-wide mitigation measures would be applied, as appropriate, to protect cultural resources. Hence the risk of negative effects on cultural resources is the smallest among alternatives.

Alternative 5 does promote commercial and recreational uses of lands near project sites where economic and/or recreational benefits could be obtained along with aquatic habitat objectives. Therefore, some disturbance of cultural resources associated with these activities might occur over time.

Alternative 6: Balanced Action

Under BPA's preferred alternative, a moderate amount of ground would initially be disturbed at mitigation and improvement sites in riparian areas. Program-wide mitigation measures would be applied, as appropriate, to protect cultural resources.

4.6.3 Impacts of Techniques: Potential Effects on Cultural and Historic Resources

In-channel Modifications and Habitat Improvement

Rechanneling streams can result in sites being washed/eroded. Heavy equipment use near stream channels can disturb archeological and historic sites through incidental excavation, soil compaction and crushing, and vegetation disturbance or removal.

Channel modifications that increase flood elevations can inundate and bury previously undisturbed sites through overbank deposition of sediment.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

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 by erosion.

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

Fire associated with prescribed burns can affect archeological sites by exposing them to discovery, or by disturbance through potentially increased erosion.

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 during wildfires.

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

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

Agricultural Management Techniques—Crops and General

Agricultural practices that disturb soils can also disturb archeological sites. Implementation of the techniques for crops considered in this assessment would have no negative impacts on cultural and historic resources unless the tilled land area were expanded.

Agricultural Management Techniques—Irrigation

Agricultural practices that disturb soils can also disturb archeological sites. Using the irrigation techniques considered here would have no negative impacts on cultural and historic resources unless irrigation facilities (e.g., tailwater recovery systems) were constructed on previously untilled land.

Agricultural Management Techniques—Animal Facilities

Construction of facilities for drainage control, alternative water sources, and site maintenance, as well as activities that disturb the soil, may disturb archeological sites.

Agricultural Management Techniques—Grazing

Grazing can compact archeological sites, and can also expose site through erosion. Techniques that disperse and alternate grazing impacts on a site reduce the risk of archeological impacts. Techniques that disturb soils, such as alternative water supply construction, may also uncover and disturb cultural and historic sites. Fencing can cause trailing along fences, which may disturb cultural resources.

Road Management Techniques

Maintenance of existing roads could affect cultural and historic resources where cultural sites and historic facilities and landmarks occur right next to roads. Road surfacing stockpiles and equipment staging areas may inadvertently affect cultural sites.

Road access limitations and road closures can help maintain archeological sites by discouraging public access that can lead to vandalism.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Any forest practice that disturbs soils increases the risk of disturbing cultural and historic sites. Forest management techniques considered here that may disturb soils include log yarding, wildfires started by equipment, prescribed burns, stand thinning, planting of trees and other vegetation by hand and machine, other site stabilization methods, and livestock grazing.

Fire associated with prescribed burns can affect archeological sites by exposing them to discovery, or by disturbing them through possible increased erosion.

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 during wildfires.

<u>Urban Area Techniques</u>

If bridges are considered historic features, improvements for drainage control may detract from their historic appeal.

Urban area techniques are not anticipated to affect cultural resources negatively.

<u>Recreation Management Techniques</u>

Heavy equipment use during recreational facility relocation can disturb archeological and historic sites through incidental excavation, soil compaction and crushing, and vegetation disturbance or removal.

Improved access to archeological sites by relocation of recreational facilities can lead to vandalism of these sites.

<u>Mining and Mine Reclamation Techniques</u>

Mine reclamation efforts would occur on severely disturbed lands, with virtually no risk of impacts on cultural or historic resources, since they most likely would already have been destroyed during the mining.

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.

- Enter into Programmatic Agreements with SHPOs, tribes, and others to ensure the following:
    - Consultation with the SHPO and affected tribes to identify potential occurrences of cultural resources;

* Where there is potential for adversely affecting cultural resources, cultural resource surveys to document any resources present;

* Where properties on or eligible for the National Register are under management control, incorporation of a cultural resource management plan; and

* Identification of opportunities to foster public appreciation of the relationship between natural resources and tribal culture.

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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 or human health effects on minority and/or low-income populations. In addition, Federal agencies must analyze the environmental effects of their actions, including human health, economic and social effects, and effects on minority 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 use; disruption of traffic or business activities during construction or ongoing operation; reduction of local tax revenues, either directly or indirectly, to the extent that greater than 1 percent of total annual revenues is lost.

4.7.2 Impacts of Alternatives: Potential Effects on Economics

Alternative 1: No Action

Under No Action, no standardized program would be applied to provide coincidental benefits to local economies. Implementation of management activities would continue to provide some temporary employment, service, and supply revenues to the local economies.

Alternative 2: Base Response (Common to All Alternatives)

Implementation of mitigation projects can provide some temporary and/or seasonal local employment, services and supplies revenues. Use of a consistent planning approach established under Alternative 2 would identify opportunities for incorporating local skills and resources. However, few, if any, full-time employees would be required for most mitigation projects.

It is unlikely that the use of water for mitigation projects would reduce water available to other water users because any water used would be used according to State law that prevents new or changed uses from "injuring" existing water rights. Thus there would be little or no reduction in 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. Watershed management projects would not be sufficient in scale to cause broader impacts within regional economies.

Alternative 3: Aquatic Habitat Objectives Emphasis

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 project activities would likely taper off after initial implementation. For projects that require long-term maintenance, local services and supplies might be used indefinitely. In a few cases where large foodplains and riparian areas were acquired for management, loss of commodity production would reduce economic returns from those areas.

Alternative 4: Cost and Administrative Efficiency Emphasis

Alternative 4 would likely have little effect on local or regional economies. Short-term use of services, supplies, and equipment would be reduced because projects would be smaller. In order to reduce costs, increased volunteer labor would be sought.

Alternative 5: General Environmental Protection

Like Alternative 4, Alternative 5 would include actions with coincidental benefits to local economies. In addition, application of program-wide mitigation measures, where appropriate, would minimize impacts on, and maximize benefits to, local economies.

Commercial uses that are consistent with aquatic habitat 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 Action

BPA's preferred alternative would apply program-wide mitigation measures, as appropriate, to minimize impacts on, and maximize benefits to, local economies This alternative would provide only minor increases in local revenues from employment, services, and supplies.

4.7.3 Impacts of Techniques: Potential Effects on Economics

In-channel Modifications and Habitat Improvement

In-channel modifications to improve habitat would be short-term activities benefiting biologists, water resources specialists, equipment operators, and associated support and materials services. Associated revenues would also be short-term, and would not generate significant long-term income, local retail business, or governmental tax revenues.

The cumulative effect of numerous habitat improvement projects could increase the gradual, long-term economic benefit of larger fisheries to tribal, commercial, and sport fishermen. In addition, flood control and management benefits would increase

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

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 to local retail businesses or governmental tax revenues.

The creation of wetlands would also provide some temporary employment and funds for equipment rental (e.g., excavators, backhoes, and graders) during construction.

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 wetland creation, they would involve short-term, low-paying laborer positions, and would not noticeably benefit the area economically.

The acquisition of sensitive riparian areas through easements and leases can reduce the economic returns of commodity production on these areas. In general, commercial use of lands acquired for mitigation actions would occur only as they are consistent with the overriding project goals and objectives. Because commodity production would be secondary (or, in some cases, irrelevant), local economic activity would be reduced if farming and associated economic activities were 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.

Agricultural Management Techniques—Crops and General

Several of the techniques presented require initial investments at the cost of the agricultural landowner. Elevated costs may be associated with techniques such as conservation cropping systems, terracing, planting windbreaks, evaluation of fertilizer rates and timing, and implementation of alternative pest management strategies. Quantifying benefits is more difficult, however. Benefits accrue as soil erosion is prevented, soils higher in productivity are maintained, applied fertilizer is more effective, and pesticide use is reduced, increasing crop yield and perhaps greater profits per unit yield.

Agricultural landowners can implement many of the techniques with existing equipment. Employment opportunities associated with such implementation are not expected to reach significant levels.

Agricultural Management Techniques—Irrigation

Construction and long-term maintenance of irrigation diversions, water conveyance structures, and alternative water sources such as wells, spring development, and impoundments, would generate some income through local labor, equipment, services, and supplies. The amount generated depends strongly on the size of the facilities and structures, their design, the materials used, and other factors.

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 jobs would range from low-skill laborer positions to journeyman and management positions with construction and engineering firms.

Depending on the size of the construction project, these structures could require substantial purchases of pipe, rock, concrete, and other materials, as well as acquisition of water rights. Funds would be provided 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 depends 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. Most irrigation techniques considered in this assessment conserve or protect water supplies and would not create significant concerns regarding economic impacts on other water users such as ranchers and farmers.

Agricultural Management Techniques—Animal Facilities

Several of the techniques presented require initial investments at the cost of the agricultural landowner. Elevated costs may be associated with techniques involving drainage improvements.

Agricultural landowners can implement many of the techniques with existing equipment. Associated employment opportunities are not expected to reach significant levels.

Agricultural Management Techniques—Grazing

Construction and long-term maintenance of water conveyance structures and alternative water sources such as wells, spring development, and impoundments would generate some income through local labor, equipment, services, and supplies. The amount generated depends on the size of the facilities and structures, their design, the materials used, and other factors.

Employment and income generated by these activities would generally be short-term. Types of employment would range from low-skill laborer positions to journeyman positions with construction and engineering firms.

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. Funds would be provided 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.

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 to local retail businesses or governmental tax revenues.

Road Management Techniques

Construction, long-term maintenance, and decommissioning of roads and road drainage structures would generate moderate income through local labor, equipment, services, and supplies. The amount generated depends on the size and the extent of the road network and landscape characteristics (such as soil characteristics, hillslope gradient, stream drainage density, and the vigor of typical roadside vegetation).

Associated employment and income would generally be seasonal but long-term. Road decommissioning, however, would offer only one-time, short-term employment per project. Types of employment would include both skilled equipment operators and low-skill laborer positions with construction firms.

Depending on the size of the road maintenance project, substantial purchases of rock, gravel, concrete, culverts, and other materials could be required. Road maintenance 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.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Forest operations such as harvesting, thinning, planting and fertilizing, slope stabilization, and prescribed burning would generate moderate income through local labor, equipment, services, and supplies. The amount generated would depend on the size and extent of the forest stand and landscape characteristics such as hillslope gradient and stream drainage density.

Employment and income generated by these activities would generally be seasonal in nature, but could be long-term if multiple watersheds were involved. Types of jobs would include skilled equipment operators, low-skill and unskilled laborers, professional foresters, and government agency personnel (in a consulting role).

Depending on the watershed size, large purchases or rental of equipment, supplies, and forest road maintenance items (rock, gravel, concrete, culverts, etc.) could be required. Maintenance and repair of forest equipment (e.g., yarders, tractors, trucks) during forest operations would provide some additional employment and benefit local services and increase governmental tax revenues.

Urban Area Techniques

Implementation of urban area techniques such as sewer and septic system improvements would generate some income through local labor, equipment, services, and supplies. Other opportunities would fall to state and community transportation and utility crews. Many of the techniques are voluntary in nature, generating no income and only minor demand for services and supply businesses.

Employment and income generated by construction activities would generally last only months. Types of employment would include low-skill laborer positions, skilled equipment operator positions, and engineer and surveyor positions with construction and engineering firms.

Recreation Management Techniques

Implementation of recreation management techniques would generate only occasional income through local labor and provision of equipment, services, and supplies.

Employment and income generated by construction activities would generally last perhaps days to weeks. Types of employment would include low-skill laborer positions and skilled equipment operator positions with construction firms. Employment and income afforded by campgrounds and areas of heavy ORV use could decrease where campgrounds and ORV trails were closed or relocated.

Mining and Mine Reclamation Techniques

Implementation of mine reclamation techniques would generate some income through local labor, equipment, services, and supplies. Employment and income generated by reclamation projects would generally last from weeks to months. Types of employment would include low-skill laborer positions, skilled equipment operator positions, and engineer and surveyor positions with construction and engineering firms.

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.

- Encourage using available local supplies and labor to accomplish project goals and objectives.
- Train and maintain a qualified and adequate work force to plan and implement various watershed restoration projects safely and effectively.
- Establish inter-local agreements with fire districts, the USFS, and other appropriate agencies to assist in controlled bum 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.

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4.8 RECREATION/VISUAL

4.8.1 Context

- **Legal.** Fishing is generally regulated by Federal, state, and tribal fish and wildlife agencies. 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 in stream channels and on lands adjacent to stream channels; and supporting recreational activities that conflict with aquatic habitat objectives or with tribal rights.

4.8.2 Impacts of Alternatives: Potential Effects on Recreation/Visual

Alternative 1: No Action

Without a standardized program, recreational opportunities would be developed on a case-by-case basis. In most cases, existing recreational uses would continue with little or no alteration (based on past mitigation projects). Some fisheries-oriented developed opportunities might be provided, such as fishing platforms and trails offering aquatic and riparian ecosystem education. Recreational access could be restricted near sensitive stream banks and high-value habitats.

Alternative 2: Base Response (Common to All Alternatives)

In most cases, significant impacts are not anticipated from changes in recreational use. The risk of changes to the range and quality of recreational experiences under Alternative 2 is less than that under No Action, primarily because a consistent planning approach would help recognize areas of high recreational value. Under all alternatives, recreational use near mitigation and improvement sites would be curbed where access restrictions were deemed necessary for fish and fish habitat protection.

Alternative 3: Aquatic Habitat Objectives Emphasis

Under Alternative 3, selected stream reaches would be closed to fishing or seasonal fishing windows modified under the jurisdiction of state agencies. Construction of habitat and channel protection structures (particularly those of non-natural appearance such as concrete weirs or riprap on stream banks) could alter the visual setting near some mitigation sites. Improvements to recreational facilities and experiences under Alternative 3 would be purely incidental to the achievement of aquatic habitat objectives.

Alternative 4: Cost and Administrative Efficiency Emphasis

Negative impacts might occur in association with access restrictions and stream and fishery closures. Improvement and relocation of campgrounds, trails, and other facilities could also affect recreational experience under this alternative. These benefits would be incidental to the achievement of aquatic habitat objectives. They would depend on their nearness to and influence on aquatic habitat, and they would be limited by the amount of resources available for recreation projects. Alternative 4 encourages the use of a permit system and allows access fees to be charged to visitors. These charges could discourage recreational use in some cases.

Alternative 5: General Environmental Protection

Recreational use of lands near mitigation and improvement sites would be encouraged under Alternative 5. This alternative would therefore potentially provide a net increase in the number and/or quality of recreational opportunities. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on recreation. Alternative 5 encourages the use of a permit system and allows access fees to be charged to visitors. 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 Action

Under BPA's preferred alternative, recreational uses would be allowed, providing they do not interfere with achieving fish and fish habitat mitigation. Negative impacts might occur from access restrictions and stream and fishery closures. Access to recreational sites on sensitive stream banks would also be restricted to protect sensitive habitats, cultural resource areas, or other environmentally sensitive areas. Alternative 6 encourages the use of a permit system and allows access fees to be charged to visitors. These charges could discourage recreational use in some cases. Program-wide mitigation measures would be applied, as appropriate, to protect recreation and visual resources.

4.8.3 Impacts of Techniques: Potential Effects on Recreation/Visual

In-channel Modifications and Habitat Improvement

In-channel and near-channel habitat improvement projects may temporarily disturb and therefore reduce the quality of some recreation experiences. Turbid water, equipment noise, and non-natural vegetation patterns generated by these projects can detract from the recreation experience.

Construction activity that disturbs and deters fish can reduce the catch by sport fishermen. Habitat improvements from in-channel modifications can increase and improve recreational experiences associated with sport fishing.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Where plant propagation is taking place, recreational opportunities may be temporarily or permanently lost. 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 riparian, wetland, and related vegetation on communities and associated wildlife populations may increase fish and wildlife-related recreational opportunities, as well as improve the natural character of mitigation lands.

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.

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.

Agricultural Management Techniques—Crops and General

Agricultural management techniques for crops are not anticipated to affect existing recreational opportunities. Planting "green manure" crops may improve the visual diversity of the landscape during non-growing seasons.

Agricultural Management Techniques—Irrigation

Irrigation techniques are not anticipated to affect existing recreational opportunities or visual resources.

Agricultural Management Techniques—Animal Facilities

Techniques for the control of effluent runoff from animal facilities are not anticipated to affect existing recreational opportunities or visual resources.

Agricultural Management Techniques—Grazing

Techniques for grazing management would generally increase or maintain recreational opportunities associated with the wild or undeveloped character of the land. Wildlife viewing enjoyment and hunting success, for example, are likely to increase.

Road Management Techniques

Road access options and road decommissioning can limit (and potentially reduce) the amount and types of recreational activities. Where unrestricted access has been allowed, newly imposed access restrictions or road closures may diminish recreational opportunities. Because most private lands involve some form of restricted access, access restrictions as a road management technique on private lands would have a negligible impact on recreation.

Road construction and maintenance can also improve recreation access by improving the ease of access.

Forest Management Techniques

The consideration of forest management techniques in this assessment is *not* intended to satisfy NEPA and other regulatory requirements necessary to permit large-scale commercial timber harvests. Forest management techniques can be used to improve the health of forest stands and restore degraded conditions caused by natural disturbances, including fire and mass wasting, and human-caused influences.

Forest management techniques considered here may temporarily affect recreational opportunities through truck traffic on forest roads, noise generated from harvest or other forest equipment (e.g., planting machines), safety issues surrounding tree-falling, disruption of hiking trails, and ash and unpleasant burn residue remaining after prescribed fires. Maintenance of SMAs will provide continuity of riparian recreational opportunities such as sport fishing.

Urban Area Techniques

Urban area techniques would have only minor effects on visual resources, perhaps improving the attractiveness of neighborhoods. Adopt-a-stream and public education programs can have recreational benefits for some persons.

Recreation Management Techniques

The temporary or permanent loss of recreational opportunities may occur as facilities are relocated or improved. Improvements would generally increase the satisfaction sought by users of dispersed and developed recreation areas. However, some recreation sites favored by campers and ORV enthusiasts might be closed or relocated.

Fish stream closures may be unpopular with some fishermen.

Mining and Mine Reclamation Techniques

Mine reclamation efforts would improve the visual impact of severely disturbed landscapes. These techniques are not anticipated to affect existing recreational opportunities. With time, some reclaimed sites may afford dispersed (e.g., hunting) and developed (e.g., off-road vehicle trails) recreational opportunities.

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.

- Identify safe public recreational opportunities that do not jeopardize project aquatic habitat objectives.
- Identify recreational opportunities suitable for physically disabled persons.

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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. 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 non-attainment 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: Potential Effects on Air Quality

Alternative 1: No Action

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. Noise, dust, and emissions associated with heavy equipment exhaust could increase, with potential impacts on local air quality. These impacts are local and short-term in their effect. Prescribed burning, currently used to varying degrees, can also adversely affect air quality.

Alternative 2: Base Response (Common to All 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 posing a safety hazard on public highways. 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 various land types throughout the Columbia River Basin (e.g., crop-, range- and forest lands), burning levels might remain similar to current conditions. Use of a consistent planning approach established under Alternative 2 would reduce risk of degradation to air quality, relative to the No Action alternative, though the identification of air quality issues and concerns.

Alternative 3: Aquatic Habitat Objectives Emphasis

Relatively few impacts on air quality would be expected under this alternative because in-channel and riparian area work is emphasized. These areas are not conducive to effective or beneficial prescribed burning; and fertilizer or herbicide use is controlled and minimized. Use of prescribed burning and herbicide and fertilizer application on mitigation and improvement projects would be limited in frequency and limited to upland areas.

The potential for dust and emissions from heavy equipment and ground disturbance would be greatest under this alternative.

Alternative 4: Cost and Administrative Efficiency Emphasis

Alternative 4 has the greatest potential for use of prescribed burns because fire is often one of the best methods to obtain desired vegetation changes, and because many acres can be treated at relatively low cost. Therefore, this alternative could generate some of the highest levels of smoke in a watershed, especially during the first few years of each new project's implementation, when prescribed fires might be used with greater frequency.

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 hectares (ha) or 40 acres (ac.)) or local applications as needed in riparian areas.

Alternative 5: General Environmental Protection

Alternative 5 would include relatively low use of 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 Action

Relatively minor impacts associated with drifting smoke or applied herbicides and fertilizers would be expected under this alternative. A moderate potential for dust and emissions from heavy equipment and ground disturbance exists under this alternative. Program-wide mitigation measures would be applied, as appropriate, to minimize potential air quality impacts.

4.9.3 Impacts of Techniques: Potential Effects on Air Quality

In-channel Modifications and Habitat Improvement

Increases in noise, dust, and emissions associated with heavy equipment exhaust would occur during projects involving equipment operation, and could temporarily reduce local air quality.

Special Vegetation Treatment Techniques, Including Techniques for Wetlands and Riparian Areas

Aerial application of herbicides can locally deteriorate air quality.

Plant propagation, vegetation control, wetland creation, and the like do not significantly affect air quality. Increases in noise, dust, and emissions associated with heavy equipment exhaust occur during projects involving equipment operation, and could temporarily reduce local air quality.

Fire can significantly degrade air quality. Smoke effects are typically local, although the cumulative effects of agricultural and silvicultural burning and 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 burned.

Agricultural Management Techniques—Crops and General

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality.

Agricultural Management Techniques—Irrigation

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality. Use of irrigation techniques should not otherwise affect air quality.

Agricultural Management Techniques—Animal Facilities

Handling and storage of concentrated wastes often generates unpleasant odors associated with urea and ammonia. When animal wastes are incinerated, smoke, ash, and odors are likely to increase in the atmosphere.

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality.

Agricultural Management Techniques—Grazing

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality.

Road Management Techniques

Noise, dust, and exhaust emissions from with heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality.

Unsurfaced roads may suspend dust above roads under heavy traffic conditions during dry weather, obscuring visibility and making breathing difficult.

Forest Management Techniques

Noise, dust, and emissions from heavy equipment exhaust would increase during forest operations, and could temporarily reduce local air quality.

Unsurfaced roads may suspend dust above roads under heavy truck traffic during dry weather, obscuring visibility and making breathing difficult.

Urban Area Techniques

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality.

Recreation Management Techniques

Noise, dust, and exhaust emissions from heavy equipment would increase during projects involving equipment operation, and could temporarily reduce local air quality. Equipment use associated with most recreational management techniques is expected to be minor.

Mining and Mine Reclamation Techniques

Noise, dust, and exhaust emissions from heavy equipment would increase during mine reclamation efforts, and could temporarily reduce local air quality.

Site restoration, including revegetation and soil stabilization, may result in reductions in windblown dust and noise.

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 guidelines 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 USFS Final EIS for Managing Competing and Unwanted Vegetation (USFS 1988).

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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 Watershed Management Program: (1) impacts of all future BPA watershed management projects considered together, and (2) impacts of all future watershed management projects considered collectively with other past, present and future activities within the Columbia River Basin.

4.10.1 Cumulative Impacts of All Future Watershed Management 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 a number of individual watershed management programs within the Columbia River Basin over the next decade.

Individual projects would range in size from fractions of an acreto several hundred acres or more. Relatively minor impacts that might occur at individual projects could occur over many hundreds of acres when all individual projects are considered together.

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

Cumulative benefits to fish would include improvements in many natural processes, including sediment transport, streamflow generation, large woody debris recruitment, and temperature regulation. As a result, healthy and viable populations of wild, native fish and other naturally spawning fish would be more likely to increase. As projects are implemented, the stability of streambanks and streambeds would result in increased cover and the stabilization of spawning gravel. Habitat complexity would increase within the channel, provding a diversity of habitat types. Sediment input to stream channels would become comparable to the capacity of the system to alternately store and transport it. A reduction in fine sediment would create clean gravel with greater spawning and overwintering success. Peak flows discharged from the watershed would not excessively scour redds or disrupt rearing fish. Riparian conditions would improve, shading streams and reducing thermal stress on fish. An increase in riparian trees would provide the supply of large woody debris for channel structure and cover. Trees and other vegetation would provide energy inputs to the food chain, secure groundwater for favorable maintenance of streamflow during dry weather, and help maintain channel stability. Fish would enjoy increased and easier access to all habitat types through the modification or removal of obstructions such as culverts and debris. Water quality improvements, including increased dissolved oxygen, decreased toxic chemical concentrations, and a reduction in coliform and other pathogens, would benefit not only fish, but wildlife and humans as well.

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

Impacts from implementing watershed restoration projects throughout the Columbia River Basin would add to past, present, and future impacts occurring from other human activities in the region. Negative effects of watershed management projects would be temporary and associated mainly with project implementation. Short-term negative effects would be compensated for by overall long-term improvements in watershed condition, and, ultimately, in increases in fish habitat and fish populations.

Prescribed burning for watershed improvement 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 watershed management 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.

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. To achieve mitigation goals, new watershed management projects may include a variety of short-term uses such as 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 almost all cases, development of new watershed management 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 with watershed restoration projects, these sites would also support or improve the land's production capacity.

Grazing, farming, and timber harvesting may be excluded from some areas (e.g., SMAs) where they currently are allowed, or prescribed where they currently are not. However, the benefits of improved grazing, agricultural and forest practices and the resulting soil conservation may result in an overall increase in the productivity of these resources.

All of the watershed management techniques proposed would result in long-term increases in fish resources and stream productivity. Projects that produce short-term increases in stream productivity at the expense of long-term or watershed-wide productivity would not be used under any of the alternatives. For example, clearing streamside vegetation could result in a short-term increase in primary productivity by allowing more sunlight into the system, while causing a long-term decrease in production by increasing the stream temperature beyond the ideal range for fish downstream.

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. Watershed management projects may include the use of gravel, sand, and other non-renewable materials to construct drainage improvements, stabilization structures, and access roads, trails, and 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.

Irretrievable commitment of resources are those commitments that result in the lost production/use of renewable resources, such as timber or rangeland. Development of watershed management projects would minimize such commitments, except where state and Federal regulations and zoning ordinances so designate. 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 the implementation of watershed management programs 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 implementation phases of most new construction projects. Depending on the level of human use allowed at each individual project site, and on the aggressiveness of improvements and restoration actions taken (e.g., planting programs), soils could be disturbed to various degrees over several years. On the whole, watershed management programs would serve to stabilize soils and provide long-term protection, especially at riparian areas, where soils are typically most likely to enter stream systems.

4.13.2 Fish and Water Resources/Quality

Activities under some watershed management programs would contribute sediments to adjacent surface waters during project implementation. However, state water regulations would be followed under all alternatives, and program-wide mitigation measures would be applied, as appropriate, under Alternatives 5 or 6. Therefore, no significant impacts are expected. Eventually, sediment contributions would decrease as riparian and other vegetation zones become established.

4.13.3 Vegetation

In many cases, it would not be possible to avoid removing some existing vegetation as part of watershed improvement activities (e.g., detention ponds, surfacing of high-use areas). Under all alternatives, rare, threatened, or endangered plant species or high-quality native plant communities would be protected.

4.13.4 Wildlife

Wildlife would be disturbed by noise and human activity where many watershed improvement projects were implemented. Overall, wildlife habitat would be maintained or increased as the overall watershed condition improves. With program-wide mitigation measures applied, as appropriate, only minor disturbance of wildlife would occur under Alternatives 5 or 6.

4.13.5 Land and Shoreline Use

Except for very few, very extensive watershed improvement projects, no significant changes in land use would occur.

4.13.6 Cultural Resources

Watershed management projects 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

No significant, negative economic effects are anticipated with the implementation of watershed improvement projects.

4.13.8 Recreation

Access restrictions would be necessary in some areas during project implementation.

4.13.9 Air Quality

Smoke from prescribed burning conducted to improve vegetation conditions or to manage fuel loads would reduce local visibility and air quality.

CHAPTER 5: CONSULTATION, REVIEW, AND PERMITS

5.1 NATIONAL ENVIRONMENTAL POLICY

This EIS was prepared pursuant to the National Environmental Policy Act (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 watershed management projects, environmental review of future individual projects would have a narrower, more project-specific focus. Additional 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 Threatened and Endangered Species and Critical Habitat

Under all alternatives, project managers would comply with the Endangered Species Act (ESA) and consult with the USFWS and with the NMFS and appropriate state agencies about the potential presence of listed and proposed threatened and endangered (T&E) species or designated critical habitat within the area of potential effect. If T&E species are present at proposed projects or if there is a question of potential impacts on T&E species, BPA and/or the project manager (e.g., State or tribal agency) would prepare Biological Assessments and consult with USFWS or NMFS 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 considered for funding under the Watershed Management Program would have the goal of conserving 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.

5.2.3 State Fish Agencies

The appropriate state agency would be contacted for any construction in or near Waters of the State to establish acceptable construction periods. Where species protected by ESA listing may be affected, BPA will consult with the appropriate agency (USFWS or NMFS).

5.3 HERITAGE CONSERVATION/NATIVE AMERICANS

5.3.1 Historic Places

The National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470) requires Federal agencies to take into account the potential effects of projects on registered properties or properties eligible for listing in 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 project requires construction on lands that contain currently listed or eligible historical resources, a cultural resources management plan would be prepared in consultation with the State Historic Preservation Officer (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 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). (See Section 4.6.1.)

5.4 STATE, AREA-WIDE, 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 Watershed Management Program would have disproportionately high and adverse human health or environmental effects on minority or low-income populations. However, the Base Response alternative (Alternative 2) includes steps to ensure that such effects would not occur, in accordance with Executive Order 12898. Actions listed under Alternative 2 are included in every Action Alternative. These steps would also be undertaken on a case-by-case basis under No Action.

5.6 FLOODPLAINS AND WETLANDS

5.6.1 Floodplain/Wetlands Assessment

This Assessment constitutes the Federal review required by 10 CFR 1022 and Executive Orders 11988 and 11990.

Under 10 CFR 1022 and Executive Order 11988, Federal agencies are required to avoid or minimize adverse impacts associated with short-term or long-term modification and occupancy of floodplains. Watershed management activities are typically consistent with floodplain values, and would often benefit many of those values (i.e., water-quality maintenance, moderation of floods, and natural resources). However, potential floodplain effects would include placing new structures or materials in streams that could be dislodged in a flood and disturbing existing streambanks and channels, which would make them more susceptible to erosion and failure during flooding until they were stabilized and revegetated.

The proposed actions would have long-term, net positive effects on the floodplains affected. Channel restoration, revegetation, and erosion control and stabilization actions would be specifically designed to lessen the impacts of future flooding on lives and property, and would help restore natural and beneficial floodplain values.

Under 10 CFR 1022 and Executive Order 11990, Federal agencies are required to issue or amend existing procedures to ensure consideration of wetlands protection in decisionmaking. Because wetlands provide valuable habitat for many wildlife species and water storage and filtering functions, watershed management projects are more likely to maintain or improve existing wetlands, or to create new wetlands; net loss of wetlands is unlikely under any alternative. Potential negative effects on wetlands would be minimal. Riparian wetlands may be temporarily affected by disturbance, but the proposed actions would help stabilize streambanks, thereby reducing erosion and sedimentation. Project areas would be surveyed to determine the extent and location of any wetlands present before disturbance; wetlands would be avoided wherever practicable. Projects would be designed to minimize negative impacts on the survival, quality, and natural and beneficial values of any wetlands present. Long-term effects would be to improve the function of, and potentially to expand the size of, both the floodplains and wetlands associated with the streams.

Standard erosion control practices would be employed during construction. All applicable permits, including Corps of Engineers Section 10 and 404 permits, and state water quality and shoreline protection permits, would be obtained, and conditions for these permits would be adhered to. Designs for permanent structures to be installed in streams would be reviewed by qualified engineers, and the structures would be floodproofed to the extent practicable.

Any wetlands that must be altered, filled or destroyed would be mitigated as a condition of the Corps or NRCS Section 404 permit.

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 farmland were to be converted. A rating of 160 or greater would require project managers to consider alternatives to conversion, such as using crops to achieve watershed management objectives such as soil conservation. Most agricultural techniques that would be used would have benefits to farmland quality such as retention of soil, groundwater maintenance, and so on.

5.8 GLOBAL WARMING

Although watershed management projects might involve prescribed burning for habitat or fire management, it would not likely be greater than would occur if the land were managed for other purposes. Managing land for water quality, soil, and aquatic habitat conservation is likely to conserve biomass. Catastrophic fires that could occur without prescribed burning could actually result in a greater release of carbon dioxide (the most important contributor to global warming) than would be released with controlled burning. Therefore, there would likely be no warming effect on global climate from projects considered for funding/implementation.

5.9 WATER RESOURCES

5.9.1 Permits for Structures in Navigable Waters

Some watershed management activities, such as irrigation diversions or pump stations 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 watershed management activities (if they require dredging or filling of waters of the United States) might require a permit from the Corps under provisions of the Clean Water Act. In-channel improvements that could result in temporary water quality impairment might also require state permits such as the Temporary Modification of Water Quality Criteria (Chapter 90.48 RCW and Chapters 173-201; 173-222 WAC) required in Washington State. Consultation requirements of all alternatives would ensure that project managers acquire necessary permits.

Stormwater discharge permits are required in each state for construction (if more than 2 hectares or 5 acres are involved) or for operation if any project discharges stormwater into Waters of the United States.

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 and 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 watershed management 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 and in-channel stream improvements, thus ensuring compliance with applicable air and water quality standards.

5.12.2 Hazardous Waste and Toxic Substances

Some properties on which mitigation projects are implemented might contain solid and/or hazardous waste. For example, land that has been used for ranching might have dilapidated structures, junked vehicles or machinery, fuel tanks, pesticide containers, oil drums, or other refuse. BPA or project managers would survey for such materials to determine whether they were present within project footprints or staging areas. 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

Watershed management activities are unlikely to release contaminants into groundwater. Techniques presented for pesticide application restrict its use near surface waters and minimize the risk of groundwater contamination. Some agricultural techniques that increase soil water infiltration could leach salts to shallow groundwater tables. Land application of animal wastes might cause nitrates to move into groundwater. However, most watershed management activities would actually reduce the opportunity for pollutants to enter surface water or groundwater.

5.12.4 Noise

Watershed management activities might involve use of heavy equipment that can generate noise. Compliance with noise standards might require restrictions on where and when heavy equipment may be used.

5.12.5 Herbicides/Pesticides

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

5.12.6 Asbestos/Radon

Watershed management 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	Contract Project Manager	B.S. Biology; 25 years experience in NEPA evaluation and project management.
Thomas C. McKinney Bonneville Power Administration	NEPA Compliance Officer	B.A. Geography; 17 years experience conducting and managing environmental impact analysis at BPA.
Judith H. Montgomery Judith H. Montgomery/ Commununications	Technical Writer/ Editor	Ph.D. American Literature; 17 years experience in writing and editing electric power and environmental documents.
Rick Oestman Jones & Stokes Associates	Fisheries, Water Quality	M.S. Fisheries Biology; 12 years experience in fisheries impact assessments.
Eric N. Powers Bonneville Power Administration	EIS Manager	B.S. Environmental Science; 7 years experience in NEPA evaluation and environmental analysis at BPA.
Mark Shaw Bonneville Power Administration	Watershed Program Manager	B.S. Fish and Wildlife Management; 22 years as a fisheries biologist specializing in habitat restoration and watershed management.
Robert L. Walker Bonneville Power Administration	Planning, Resident Fish and Wildlife	B.S. Wildlife Biology; 25 years as natural resource specialist and wildlife biologist.
Nancy H. Weintraub Bonneville Power Administration	Fish and Wildlife NEPA Team Lead	M.S. in Zoology; 17 years experience in NEPA compliance and aquatic ecology.
Mike Wolanek Jones & Stokes Associates	Hydrologist	M.S. Forest Hydrology; B.S. Forest Management; 10 years experience in forest hydrology, environmental impact assessment, and BMP prescriptions.
Andy Wones Jones & Stokes Associates	Water Quality	M.S. Biology; 10 years experience in aquatic sciences.

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CHAPTER 8: LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS EIS WERE SENT

Native American Tribes

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

Congressionals

Senator Max Baucus
Senator Larry Craig
Senator Gordon Smith
Senator Dirk Kempthorne
Senator Patty Murray
Senator Slade Gorton
Senator Ron Wyden
Senator Conrad Burns
US House of Representatives, Office of the Honorable Helen Chenoweth
US House of Representatives, Office of the Honorable Michael Crapo
US House of Representatives, Office of the Honorable Rick Hill
US House of Representatives, Office of the Honorable Elizabeth Furse
US House of Representatives, Office of the Honorable Bob Smith
US House of Representatives, Office of the Honorable Earl Blumenhauer
US House of Representatives, Office of the Honorable Peter DeFazio
US House of Representatives, Office of the Honorable Darlene Hooley
US House of Representatives, Office of the Honorable Linda Smith
US House of Representatives, Office of the Honorable Richard (Doc) Hastings
US House of Representatives, Office of the Honorable George Nethercutt

Interest Groups and Businesses

Alliance For the Wild Rockies
American Wildlands
ARA
Association of Northwest Steelheaders
Battelle Pacific Northwest Laboratories
Battelle Pacific Northwest Laboratories, Human Affairs Reseaich Centers
Boise Cascade Corporation
The Center for Watershed & Community Health
Columbia Blue Mountain R C & D
Clouston Energy Research
Electric Power Research Institute
Environmental Information Center
Flathead Wildlife, Inc.
Friends of the Bitterroot Inc.
Friends of Wild Swan
Garcia & Associates
Grande Ronde Resource Council
Jones & Stokes Associates
Long Live the Kings
Louisiana Pacific
Mobrand Biometrics
Montana Association of Conservation Districts
National Association of Conservation Districts
Native Fish Society
Northwest Forestry Association
NW Regional RC&D Area, Inc.
The Observer
Oregon Cattlemen's Association
Oregon Trout
Oregon Water Trust
Oregonian Newspaper
Otak Inc.
Pacific Coast Federation of Fishermans Assoc., Northwest Region
Pacific Rivers Council
Potlatch Corporation
Protect Glacier
Public Power Council
Puget Sound Water Quality Auth.
Puregro Company
Rivers Council of Washington
Seattle Post Intelligencer
Shannon & Wilson, Inc.
Siuslaw Institute of Watershed Arts & Science

State Director ASCS
Stegner Grain Company
Trout Unlimited
Trout Unlimited, Northwest Washington Council
Umatilla Basin Watershed Council
Western Montana Fish & Game Assn.
Wallowa County Chieftain
Wallowa County Stock Growers
Water Quality Consultant, Barry Moore
Water Watch of Oregon
Wild Stone Resources LTD

State Government

Governor's Watershed Enhancement Board
Office of the Governor, Idaho
Office of the Governor, Montana
Office of the Governor, Oregon
Office of the Governor, Washington
State of California, Department of Fish & Wildlife
State of Idaho, Department of Fish & Game
State of Idaho, Department of Water Resources
State of Idaho, Division of Environmental Quality
State of Idaho, Soil Conservation Commission
State of Montana, Department of Fish Wildlife & Parks, Kalispell
State of Montana, Department of Fish Wildlife & Parks, Helena
State of Montana, Department of Natural Resources
State of Oregon, Association of Conservation District, Baker City
State of Oregon, Association of Conservation District, Roseburg
State of Oregon, Bureau of Farms
State of Oregon, Department of Agriculture
State of Oregon, Department of Economic Development
State of Oregon, Department of Environmental Quality
State of Oregon, Department of Fish & Wildlife, Clackamas
State of Oregon, Department of Fish & Wildlife, Enterprise
State of Oregon, Department of Fish & Wildlife, La Grande
State of Oregon, Department of Fish & Wildlife, Portland
State of Oregon, Department of Forestry, Forest & Water Issues
State of Oregon, Department of Forestry, La Grande
State of Oregon, Department of Forestry, Salem
State of Oregon, Department of Parks & Recreation
State of Oregon, Department of Water Resources
State of Oregon, Department of Water Resources, Baker City
State of Oregon, Department of Water Resources, La Grande
State of Oregon, Department of Transportation Hwy Div. Region 5

State of Oregon, Division of State Lands
State of Oregon, Forest Industrial Council

State of Washington, Conservation Committee
State of Washington, Department of Agriculture
State of Washington, Department of Ecology
State of Washington, Department of Ecology, Bellevue
State of Washington, Department of Ecology, Spokane
State of Washington, Department of Fish & Wildlife, Dayton
State of Washington, Department of Fish & Wildlife, Habitat Management Project
State of Washington, Department of Fish & Wildlife, Rocky Beach
State of Washington, Department of Fish & Wildlife, State-wide Investigators Unit
State of Washington, Department of Fish & Wildlife, Walla Walla

Local Government

Asotin Creek Model Watershed
Association of Oregon Counties
Bitterroot Conservation District
City of Challis, Soil & Water Conservation District
City of Elgin
City of Everett, Department of Public Works
City of La Grande, Department of City Hall Planning
City of Lincoln, Board of Commissioners
City of Missoula
City of Salmon
Columbia Conservation District
County of Baker
County of Columbia
County of Columbia, County Commission, District 2
County of Curry, Court House
County of Flathead
County of Lake
County of Malheur
County of Mineral
County of Missoula
County of Rivalli
County of Sanders
County of Umatilla
County of Union
County of Union, Commissioner
County of Union, Extension Office
County of Union, Soil & Water Conservation District
County of Wallowa
County of Wallowa Commission
County of Wallowa Court
County of Lemhi, County Agent
County of Lemhi, Commissioner

County of Walla Walla
Flathead Basin Commission
Flathead Conservation District
Grande Ronde Model Watershed
Idaho Model Watershed Project
League of Oregon Cities
Pataha Model Watershed
Rogue Valley Council of Governments
Tucannon Model Watershed

Regional Agencies

BC Environment
BC Environment, South Interior Region
BC Ministry of Environment Lands & Parks
Columbia River Intertribal Fish Commission
Northwest Power Planning Council

Libraries, Repositories, and Universities

Alternative Energy Resources Organization Library
Battelle Pacific Northwest Laboratories, Department of Energy Public Reading Room
Battelle Pacific Northwest Laboratories, Hanford Technical Library
Billings Gazette Library
Boise State University
City of Boise Public Library & Information Center
City of Seattle, Main Branch Public Library, Government Publications
City of Spokane, Main Branch Public Library, Regional Depository
Columbia Basin College, Library Media Center
Eastern Montana College Library
Eastern Oregon State College
Eastern Washington University
Elam & Burke PA Law Library
Fort Vancouver Regional Library
Gonzaga University
Government Publications, California State Library
Lewiston Morning Tribune Library
Montana State Library
Northwest Nazarene College, John E. Riley Library Federal Depository
Oregon State University
Oregon State University, Department of AG & Resource Econ.
Pacific University Federal Depository, Harvey W. Scott Memorial Library
Portland State University, Regional Depository, Millar Library
Ricks College Federal Depository, David O. McKay Library Documents Department
Seattle Times Library

Southern Oregon State College Library, Department of Documents, Federal Depository
Spokane Community College
Spokesman Review Newspaper Reference Library
State of Idaho, Statesman Library
State of Oregon, Department of Fish & Wildlife Library
State of Washington, Library Document Section, Regional Depository
Montana State University, Montana Water Course
Montana State University, Renne Library
Moscow Latah County Library System
State of Washington Law Library, Temple of Justice, Federal Depository
State of Wyoming Law Library, Regional Depository
Tamarack Federation of Libraries
University of Washington Regional Depository, Suzzallo Library Government Publications
US Army Corps of Engineers, District Library
US Army Corps of Engineers Technical Library, Portland District & North Pacific Division
US National Marine Fisheries Service, Northwest & Alaska Center Library
Walla Walla College, Periodical Department Library
Washington Public Power Supply System Library
Washington State Library, Documents Section
Washington State University
University of Idaho, Aquaculture Research Institute
University of Idaho, Dept. of AG Economics & Sociology
University of Oregon, Department of Landscape Architecture

Federal Government

Interior Columbia Basin, Ecosystem Management Project
US Army Corps of Engineers, Department of Environmental Resources
US Army Corps of Engineers, District Offices
US Department of Energy, Western Area Power Administration
US Department of Agriculture
US Department of Agriculture, Blue Mountains Natural Resources Institute
US Department of Agriculture, Forest Service, Bitterroot National Forest
US Department of Agriculture, Forest Service, Deerlodge National Forest
US Department of Agriculture, Forest Service, Department of Forestry
US Department of Agriculture, Forest Service, Department of Forestry & Water Issues
US Department of Agriculture, Forest Service, Flathead National Forest
US Department of Agriculture, Forest Service, Kootenai National Forest
US Department of Agriculture, Forest Service, La Grande Ranger District
US Department of Agriculture, Forest Service, Lolo National Forest
US Department of Agriculture, Forest Service, Science Lab
US Department of Agriculture, Forest Service Umatilla National Forest, Pomeroy Ranger District
US Department of Agriculture, Forest Service Umatilla National Forest, Supervisors Office
US Department of Agriculture, Forest Service, Wallowa Whitman National Forest

US Department of Agriculture, Forest Service, Wallowa Valley District
US Department of Agriculture, Natural Resources Conservation Service
US Department of Agriculture, Natural Resources Conservation Service, Office of Salmon Recovery
US Department of Agriculture, Natural Resources Conservation Service,Watershed Analysis Team
US Department of Commerce, National Oceanic & Atmospheric Admin, Department of Marine Fisheries
US Department of Commerce, National Oceanic and Atmospheric Admin., National Marine Fisheries Service
US Department of Interior, Bureau of Indian Affairs
US Department of Interior, Bureau of Land Management
US Department of Interior, Bureau of Land Management, Baker City
US Department of Interior, Bureau of Land Management, Boise
US Department of Interior, Bureau of Land Management, Salmon
US Department of Interior, Bureau of Reclamation, Boise
US Department of Interior, Bureau of Reclamation, Central Snake Projects Office
US Department of Interior, Bureau of Reclamation, Denver
US Department of Interior, Bureau of Reclamation, Salmon
US Department of Interior, Fish & Wildlife Service
US Department of Interior, Fish & Wildlife Service, Federal Activities
US Department of Interior, Fish & Wildlife Service, Office of Columbia River Fisheries Program
US Environmental Protection Agency, La Grande, OR
US Environmental Protection Agency, Seattle, WA
US Environmental Protection Agency, Helena, MT
US General Services Administration, Federal Archives and Records Center
US National Archives & Record Administration, Federal Records Center, Northwest Region

WATERSHED MANAGEMENT PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT: COMMENTS AND RESPONSES

The Draft Watershed Management Program EIS was published in February 1997, and circulated for public review. Reviewers were encouraged to write or e-mail comments on the DEIS. The EIS environmental team also held public meetings across the Columbia River watershed to gather comments. Meetings were held in Yakima and Spokane, WA; in Lewiston, Boise, and Salmon, ID; in LaGrande, Redmond, and Portland, OR; and in Kalispell, Missoula, and Libby, MT. The public comment period closed on March 25, 1997. In all, 142 comments were recorded at the meetings; another 110 comments were identified from the 19 letters received.

All identified comments were read and assigned to comment categories for members of the environmental team to review, respond to, and modify the EIS, as necessary. Categories are listed below.

The comments are treated as follows.

- Each comment has been assigned a unique identifying number (e.g., the fourth comment in comment letter six is identified as 06-04: the fourth comment at the Yakima meeting is identified as YK-04). For letters, coding is in boldface and the name of the commenter also appears in italics at the end of each comment.
- Comments are arranged by general subject for greater ease of response.
- Some comments applied to more than one subject. Where a comment is repeated, the location of its "twin" is listed at the end of the comment.
- Any changes to the EIS are noted in the responses.

Meeting Codes

Codes assigned to meetings are as follows:

YK	Yakima	**SP**	Spokane
LW	Lewiston	**KL**	Kalispell
LG	LaGrande	**MS**	Missoula
RD	Redmond	**SL**	Salmon
PT	Portland	**LB**	Libby
BS	Boise	**TR**	Comments from meetings with Shoshone-Bannock, Shoshone-Paiute, and Umatilla tribes

Commenters

[01	*Found not to be on this project]*
02	Mark Tipperman
03	Roberta Bates
04	Mike Keppler
05	Sidney N. Clouston, Jr. Clouston Energy Research
06	Steve Wegner
07	John M. Skovlin Donna Skovlin
08	Joseph R. Maroney Fisheries Program Manager, Kalispel Tribe of Indians

09 Herbert A. Pollard II
Regional Supervisor
Idaho Fish and Game, Clearwater Region

10 Gordon Stewart,
President
Flathead Wildlife, Inc.

11 Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

12 John Etchart
Chair, Northwest Power Planning Council

13 Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

14 Robert Ament
American Wildlands

15 Candace Thomas
Chief, Environmental Analysis Branch
US Army Corps of Engineers

16 Barbara J. Ritchie
Department of Ecology
State of Washington

Also includes letters from (1) Cyreis Schmitt, Conservation Services Division Manager, Habitat Management Program, Washington Department of Fish and Wildlife; and (2) Patty Lynch, Washington State Department of Transportation

17 Preston A. Sleeger
Acting Regional Environmental Coordinator
U.S. Department of Interior

18 Elizabeth Holmes Garr,
Habitat Conservation Program
National Marine Fisheries Service

19 Richard B. Parkin
Manager, Geographic Implementation Unit
Environmental Protection Agency

PURPOSE AND NEED/SCOPE

Comment

18-01 The program objectives are not clearly stated. [Commenter quotes section 1.2 Purposes] The Fish and Wildlife Program's aquatic habitat objectives are not described or referenced, and "environmental protection" is a goal rather than a specific objective. Program objectives should be explicitly stated in the draft EIS.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: We have now referenced sections 7.6A Habitat Goal and 7.6D Habitat Objectives for the Northwest Power Planning Council's (Council's) 1994 Fish and Wildlife Program in section 1.2 of this FEIS.

As stated in that section, purposes are the goals or objectives on which BPA intends to base its choice among alternatives. In choosing among the alternatives, we will evaluate the degree to which each of the alternatives provides environmental protection.

Comment

12-03 Please include language that clarifies the importance that the EIS is fully consistent with the existing program as well as future versions of the program. It is in the region's and Bonneville's interest not to close doors on what might be done in watersheds in the future. [Comment not intended as a criticism, but meant to ensure good opportunities are not foreclosed.]

John Etchart
Chairman
Northwest Power Planning Council

Response: We have added language (third paragraph of Section 1.1) that states, "BPA's proposed approach to the watershed planning process and this EIS is designed to be fully consistent with the Council's Fish and Wildlife Program. The EIS anticipates future refinements to the Council's Fish and Wildlife Program by providing flexibility through a wide array of techniques, and through a planning approach that does not dictate site-specific solutions."

We have attempted to include in this EIS as many watershed management techniques as practicable. We realize that new techniques could be proposed in future revisions to the Fish and Wildlife Program Any techniques not included in Appendix A of this FEIS could be added in the future through supplemental analysis, or through a separate NEPA analysis. Please also see response to comments 05-07 and YK-10 on page CR/39.

Comments

LG-12 Does the EIS cover the mainstem as far as watershed work?

Response: Yes, this EIS could cover watershed actions in the mainstem, but does not cover mainstem operations issues, such as drawdowns at the Lower Snake and John Day dams. These issues were addressed in the Columbia River System Operation Review EIS. See section 1.5.2 of the Watershed DEIS.

Comment

SP-11 Do projects need to be directly connected to an area impacted by the dams?

Response: No, most of the projects are located in the tributary watersheds, while most of the dams are located on the mainstem Columbia River. Projects need only be located in the Columbia River Basin to be considered for funding.

Comments

BS-3 Why is wildlife not mentioned in the "need for action?"

08-02 [Regarding EIS statement: "The goal of these projects is to assist recovery effort for anadromous fish in the CRB" Page 1/3 DEIS] This statement needs to reflect that the goal of these projects is to assist recovery of anadromous fish, resident fish and wildlife within the CRB. Within the Council's Program it states that "Good habitat is important for resident fish, just as it is for anadromous fish. The degraded condition of resident fish habitat in the Columbia River Basin often rivals that of anadromous fish. The Council believes comprehensive, cooperative watershed management is essential to making good investments in protecting, mitigating, and enhancing resident fish in the basin."

Joseph R. Maroney
Fisheries Program Manager,
Kalispel Tribe of Indians

12-04 Reports by three independent scientific panels [Independent Scientific Group, National Research Council, National Marine Fisheries Service Salmon Recovery Team] have called for ecologically-oriented approaches to restoration of fish and wildlife habitat. The DEIS appears to be fish-oriented, as opposed to using an ecological approach. Throughout the document, it addresses "anadromous fish

(con't)

and resident fish habitat." Conversely, at page 3/49 it address wildlife as part of the "affected environment." We recommend that the language in the EIS be modified to clarify that this is an ecologically-oriented approach, not just a species-specific approach.

John Etchart
Chairman
Northwest Power Planning Council

Response: While the primary emphasis of the watershed program is to address anadromous and resident fish habitat impacts, we realize the importance of looking for ways to address mitigation from an ecosystem standpoint, not just focusing on fish. That is why we used an ecosystem-based planning process (developed in *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, a report of the Interagency Ecosystem Management Task Force, June 1995) as our model for the eight-step process we are proposing to adopt.

One of the reasons we prefer Alternative 6 is that it does recognize the value of a balanced, ecosystem approach to watershed planning. Many of the mitigation efforts for anadromous or resident fish would go hand-in-hand to also benefit resident fish and wildlife. From a cost standpoint, it also makes sense to fund watershed activities that benefit as many species as possible. See the preferred alternative discussion under section 2.1.7, third paragraph.

We have clarified the first purpose to address the ecosystem approach. Also, we have added fish and wildlife, where appropriate, to the language in Chapter 1.

Comment

YK-15 Watershed restoration projects should be related to and consistent with salmonid management; e.g., Yakama Indian Nation wildlife projects are being planned to provide salmonid mitigation, as well. Watershed projects should address this goal, as well. [Also see **Process and Coordination.**]

Response: The basic goal of watershed plan development and implementation funded by BPA is restoration of salmonid habitat productivity. Alternatives 3, 5, and 6 of the EIS include a prescription under Step 5 (Establish Project Goals) to "Include, as a project goal: . . . development of habitat that complements the activities of the region's tribes and state and Federal fish, wildlife, and water resource agencies and private landowners." This would include salmonid and wildlife management.

PROCESS/COORDINATION

Jurisdictional Coordination/Partnerships

Comment

LG-2 General Comment: For all interested people and parties involved, it's a great frustration to deal with the many different agencies involved. There should be a clear, easy to follow, flow chart showing agency responsibility, any overlap of agency involvement and where to go(which agency).

Response: Each of the Model Watershed programs has recognized this frustration among its constituents. The watershed coordinators have tried to consolidate the permitting process among state and Federal agencies, to act as a clearing house for coordination among agencies, and generally to ease the frustration of dealing with multiple agencies. When and if future watershed programs are funded, this will continue to be emphasized as a part of their work program.

Comment

LG-10 Need integration of federal ecosystem type EISs - each agency looks only at its own area of concern/management - need more global view.

12-06 Several of the ongoing NEPA compliance documents [BPA's watershed EIS, the USFWS/NMFS/BPA hatchery EIS, the USFS/BLM Interior Basin Ecosystem Management Project EIS] need to be coordinated and reviewed in a common light to truly approach an ecological orientation. Language should be added to the DEIS that outlines how these important EISs will be coordinated.

John Etchart
Chairman
Northwest Power Planning Council

LB-31 How will this EIS be coordinated with the Upper Columbia River Basin EIS (USFS & BLM)? Look for areas of potential conflict.

18-07 The DEIS should address how it will mesh with other current EISs in the region, such as the USFWS/NMFS/BPA hatchery EIS and the USFS/BLM Interior Columbia Basin Ecosystem Management Project EIS. These should be coordinated and reviewed together in order to ensure that integrated ecosystem planning is truly underway in the Columbia Basin.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

LB-34 It is hoped that the Upper Columbia River Basin, state, and local watershed efforts are compatible.

Response: We have attempted to integrate this EIS with otler Federal ecosystem type EISs by proposing to adopt the watershed-based project planning process developed for the US Forest Service's Ecosystem EISs. Our eight-step planning process is adapted from *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, a report of the Interagency Ecosystem Management Task Force, June, 1995. Several of the steps from this report further integration by:

- requiring coordination with other stakeholders, which would include Federal, state, and local agencies (Step 2);
- requiring a characterization of the historical and present site conditions and trends, which would include ongoing ecosystem management activities by other agencies and entities (Step 3).

Each of these steps in this EIS has been modified according to the emphasis of the respective alternative. An example of integration would be if and when the USFS and BLM choose a preferred alternative for the Upper Columbia River Basin EIS (UCRB EIS), this information may be used by individual watershed groups in their own watershed plan development or in coordinaion with plans developed by individual forests or BLM Districts.

In addition, BPA asked several other Federal agencies whether they wanted to be cooperating agencies on this EIS. The Natural Resources Conservation Service, the Bureau of Reclamation, and the Army Corpsof Engineers are the Federal agencies that responded. Because of their cooperating agency status, they will be able to use this EIS for funding watershed projects, once it is finalized. Other Federal agencies could also elect to adopt this EIS in the future.

We have added information to Section 1.5 to address this issue.

Comment

LG-11 Grande Ronde is doing this [watershed planning on the watershed level - Coordinated Resource Management Plan (CRMP) planning is across jurisdictional boundaries and integrated.

Response: CRMPs can be developed on any scale necessary to fit the objectives of the planning effort. CRMPs that cross jurisdictionalboundaries will generally better meet the overall goal of ridgetop-to-ridgetop watershed management. As individual watershed plans are developed, this scale of CRMPs will be emphasized.

Comment

YK-15 Watershed restoration projects should be related to and consistent with salmonid management; e.g., Yakama Indian Nation wildlife projects are being planned to provide salmonid mitigation, as well. Watershed projects should address this goal, as well. [Also see **Purpose and Need.**]

Response: The basic goal of watershed plan development and implementation funded by BPA is restoration of salmonid habitat productivity. Please see response to this comment under **Purpose and** Need, page CR/6.

Comment

YK-5 Supports alternatives that broaden the scope of partnerships with existing agencies and coordination with existing planning activities; e.g., WDOE grant-funded planning by Okanogan County and Okanogan Conservation District. [Also see **Alternatives.**]

Response: This concept has and will continue to be a goal of the watershed programs. Each Model Watershed program has taken on the role of being a point of coordination for implementing state programs such as water quality and riparian management. In the case of the Okanogan, coordination with and support of the existing state-funded planning activities will be a major focus of the program.

Comment

SP-27 How do fish and wildlife groups, e.g., Trout Unlimited, get funded for watershed enhancement projects? Can they use their memberships to magnify benefits - free labor, monitoring. [See also **Funding.**]

Response: The Council develops a list of projects that are proposed to BPA for funding under its Fish and Wildlife Mitigation Program. This yearly process generally begins in January, with a solicitation of proposals for continuation of ongoing and new projects. Projects are generally selected by August or September, with new funds available by October 1 of each year. To receive BPA funding, a fish and wildlife group must submit its proposal to the Council and have it prioritized, such that it is recommended for BPA funding. And, yes, these groups can use their memberships to magnify project benefits.

Comments

LB-25 How will all the different watershed groups being formed be coordinated? Some are funded by state, some by BPA, others? [See also **Funding.**]

YK-18 Concern for "partnerships" regarding the funding for watershed projects approved by the Northwest Power Planning Council. [See also **Funding.**]

Response: For the entire Columbia River Basin, there is no coordinating body for watershed activities. Within the Council's Fish and Wildlife Program, Section 3.1D.1 calls for the formation of subregional teams to coordinate watershed, habitat, and production activities; however, this action has not yet occurred. Depending on the state, there may or may not be a central coordinating body for watershed groups. Oregon has the Governor's Watershed Enhancement Board (GWEB), Washington has a watershed task force under the governor's office and a private organization called the Washington Rivers Council, Idaho has established an organization of basin and watershed groups to deal with water-quality-impaired streams, and Montana has now established state-wide watershed advisory groups out of the governor's office. There is a mixture of control within each state, depending on where the watershed group receives its funding. Watershed groups receiving state or Federal funding would have a certain degree of oversight, depending on the sponsoring agency. In general, watershed groups are not designed to have central control, but to let the work occur from the ground up.

Where BPA has funded watershed groups, partnerships have successfully been encouraged. One of the major parts of a BPA funded-watershed contract has been to actively seek out partnerships in all phases of the watershed planning and implementation. Once a watershed coordinator position has been established, the coordinator has acted as a central point to crystallize partnerships with other Federal, state, tribal and private entities.

Comment

16-23 WSDOT supports development of a management plan to provide guidance for the review of mitigation projects submitted to BPA for funding and for the development of alternatives that would promote consistency in planning and management objectives based on watershed concepts. [Such guidance] may enhance opportunities for WSDOT to coordinate transportation mitigation requirements with priorities established by BPA and the Council. WSDOT may be able to request funding or matching funds for activities that will promote BPA's goals of improving fish habitat, as well as meet our own needs for environmental mitigation and fish passage restoration. The objectives described in Alternative 6 compliment Transportation's interest in moving towards a watershed approach. (See also **Alternatives**.)

Patty Lynch
Washington State Department of Transportation
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your comment. The eight-step project watershed planning process includes a step that addresses involving government agencies (step 2). Partnerships such as those you are proposing are encouraged under all the alternatives of this EIS.

Comment

MS-4 On-site interpretation programs are important to watershed programs. Coordinate with other agencies, i.e. Montana [Department of Natural Resources]. Work with common interpretive goals, e.g., the why vs. don't do it. USFS Lake Koocanusa scenic byway interpretive plan is an example. [Also see **Environmental Impacts**.]

Response: On-site interpretation programs have not been a significant part of the watershed program. To date, however, there are examples of information signs at projects and of education seminars and classes developed by the watershed groups. These have been directly related to projects on the ground, for a hands-on basis of referral. Many of the projects will continue to make small scale interpretive efforts. Agency cooperation, as called for under Step 2 of the eight-step watershed planning process, will generally lead to this sort of cooperative effort. Any large-scale interpretive sites would likely have to be proposed as separate projects within the yearly prioritization process.

Comment

SP-10 Are you working with logging companies to make sure they are observing spawning stream buffer zones?

Response: BPA-funded watershed programs do not have a regulatory role within the watersheds. This role is left to the appropriate state or Federal agency charged with this responsibility. If enforcement of regulations such as stream-side buffer zones were a concern or problem, the watershed groups could act as point of coordination with regulatory agencies, or develop a goal or objective relating to this issue.

Comment

SP-13 Canadians also need to do better watershed work - better if everyone works together.

Response: Transboundary issues of watershed management are being addressed in watersheds in northern Washington, Idaho and Montana. To the extent possible, watershed restoration issues that transcend the Canadian/US boundary will be raised and addressed. To this point, it must rely on cooperation, because the BPA-funded watershed groups have no regulatory authority either within the US or in Canada.

Comment

SP-24 Cost sharing helps in getting projects funded. [See also **Funding**.]

Response: Cost sharing is a required element of watershed funded projects. The Council has set a minimum 10% cost-share level for BPA-funded projects. Cost sharing has typically been in the range of 30 to 50% on many projects. Cost sharing has come in the form of in-kind materials or labor, long term-project operation, and maintenance or direct cash.

Comment

SP-14 Wherever the work begins - must also be done throughout the watershed.

Response: Whenever one type of work, such as road obliteration, is begun within one area of a watershed, it may or may not be extended throughout the watershed. Each project is prioritized on the basis of biological need and opportunity to implement in a given area. When these two parts come together *and* the project is a high priority, a project is implemented.

Comment

SP-25 How do you plan to work across jurisdictions, i.e. Grande Ronde watershed covers two states, multiple agency jurisdictions?

Response: The responsibility for coordination among multiple agencies and states is a part of the contractual obligation of BPA-funded watershed projects. This is usually accomplished by making all participating agencies a part of the watershed council or other oversight body, or part of a technical advisory group. Coordination may take place on an informal basis by correspondence or notification and invitation to watershed meetings.

Comment

SP-20 Accountability and responsibility for meeting program goals must be at lowest level, but need overall framework for program, cohesive way of selecting projects.

Response: Steps 5 through 8 of the Process for Project Implementation in all alternatives will provide the guidance for developing and meeting objectives at the watershed level. In certain large watersheds, there may be subwatershed plans that will tier to the overall watershed goals and objectives. In addition, the Council, in cooperation with the Columbia Basin Fish and Wildlife Authority (CBFWA), is currently updating an overall framework of natural and artificial salmonid production goals, with subsequent habitat maintenance and improvement goals. These will serve as guides for specific watershed plan development.

Comments

04-07 For fifty years, private and government agencies have spent millions and millions on studies and impact statements. Let's start implementing some real projects that will have a true and everlasting effect for the better of all. Thanks for your time and efforts.

Mike Keppler

10-03 A problem . . . is the amount of time that it takes to implement a plan. Often, opportunities are lost before a plan can work its way through the red tape. We would like to have someone investigate the possibility of some agency being able to step in and secure these opportunities until such time as the bureaucracies can get in motion.

Gordon Stewart,
President
Flathead Wildlife, Inc.

Response: Early implementation of projects has been a goal of the watershed program. These projects are often called "demonstration" projects, focused on the ability to show how a particular type of action affects the watershed. The ability to put demonstration projects on the ground before a watershed plan is finished is often based on available funding. At present there is no contingency funding held back in the Council's process for such potential projects. Only if a project proponent had the foresight to include this type of request in an funding proposal would such funding be available. A major benefit of this EIS is the expediting of NEPA review and approval of appropriate watershed plans and reduction of the time to implement a plan.

Comment

19-03 Not all projects should be categorically excluded from environmental assessment under NEPA. A watershed assessment should be completed, which identifies priority areas for attention. Participants should reach agreement on certain actions based on that assessment, thereby making individual NEPA processes unnecessary. However, certain types of projects must go through a permitting process, and that may be large in scale or overall environmental effect such that an environmental assessment is warranted. An example is the Methow irrigation conversion project in which the conveyance system for irrigation water [is proposed to be] converted from open canals to a pipeline.

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: Not all projects would be categorically excluded under this EIS. Projects covered by the analysis of this EIS may be tiered to this EIS and subsequently excluded from any further NEPA review. Projects that fall outside this analysis would have a separate or supplemental NEPA process completed. In addition, even those projects appropriate for this EIS will undergo site-specific review and permitting, as necessary, for analysis not covered in this document, such as cultural resources and threatened or endangered species.

Comment

05-01 [Regarding the eight-step process] In step eight which is titled "Adapt Management According to New Information" . . . "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." It is this area of new information and technology which deserves adequate attention as well as action.

Sidney N. Clouston, Jr.
Clouston Energy Research

Response: We agree that this is an important part of the process. This step requires that step 7, Monitoring and Evaluating Results, also be a part of the watershed plan. BPA now requires that all projects have a monitoring and evaluation plan and be funded from the project's implementation funds. In addition, all projects are required to submit yearly and or final project reports which are available to all interested parties, so results and lessons can be shared throughout the region.

Comment

09-01 Commenter agrees that there is a need for a programmatic approach to BPA's watershed program. Many potential BPA projects can be implemented by existing agencies (e.g., Natural Resources Conservation Service, Idaho Dept. of Fish and Game, USFS, private timber companies, Nez Perce Tribe, and Department of Environmental Quality). To achieve objectives while being cost and administratively efficient, commenter suggests that the alternatives and EIS attempt to achieve these objectives by defining using an interagency approach to project prioritization, implementation, and monitoring . . . because the BPA-funded projects and agencies usually do not have the expertise or resources to achieve the eight steps identified in the DEIS summary. [Also] experience has shown that a NEPA-type effort to solicit comments or consultation with affected stakeholders is not as effective as participation, involvement, and responsibility for projects. BPA should decide not through programmatic level, but by interagency process. This would provide a better tie to project priorities, desired future condition, and site-specific project and monitoring needs within each watershed. Therefore, these would not be prescribed by BPA's programmatic EIS decision, but on the social, economic, and biological limits and conditions as decided by the interagency effort.

Herbert A. Pollard II
Regional Supervisor
Idaho Fish and Game, Clearwater Region

Response: We agree that neither this EIS nor any one single agency has the ability to fully implement a watershed plan. It is not the purpose of this EIS to provide more than a programmatic level of process steps and prescriptions, and an evaluation of a broad range of possible watershed techniques. The watershed groups themselves will, through the eight-step watershed planning process, ultimately create their own watershed-specific plans. The eight-step process and section 7.7 of the Council's Fish and Wildlife Plan encourage the type of interagency cooperation you are suggesting. If a watershed planning process receives funding from BPA under direction of the Council, both the material from the Council's Fish and Wildlife Program and this EIS will be suggested as contractual requirements. Other processes might be acceptable, if the project proponent had another methodology that would result in the same goals. (Further NEPA review might be required, however.) In all cases, interagency cooperation and the definition of watershed goals and objectives and ultimate implementation of the eight-step process will be developed at the watershed level.

Comment

16-03 Sec 4.2.4: the last bullet (mitigation measures) should include: obtain water rights for withdrawal of water from the state where the project is being considered.

Barbara Ritchie
Environmental Review Section, Washington Department of Ecology

16-04 Sec 4.2.4 should also have an additional bullet, stating: Coordinate with state and local water resources and water quality agencies to share data collection efforts in project areas.

Barbara Ritchie
Environmental Review Section, Washington Department of Ecology

Response: Your comment (16-03) has been included in the 11th bullet (Section 4.2.4). Your comment (16-04) has been added as the last bullet (Section 4.2.4).

Comment

16-24 The DEIS is inconsistent in its proposed consultations with regulatory agencies. Coordination with local jurisdictions with regard to local ordinances is not addressed. Example: Although [re: wetlands] Corps permits, NRCS, and compliance with the Clean Water Act are mentioned, wetland rating, buffers, and local permits are not. Example: Although USFWS is noted for consultation regarding all major construction projects, state wildlife agencies are not mentioned, even though permits require that state fish agencies are to be contacted for all construction in or near waters of the state.

Patty Lynch
Washington State Department of Transportation
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Under the eight-step watershed planning process, step 2 states that under all action alternatives project managers would consult with affected local government, adjacent landowners, tribes, and state agencies regarding fish, wildlife, habitat, or other issues (see section 2.1.3). Since this is a programmatic EIS that covers several States with differing regulations, we did not include references to specific State and local regulations.

Comment

16-09 Many watershed planning and implementation activities are currently underway in the Columbia Basin; we assume that BPA's watershed program, regardless of alternative, will be coordinated with and complementary to those efforts.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Yes, this is our intent. Although BPA is not required to do so by law, BPA will coordinate with current watershed planning and implementation activities in the watershed potentially affected by a given project.

Watershed Approach

Comment

19-02 It is important to use a watershed/landscape assessment as a basis for making project proposals and decisions. We understand that BPA intends to use a watershed approach to project approvals. It is not clear from the EIS whether the basis for project area identification, development of desired future condition, and characterization of historical and present site conditions and trends is a watershed/landscape assessment or whether the basis is site-specific. Please clarify the intent of and process for your watershed approach.

We advocate a process in which projects identified in collaboration with agencies, tribes, and interested citizens are based on a thorough watershed/landscape assessment. Absent such an analysis, the validity and usefulness of many project proposals would lie in question.

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: The eight-step planning process is designed to be implemented on a watershed basis in all alternatives. This is a watershed-based program, with a focus on ridge-top-to-ridge-top analysis.

Comment

03-07 Even though Alternative 6 would be an effective guideline for approval and acceptance of projects at a local level, it seems to me that the present practice of promoting small projects uncoordinated with adjacent conditions is an inefficient restoration strategy. I think the mode of approving projects which will be diminished by contiguous substandard land and water environments is a reversal of what the process should be.

First, you should analyze the whole stream, identify all problems for its length, determine specific solutions, set priorities for problems most urgently needing reconstruction (regardless of ownership or location]. Then each project would augment the general plan. [Commenter gives specific examples following.] Best to set a priority river and work on the entire body than to squander money on isolated small projects that do not have an appreciable effect on the overall incapacity. [Use] a coordinated program to work on all the problems of all the stream at the same time.

Roberta Bates

Response: Your model for analysis and setting priorities is a refinement of a number of the eight steps within the EIS. The ideal application of these steps is always desired, but not always achieved within watershed programs. If a watershed receives BPA funding, they are required to show how project funding requests fit into this model. There are often circumstances that do not permit perfect application of this model, such as the relative willingness of a private landowner to work on his or her land, the availability of funding, or other complicating regulatory or procedural processes. We will follow this type of model as closely as possible in watershed project funding.

Comment

03-08 If a total correlated plan were developed [see comment 03-07: for an entire stream length] and presented to the public, there would be a good response even from private land holders. It would . . . require large sums of money but would be more productive in the long term and save the expenditure of money on useless unrelated projects. [Commenter names Catherine Creek as a good place to apply this approach.]

Roberta Bates

Response: A totally correlated plan with agreement from all of the landowners is indeed a laudable goal. In the ongoing watershed programs this is a goal, but has rarely been achieved. Limitations in funding are often also a complicating factor, due to the overabundance of viable projects. Another issue is "in lieu" funding, i.e., BPA cannot fund projects that are clearly the responsibility of another entity. However, this type of planning will continue to be a goal of BPA-funded watershed programs.

Comment

12-05 We are pleased to see the DEIS emphasize the need for an adaptive management approach. It would be useful to go further and describe what adaptive management might mean in the watershed context [because implementation of such management has proved difficult]. The DEIS provides an opportunity to state expectations more clearly, so that we can establish a solid basis for adaptive management in implementation. The EIS could outline the elements of an organized monitoring and evaluation program, e.g., goals based on assessment of available information, hypotheses addressing critical information gaps, monitoring and evaluation to fill critical information gaps, and an effective feedback mechanism to incorporate new information into implementation activities.

John Etchart
Chairman
Northwest Power Planning Council

13-05 Projects must be evaluated to see whether fish are using the instream habitat structures and to identify which structure is preferred by the target species. [Commenter notes variety of such structures in Asotin and Pataha creeks, Grande Ronde and Tucannon rivers.] Without rigorous monitoring and evaluation in each project, we may just keep building the same [possibly ineffective] designs. This issue is the fundamental premise for the Program and needs to be a requirement placed on each proponent before funding. An evaluation effort helps ensure that the program provides substantial benefits to fish and is accountable for expenditures of public funds.

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: Steps 7 and 8 of the eight-step watershed planning process describe and require that there be monitoring and evaluation of the projects and that this information be used to adapt and change the plans as needed. Each of the current watershed projects has attempted to implement this concept, depending on their respective abilities to collect and analyze new information. We feel that this principle, like the other seven steps, is best detailed at the watershed level. Each watershed process has a unique infrastructure that can develop its own adaptive management process to meet its particular needs. In addition, this EIS does not address Federal or state land agency management direction. It covers only those projects funded under this watershed program.

Regarding the Tucannon plan: WDFW, as part of the technical committee, has a responsibility to help design an effective monitoring plan for the projects. It is a requirement that all projects have a monitoring component; funds from the project can be used for this purpose.

Comments

SP-26 How will you measure the success of the program?

03-09 How is it possible to estimate the effectiveness of a project without a plan against which to evaluate how successful the project will be toward accomplishing the goal of mitigating the loss of resident and anadromous fish habitat. For instance, if a project is proposed to fence off a mile section of Spring Creek to restore streamside vegetation, how much will that contribute to the health of fish in the Grande Ronde River? What are the overall conditions of Spring Creek and what are the plans for the entire system? Will the project complement the overall plan or will it be liquidated by depleted climates above and below the project location?

Roberta Bates

13-04 Managers need to establish some quantitative measure to gauge success/failure. The Watershed Management Program should resolve this issue and require each manger to establish a goal against which some statistical measure of change (including time element and amount of change) can be compared. Measurable benefits for salmonids should be closely monitored and evaluated by BPA and others [over time]. Ecological monitoring is difficult and requires many years to detect a change, considering the amount of natural variation in most metrics assessed.

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: Overall watershed specific mitigation goals are established by the Council's Fish and Wildlife Program, the Council's subbasin plans and the Multi-Year Implementation Program. There have not been any reliable models established to directly quantify the increase in habitat productivity and resulting increases in salmon smolt production. The most reliable attempt at quantification has been in a process called "Ecosystem Diagnosis and Treatment of the Grande Ronde Model Watershed," which estimated the relative changes in habitat productivity between historical and present day conditions. Changes in habitat productivity can be estimated by quantifying changes in specific habitat parameters such as stream temperature and in-stream complexity. Any given habitat project is designed to have an effect on one or a number of habitat parameters. Often these changes are also measured in the trend of a stream system to function as a system, as opposed to a change in one particular parameter. It is the goal of all watershed projects to move towards overall goals and objectives established at the watershed level. Fish habitat productivity based on a watershed context has a goal to receive BPA funding.

Steps 5, 6, and 7 of the common eight-step process establish the principles of setting goals, implementing projects to specifically meet these goals, and monitoring their results. The specific biological goals will be left to the technical teams of the watershed plan. The ability to monitor the effects of any one given project may be difficult to measure in a system such as the Tucannon, but project implementation monitoring should show whether the project was properly installed and is functioning as expected.

Appendix A (Techniques) outlines the expected results of each technique. Over time, general trends should begin to appear that show progress towards meeting the biological specific goals. It will be much more difficult to show specifically how one project or even a suite of projects has affected smolt production. BPA will rely on the watershed technical committees to set the goals and monitor the progress of the watershed plans.

Comment

03-10 Regardless of the "success" of a myriad of projects on feeder streams, if the Grande Ronde River is polluted, overheated, devoid of shading vegetation and otherwise too degraded for a flourishing fish habitat, the money spent on those projects will be wasted . . . . the standards must require some evidence that there will be a lasting improvement in the total watershed system, not just on small tracts that have little influence beyond the site.

Roberta Bates

Response: The watershed-level plans will address these types of priorities for implementing specific projects. Watershed health or recovery will be a sum of the parts, and cannot be measured by the success of any individual project. The cumulative effects of the multitude of small projects will ultimately lead to a "properly functioning" watershed.

Comment

17-01 Regarding Alternative 6 [Balanced Alternative]: . . . The "balance" reached should represent the key factor for determining whether or not effective and measurable habitat improvement would be obtained. Significant changes in some watersheds would be necessary to provide detectable levels of improvement. Efforts to "balance" should not preclude meaningful habitat improvement. However, many aquatic improvement projects would have beneficial environmental components. (See also **Alternative 6**.)

Preston A. Sleeger
Acting Regional Environmental Coordinator
U.S. Department of the Interior

Response: We believe the balanced alternative approach is consistent with your comment. We hope to balance habitat improvement against cost and environmental factors, to achieve effective and measurable improvements in watersheds. We agree that in some cases this may involve a significant investment in money or some short-term impact to other environmental resources, and the balance will come in evaluating the long-term benefits of the project against these costs.

Comment

03-11 Millions of grant money could be spent on numerous ineffective projects and there will be little recuperation of habitat or increase in fish count. Farmers and other commodity users might not care because efforts to preserve and protect fish are a nuisance [to them] at best. Commenter feels that these interests might benefit financially from projects but fish would still disappear. Leaving the approval of projects in the hands of local water resource users could insure that [money be wasted and the fish problem worsen].

Roberta Bates

Response: BPA-funded watershed habitat projects are developed and funded on a *voluntary* basis. BPA is not a regulatory agency, and cannot force projects on anyone. All projects submitted to BPA for funding have to have a clear biological connection to increased habitat productivity for salmonids. Often there is a connection between habitat restoration projects and benefits to private landowners. There is always a requirement for cost sharing in such cases. Watershed programs on private lands will not be successful without the cooperation of the affected landowners.

Comment

03-12 Please always keep in mind the goal of fish protection and total habitat enhancement against which to evaluate the best results possible for the money spent. Will these projects truly accomplish benefits for fish? (We ask: "At the present rate of project implementation and restoration, how long, how much time will it take, for the waterways to be restored to a flourishing condition where fish and wildlife are thriving, healthy and productive.") We do not think that is possible without a comprehensive plan for the Grande Ronde River Watershed.

Roberta Bates

Response: Cost effectiveness will always be a goal of implementing watershed projects. We always want to achieve the maximum results for the dollars expended. This is why the Grande Ronde and other watersheds have tried to develop and implement their watershed plans based on achievable and measurable goals and objectives. The amount of dollars needed for full plan implementation can only be estimated, pending more detailed subwatershed and (ultimately) project-specific plans. Funding of any given project or suite of watershed projects will still be subject to the Council's annual prioritization process, where there will always be more projects than available funds.

Comment

16-07 Specific projects should be evaluated in a watershed context; one which considers watershed processes such as basin hydrology, instream flow, sediment delivery and routing, water quality, riparian area and wetland extent and condition, and fish access and passage.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your comment. This issue is addressed in FEIS section 2.1.7 for Alternative 6 under step 4, bullet #1.

Comment

16-08 To meet objectives for fish and wildlife, addressing limiting factors is essential for long-term success. An analysis of limiting factors (for each life history stage) in a watershed should be conducted and incorporated in the watershed plans before specific projects to meet these objectives are implemented. Monitoring of outcomes, coupled with adaptive management, are also essential to realize the full potential of the mitigation funds and activities.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: We agree. Steps 3 - 5 and 7 of the EIS's eight-step watershed process inherently require some form of a limiting factor analysis, plus monitoring of the results. Also, when the Council selects a watershed for funding, we use language from section 7.7B.2 as additional guidance in developing contracts with the watershed proponents. That section contains specific language that deals with identification of key limiting factors for each life history stage.

Comment

18-06 [In addition to language supporting an adaptive management approach] the DEIS should also contain language describing how such an approach would be used in a watershed context. In this instance, adaptive management would call for ongoing monitoring and evaluation of results, impacts, data gaps, etc. on both the project and watershed levels. The watershed management program should thus include a clear monitoring and evaluation component.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: Thank you for your comment. This comment is addressed under Section 2.1.1, Step 7, which explicitly states that project managers are to monitor conditions and evaluate results.

Comment

18-04 Restoration actions are appropriate only after the causes of habitat degradation have been identified and remedied, and natural, passive restoration has demonstrably begun. Only within this context will active projects accelerate the underlying trend (and then only if well-designed). Outside this context, active restoration projects are at best unlikely to be effective, and could sometimes be harmful.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: We agree. The EIS's eight-step process, when properly applied, will provide the context for restoration to occur when underlying management changes are also addressed.

Public Involvement/Decisionmaking

Comments

LB-9 More emphasis on local control shown in EIS.

LB-26 Like the idea that local government is involved - has been left out of other programs.

13-07 We support the concept of local involvement in planning and decision making encompassed in the model watershed program. We ask that BPA and committees associated with the Fish and Wildlife Program carefully evaluate all model watershed programs to ensure effective use of monies and substantial benefits to salmonids. (Also see **Funding**.)

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: The premise of the EIS and the BPA watershed planning process is that local watershed groups (1) decide what the specific issues are for each watershed and (2) come to consensus on the best ways to address these issues. BPA is proposing broad planning guidelines for this process, but would not be involved in specific decisionmaking in the individual watersheds. Therefore, there is a great deal of local control in the process.

Comments

SP-28 What are the weaknesses of "going local" with the decision making process?

LB-12 Politicization of advisory groups is flawed at the local level. Take politics out!

Response: Several commenters have pointed out the possibility of local watershed advisory groups becoming "politicized," and proposing projects that may not be the most ideal from an overall watershed or cost standpoint. This may be a weakness of the localized process. However, it is not BPA's policy to direct watershed planning in local watersheds. The proposed standardization of the planning and implementation process will help avoid this problem. Also, the Council's prioritization and scientific review processes will help ensure the integrity of the process through their recommendations as to which projects actually receive funding from BPA.

Comments

SP-5 Who has the broader picture planning responsibility and the final say over the process?

SP-3 Does Northwest Power Planning Council have any say over how the projects are planned and implemented?

Response: BPA's proposed standards and guidelines would guide the broader-picture planning by requiring watershed projects funded by BPA to be developed through the eight-step planning process outlined in the EIS. The Council would review, prioritize, and recommend projects for funding by BPA. We anticipate working closely with the Council throughout this process.

Comments

MS-2 There needs to be a continual link for the project manager to go back to the city councils and public entities.

MS-3 Formalize a plan for BPA and watershed council to involve public on a continual basis regarding each step or phase of the project planning process.

03-01 Of especial importance are: (1) [The step on involving stakeholders in Alternative 6]. This is a major consideration when spending public monies for projects involving resource essential for public welfare. There has been very little public input outside the immediate circle of the Grande Ronde Model Watershed and those connected with it. [Also see **Alternatives**.]

Roberta Bates

13-06 Each model watershed project should include public meetings and public outreach efforts at the local community level to educate participants in the watershed program and the general public about the local habitat problems and fish needs. Too often steering committees become isolated from the general public.

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

MS-1 There is no reference to informing public in the 8-step planning process.

Response: Step 2 of the planning process, "Involve Stakeholders," is the link between the project sponsor and the public and public entities. As stated in section 2.1.1, this step involves gathering input from affected agencies, landowners, 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." We will add local governments to this list.

Comment

SL-1 Cooperation is key - ranchers are willing to cooperate if they are asked - but not when they are forced.

Response: All BPA-funded watershed projects are undertaken with voluntary partners, and ranchers will be welcome.

Comment

SL-3 How were the original 6 model watersheds identified? - They (especially Idaho ones) are so far upstream in the watershed. [Also see **Miscellaneous**.]

Response: In the fall of 1992, the Council amended its Fish and Wildlife Program with several "Early Action" projects. The Model Watershed projects were among these. The states of Oregon, Idaho, and Washington were directed to choose one or more "Model" watersheds for this program. Each state, under the lead of one state agency such as the Department of Water Resources in Oregon and the Conservation Commissions in Idaho and Washington, brought several state and sometimes Federal agencies together to make the selections. Each used a prioritization process combining a variety of biological and social factors to select the watersheds. These selections were approved by the Council, and BPA began to fund their implementation in late 1992 and early 1993.

ALTERNATIVES

GENERAL

Comment

YK-5 Supports alternatives that broaden the scope of partnerships with existing agencies and coordination with existing planning activities; e.g., WDOE grant-funded planning by Okanogan County and Okanogan Conservation District. [Also see **Process**.]

Response: The eight-step planning process encourages coordination and partnerships wherever possible. Alternatives 2 - 6, the action alternatives, are based on the eight-step planning process.

Comment

KL-3 Likes the way EIS alternatives lay out what needs to be done for proposed projects.

Response: Thank you for your comment.

Comment

18-02 We agree that the recommended alternative (Alt. 6) provides the most reasonable approach [to meeting the objectives]. This alternative would be more efficient and consistent than the current process (No Action). However, we note that of the six alternatives provided, four were components of the sixth alternative. To be consistent with the intent of NEPA, an EIS should provide distinct and viable alternatives.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: Thank you for your comment. We believe that these are distinct and viable alternatives. Each alternative provides a different emphasis to approaching watershed management.

Comment

SP-2 Alternatives allow people an "out." Will apply only what they want.

Response: The five action alternatives were developed for purposes of the EIS. Only one will ultimately be selected by BPA in the Record of Decision.

ALTERNATIVE 6

Comments

LG-1 Prefers Alternative 6 - combines best of all alternatives.

LB-11 Support Alternative 6!!

LG-5 Likes Alternative 6 - especially emphasis on sustainability of projects and monitoring and evaluation.

08-01 Alternative 6 is the most agreeable.

Joseph R. Maroney
Fisheries Program Manager,
Kalispel Tribe of Indians

10-01 [Flathead Wildlife Inc] agrees with BPA that the Balanced Action alternative is preferred over the other five.

Gordon Stewart,
President
Flathead Wildlife, Inc.

12-02 The Council supports Alternative 6 and agrees with the following points in the DEIS

- that Alternative 6 provides the most balanced approach to meeting aquatic habitat objectives of watershed management projects, achievement of cost and administrative efficiency, and protection and improvement of other environmental resources when those actions would support watershed management.
- that Alternative 6 would implement such programs and projects more efficiently and with greater consistency than under the current case-by-case basis.
- that other alternatives are not adequate to fully meet the needs of the watershed program.

John Etchart
Chairman
Northwest Power Planning Council

KL-1 Strongly support Alternative 6. Oppose Alternatives 3 & 4. Alternative 3 is too much of a "techno-fix". Alternative 4 promotes low cost but temporary fixes.

LB-8 Alternative 3 - 5 are "no brainers." Alternative 6 is the only one that would make sense in this EIS. Alternative 6 should be broken down into other alternatives under it.

YK-19 Believes 6 can fit with other planning activities if it encompasses components of other alternatives. (Review to make sure!)

05-04 As in most cases, a balanced approach is best. [Alternative 6] . . . embraces most of the good elements of each alternative. Nevertheless, the need of specific projects that improves habitat exists.

Sidney N. Clouston, Jr.
Clouston Energy Research

03-01 Alternative 6 . . . will provide the best protectior for the fish and related environmental conditions. Of especial importance are: (1) [The step on involving stakeholders]. This is a major consideration when spending public monies for projects involving resource essential for public welfare. There has been very little public input outside the immediate circle of the Grande Ronde Model Watershed and those connected with it. [Also see **Public Involvement.**]

Roberta Bates

03-02 Alternative 6 . . . will provide the best protectior for the fish and related environmental conditions. Of especial importance are: (2) "Identify a desired future condition that is self-sustaining (low maintenance), including the development of a sense of responsibility and 'ownership' in the general public for watershed conditions."

Roberta Bates

03-03 Alternative 6 . . . will provide the best protectior for the fish and related environmental conditions. Of especial importance are: (3) establishing baseline information for watershed against which change can be measured.

Roberta Bates

03-04 Alternative 6 . . . will provide the best protection for the fish and related environmental conditions. Of especial importance are: (4) including as project goals "protection and improvement of a variety of fish habitats . . . " and "development of riparian habitat that can benefit water quality, fish and wildlife." Surely these requirements all should be incorporated in every project that boundarys the water. [Also see **Techniques.**]

Roberta Bates

16-06 Of the alternatives presents, [WDFW] supports Alternative 6. it appears to provide the best all-around approach for evaluating, ranking, implementing, and monitoring watershed projects. [Commenter has specific questions/comments; see other **16**-identified comments.]

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your support of Alternative 6, BPA's preferred alternative.

Comment

19-04 Decrease emphasis on use of pesticides and herbicides. To prevent pollution of soil and water, protect fish, wildlife, and humans, and to foster overall system health and resilience, we ask you to decrease the emphasis upon use of pesticides and herbicides in your preferred alternative. We suggest that Alternative 6 reflect infrequent use rather than moderate use of pesticides and herbicides (Table 2-1). (See also **Techniques.**)

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: This change has been made to the EIS.

Comment

16-23 WSDOT supports development of a management plan to provide guidance for the review of mitigation projects submitted to BPA for funding and for the development of alternatives that would promote consistency in planning and management objectives based on watershed concepts. [Such guidance] may enhance opportunities for WSDOT to coordinate transportation mitigation requirements with priorities established by BPA and the Council. WSDOT may be able to request funding or matching funds for activities that will promote BPA's goals of improving fish habitat, as well as meet our own needs for environmental mitigation and fish passage restoration. The objectives described in Alternative 6 compliment Transportation's interest in moving towards a watershed approach. (See also **Purpose and Need**.)

Patty Lynch
Washington State Department of Transportation
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your comment. The eight-step project watershed planning process includes a step that addresses involving government agencies (step 2). Partnerships such as those you are proposing are encouraged under all the alternatives of this EIS.

Comment

18-05 [Context: NMFS concern for aquatic habitat objectives and sustainability of habitat improvements] The following elements should be included in BPA's preferred alternative (Alternative 6):

- All projects funded by BPA's watershed program should address problems or opportunities that have been identified in a watershed assessment. [Otherwise] it is likely that many projects will be funded which will not address the needs and priorities identified on a watershed or ecosystem level.

- Develop a Statement of the Desired Future Condition: Consider concepts that include sustainable revenue generation (e.g., crop production, timber harvest) to reduce initial or long-term Federal costs, as long as they are consistent with aquatic habitat objectives (from Alternative 4).

- Characterize the Site Conditions and Trends: identify and map soil conditions, topography, hydrology, vegetation, and otherphysical and biological systems within the areas proposed for watershed management projects (from Alternative 3).

- Establish Project Goals: add to the statementbeginning "protection and improvement of a variety of fish habitats . . . ' to include (after "protective cover") "especially for high-quality native orother habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species" (from Alternative 5).

- Monitor Conditions and Evaluate Results: The BPA should encourage and support the more rigorous and comprehensive management objective monitoring that is included in Alternative 3.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: All projects that receive BPA funding must pass through the Council's prioritization process. This process should address the problem of funding projects outside of the watershed priorities. Also, if the eight-step process is used, this should not be a problem.

Changes have been made to reflect your suggestions, as follows: to the desired future condition of Alternative 6; to the site conditions and trends; to project goals of Alternative 6.

We feel that the monitoring requirements of Alternative 6 will be adequate to meet the needs of comprehensive watershed management and supply the information needed for step 8, adaptive management.

Comments

LG-7 Concern that "balanced" approach gives equal weight to cost, other environmental resources, and fish mitigation. Fish mitigation should have a priority. [Also see **Priorities.**]

SP-29 What are the administrative drawbacks to the implementation of Alternative 6?

LW-1 Alternative 6 sounds kind of "warm and fuzzy." The language of thought may sound politically correct, but it may prove difficult when it comes down to deciding which priorities in each alternative you want to follow.

LG-3 Page 23 [Alt. 6] - Concern about statement re: avoiding impacts to local economics related to the environment. Will this allow good projects to be eliminated? Would like to see this statement eliminated.

02-02 The watersheds' overriding concern must be restoration of the riparian areas and wetlands destroyed and damaged by the hydroelectric system. Concerns about local economics, costs, culture and the like must take a back seat. Alternative 6 will jeopardize efforts to save riparian species by giving other interests which are not in jeopardy the same level of consideration.

Mark Tipperman

04-03 Alternative 6 has too many action alternatives [action items] and by the time all are addressed, nothing or little will be done because of adverse impacts on land, economies, recreation, etc.

Mike Keppler

17-01 Regarding Alternative 6 [Balanced Alternative]: . . . The "balance" reached should represent the key factor for determining whether or not effective and measurable habitat improvement would be obtained. Significant changes in some watersheds would be necessary to provide detectable levels of improvement. Efforts to "balance" should not preclude meaningful habitat improvement. However, many aquatic improvement projects would have beneficial environmental components. (See also **Alternative 6**.)

Preston A. Sleeger
Acting Regional Environmental Coordinator
U.S. Department of the Interior

Response: Alternative 6 does give a balanced approach to cost, environmental resources, and aquatic habitat objectives. However, fish habitat improvement would be recognized as the project priority.

We cannot predict what administrative problems might arise for individual projects. The management feedback loop described in Step 8 of the watershed planning process, however, would respond to administrative or other drawbacks as they emerge during a project.

Human-related resources are regarded by the Council on Environmental Quality as environmental resources to be protected; therefore they are noted not only in Alternative 6 but also under Alternative 5 (General Environmental Resources). Please see also the response to comment 07-01 (below).

Fish habitat improvement would be recognized as the project priority under Alternative 6, but those projects that favor multiple resource benefits would receive priority for funding.

We believe the balanced alternative approach is consistent with your comment. We hope to balance habitat improvement against cost and environmental factors, to achieve effective and measurable improvements in watersheds. We agree that in some cases this may involve a significant investment in money or some short-term impact to other environmental resources, and the balance will come in evaluating the long-term benefits of the project against these costs.

All comments have been noted. Thank you.

OTHER ALTERNATIVES

Comments

LW-2 Alternative 5 is probably the one to try and achieve. Once you achieve a good base of environmental protection and restoration, the rest of the system will maintain or repair itself while still providing the amenities that you list. Restore and maintain the basic wildlife and habitat structures necessary and the rest of the system will follow. A lot can be accomplished by administrating the current laws on the books, such as the Washington Forest Practices Act and the Clean Water Act.

Response: BPA and the Northwest Power Planning Council agree that Alternatives 2 - 5 are not adequate to fully meet the needs of the watershed program. However, your comment has been noted.

Comments

04-06 [The EIS should] stop being concerned with impacts to man and commercial use and look at strictly Nature's need for free flowing unmanipulated use of the water ways and adjacent lands. [Ref: Alt. 5] [Also see **Impacts/ Socioeconomics**.]

Mike Keppler

07-01 Commenters prefer Alternative 5, General Environmental Protection. The protection of our environmental resources must take top priority. By protecting these resources, we will receive the most benefits to all interests in the long term.

John M. Skovlin
Donna Skovlin

Response: According to the Council on Environmental Quality (CEQ), under the "Regulations For Implementing the Procedural Provisions of the National Environmental Policy Act" (1992) it states that the effects and impacts of a proposed action shall include ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. CEQ also states that we are to avoid impacts on the "human environment" which is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. Therefore, the EIS will continue to be concerned with impacts on humans.

Comment

06-02 [Alternatives 4, 5, and 2] take too many other factors into account. The main emphasis of the EIS is to "repair" lost habitat due to the dams. Alternatives 4, 5, and 2 do this to a much less extent than Alternatives 3, 1, and 6.

Steve Wegner

Response: Thank you. Your comment has been noted. BPA has identified Alternative 6 as the preferred alternative.

Comment

16-15 Re: Alt. 5: Page 2/19, top: Delete word "non-target." [Seems inconsistent with previous paragraph and intent of this alternative.]

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: We agree; this change has been made.

Comment

16-16 Re: Alt. 5: Page 2/20, pr. 4, first bullet: Delete word "ecological" (may be narrowly interpreted) and replaced with "natural resources."

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: We believe that "ecological" is broader than "natural resources."

Comment

16-17 Re: Alt. 5: Page 2/21, pr. 6: What is the difference [between] the term "side benefit" as it is used here and "coincidental benefits" used in Alt. 3? The use of the term "side benefits" seems inconsistent with the intent of this alternative. The preceding pr. states that under this alternative BPA would encourage project managers to include social, economic, culturaland natural resource protection and improvement goals. Protection and improvement goals for natural resources (wildlife) seems to indicate an expectation of more than a "side benefit."

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: We agree; the change has been made.

Comments

LW-3 Alternative 4 - Be careful: you don't necessarily want the cheapest technique, but the technique or project that will give you the best value. The two are not always the same. Spend your money wisely, not frugaly. [Also see **Funding.**]

04-02 Regarding Alternatives 1 and 4: Not enough isbeing done and policies in effect such as drawdowns are more adverse than effective as far as wildlife, and aquatic habitat is concerned.

Mike Keppler

05-05 The entire watershed of the Columbia and Snake rivers are not involved. It cannot be involved with Alternative 4 .... part of the Snake River is effectively eliminated as spawning habitat, due to dams without fish ladders. It would be cost prohibitive to try to open up the areas above those dams.

Sidney N. Clouston, Jr.
Clouston Energy Research

Response: Thank you. Your comments have been noted.

Comment

06-01 Alternatives 3 and 1 are best. They best support your purpose and need statement of "mitigation for anadromous and resident fish habitat lost during development of the FCRPS."

Steve Wegner

Response: Thank you. Your comment has been noted.

Comment

04-01 *The best alternatives are* to design and construct natural-feeling and looking water flows around all man-made structures that deter fish from migrating up or down old natural water routes to spawning areas instead of spilling over and/or through dams and other obstructions. [Commenter nominates Alternative 3 as best.]

Mike Keppler

Response: The specific design of passage structures will depend on the site conditions. Use of side channels or other bypass waterways may be considered as an alternative. Other considerations such as cost, current land use, location, gradient, and so on, will also be used to determine the best choice.

Comment

04-04 The more restoration of habitat the better. It can only enhance the quality of life of all creatures including man. [Reference: Alternative 3]

Mike Keppler

Response: Thank you. Your comment has been noted.

Comments

11-06 Alternative 3 prescribes the kind of habitat-based prioritization that will produce long-lasting benefits at the most reasonable cost. Upland areas, roadless areas and mainstem riparian areas need to be protected and maintained as [while] impaired habitats, only partially supporting biological diversity, are restored. It makes no sense to destroy aquatic refugia that includes strongholds of high quality habitat. Moratoriums on land-disturbing activities in core watersheds with high quality habitat is the best way to ensure self-sustaining viable populations of sensitive and rare species. A system of core areas, buffers and connecting corridors using the principles of Conservation Biology is a sensible "best available science" approach to prioritizing BPA projects.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

LG-13 Need to prioritize so that the stream itself is given priority over upland practices (e.g., noxious weed control). This can also be looked as giving Alternative 3 the priority alternative. [Also see **Priorities.**]

LB-7 Alternative 3: Aquatic habitat is not the only thing that needs to be mitigated.

02-01 . . . no alternative except 3 will fulfill BPA's obligation to mitigate the adverse impacts of the Northwest Hydraulic [Hydroelectric] System. . . . The watersheds' overriding concern must be restoration of the riparian areas and wetlands destroyed and damaged by the hydroelectric system.

Mark Tipperman

11-07 Alternative 3, however, has its downside [see comment 11-06]. Words like "flexibility" for project managers, "adaptive management" and other weasel words cannot be left undefined. FS, BLM, state school trust lands managers abuse these words to delay action. Define them in full detail to prevent abuses of management discretion and unreasonable delay. Don't use any language that could be used to subvert the goals and objectives of Alternative 3. If that alternative is redesigned to get results it could begin to make significant improvements over the status quo. If legal loopholes are not sealed tightly, improvements to aquatic ecosystems will be hard to come by.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

Response: Please see response to comments 12-05 and 13-05, page CR/18.

Comments

14-04 With all the recent findings on the demise of the Columbia River Basin Ecosystem we feel that the DEIS's Alternative 3 should be developed and expanded in the Final EIS. This alternative with an Aquatic Habitat Objectives Emphasis is needed to curtail the many "train wrecks" occurring to the many aquatic dependent species.

Robert Ament
Resource Specialist, American Wildlands

14-05 We support an emphasis on the whole watershed rather than simply on riparian and in-stream habitat. Recent flooding and landslides throughout the region were often a result of management activities further from the watercourses than Alternative 3 contemplates. Thus Alt. 3 should be changed to aggressively restore a much larger land area under BPA approved management/mitigation activities. This also will ensure a sounder ecosystem approach.

Robert Ament
Resource Specialist, American Wildlands

Response: BPA has designated Alternative 6 as its preferred alternative, because it incorporates Alternative 3's aquatic habitat objectives, while balancing cost efficiency and protection of environmental resources. Under Alternative 6, fish habitat improvement would still be recognized as the project priority. However, we believe that the priority on aquatic objectives needs to be balanced to 1) achieve the most mitigation possible with the limited funds available, and 2) take into consideration impacts on other environmental resources that could occur as a result of watershed mitigation work. For example: large-scale ground-disturbing work could be contemplated under an "aggressive" watershed approach under Alternative 3. We feel that the costs and potential impacts on water quality and cultural resources from such a project need to be taken into account.

Comments

KL-2 Base response [Alternative 2] is what is already happening.

05-03 Alternative 2 . . . does not address "Many Best Management Practices" [because they are not required by law]. It would cause a loss of many good opportunities of productive collaborations, benefiting many groups and programs. [Commenter gives as example prescriptions for training and employment at-risk youth to do project work.]

Sidney N. Clouston, Jr.
Clouston Energy Research

Response: Thank you for your comments. Because it includes all legal requirements, Alternative 2 is the base for (and therefore part of) the other action alternatives. Alternative 6 does include BMPs. Please also see the first program-wide mitigation measure under the Economics discussion in Chapter 4 (section 4.7.4).

Comment

16-14 Ref: Alt. 2; Sec. 2.1.3, Step. 2, Involve stakeholders: Because this EIS focuses on fish and fish habitat, "consultation with affected tribes, and state fish and wildlife agencies" may be interpreted as consultation with the fisheries programs within the affected tribes etc. Change sentence to read: "Consult with affected local government, adjacent landowners, tribes, and state fish and wildlife agencies regarding fish, wildlife, habitat, or other issues."

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: This change has been made. We have also dropped "fish and wildlife" to indicate that consultation should be with all affected state agencies.

Comment

05-02 A status quo process [Alternative 1, No Action] ought not to be selected [because it has no provision for taking new information into account]. New is not always better, but it is often better when experience and other feedback sheds more light.

Sidney N. Clouston, Jr.
Clouston Energy Research

Response: Thank you for your comment. We agree.

TECHNIQUES

Comment(s)

05-06 It would be cost-effective to improve available habitat and enhance other areas. The greenbelting of water ways are dual purpose projects that are cost effective because it will benefit wildlife as well as fish. Spawning habitat and migration supporting improvements (i.e. food production) are necessary all along the streams and rivers to the ocean. A balanced approach with BMPs will bring about the best actions in project implementation and where management according to new information would not be constrained in adaptation within the preferred approach.

Sidney N. Clouston, Jr.
Clouston Energy Research

Response: We agree; a balanced approach would provide the most benefits to a variety of species and habitat areas. Alternative 6 does give a balanced approach to cost, environmental resources, and aquatic habitat objectives. The various techniques outlined in Appendix A would help to achieve improved spawning habitat and migration improvements.

Comment

19-05 Eliminate "wildlife harvest" as a management technique. If forage is lacking, it makes more sense to reduce cattle grazing and restore areas degraded by human alterations of the ecosystem than to eliminate wildlife. Compared to the effects of cattle grazing and other human-induced alterations to the ecosystem, wildlife have little impact and are a natural, integral component of the system. (See also **Impacts: Wildlife**.)

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: This technique will be retained as a possible, though infrequently used, management tool. A watershed analysis will indicate whether livestock grazing controls are needed for vegetation management. It may be possible that, even after livestock management controls, wildlife are still a part of the problem. This technique would be used only after a thorough analysis of all alternatives, but is one that we believe should be retained as one of the tools.

Comment

05-07 [Commenter cites the Council's Fish and Wildlife Program, section 13.aF "Promising New Ideas for Improving Salmon Survival"]: "This measure is intended to provide an expedited process to encourage innovative approaches to improving salmon survival." Adaptive management would set aside some small percentage for research, development, and demonstrations (RD&D). This is important when wetlands, riparian zones or greenbelt areas are created. Managers must be mindful of wild and scenic river guidelines and opportunities that BMPs can be applied to. New methods and new technology in the balanced approach should not be excluded because of its newness, but at least pilot demonstrations should be developed and applied where appropriate

Sidney N. Clouston, Jr.
Clouston Energy Research

YK-10 Need to address canal system operation through use of automated check structures, instrumentation, and data telemetry and re-regulation.

Response: Adaptive management has been built into the planning process for all action alternatives. In addition, provision for adaptive management ideas and new technology has been expanded in descriptions of Alternatives 2, 3, and 6 in Chapter 2 of the final EIS. Also, techniques that are funded and implemented under this program are not required to be modeled to the letter. As long as the intent of a technique is met, reasonable modifications and adaptations of the technique as presented in the EIS may be allowed.

Comment

03-04 Of especial importance [in Alternative 6] are: (4) including as project goals "protection and improvement of a variety of fish habitats . . . " and "development of riparian habitat that can benefit water quality, fish and wildlife." Surely these requirements all should be incorporated in every project that boundarys the water. [Also see **Alternatives**.]

Roberta Bates

Response: All alternatives presented in the draft EIS will require funded projects to address and achieve aquatic habitat objectives. As illustrated in Table 2-3, however, there is a range of performance among alternatives with regard to how (or, the degree to which) the objectives are met.

Comment

06-03 Make sure that the actions you fund do not result in added damage. We in the [US Forest Service] have been using the "ROSGEN" techniques to analyze and plan stream restoration projects. Commenter suggests various restoration techniques that can include rootwad revetments, resculpting of floodplains, vortex-rock weirs, and various other types of in-channel structures.

Steve Wegner

Response: Technique 1.3 (Appendix A) addresses this concern, and is suggested for frequent or moderately frequent use in most alternatives, including the preferred alternative.

Comment

11-02 Please fund projects that prioritize preventative measures. In many cases preventing more aquatic habitat damage is more important than mitigating for past actions. Roadless areas are currently maintaining the most successful bull trout and westslope cutthroat trout populations in the Snake and Columbia River system. Many of these areas are not protected. Preventing the destruction of roadless areas and upland headwaters regions is cost effective and provides long-term benefits to many aquatic lifeforms.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

Response: Alternatives 3, 5, and 6 (the preferred alternative) require projects to consider planning goals that both protect high-quality habitat (as types of refugia) and restore degraded habitat. Also, the acquisition of "key" riparian areas specifically for the management and protection of riparian-dependent aquatic habitats has been added as a technique under section 2 of Appendix A.

Comment

11-01 We hope that BPA will **not** support at least the following things: (1) State and/or federal hatcheries and stocking programs to "restore" bull trout and other native fishes; (2) poisoning streams to control exotic species like brook trout, pike, or other introduced non-native species; (3) overly aggressive electro-shocking to verify "viable populations" of native fishes in areas coveted for logging, grazing, mining and other pollution-causing activities; (4) projects that fragment or reduce the size and habitat quality of roadless refugia; and (5) projects that are linked to extractive, consumptive use projects (i.e., Forest Service timber sales that rely on KV funds and unkept promises to accomplish road restoration).

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

Response: This programmatic EIS supports a watershed management approach to the mitigation and restoration of fish habitat. Species-specific management techniques, including the funding of hatchery and stocking programs, are not within the scope of this EIS. The concept of habitat fragmentation at large scales applies primarily to wildlife. However, consideration of high-quality aquatic habitats and their recognition as refugia are considered in the planning process in Alternative 3 (Section 2.1.4, steps 1 and 5) and Alternative 6 (Section 2.1.7, steps 1 and 5). Also, the acquisition of "key" riparian areas specifically for the management and protection of riparian-dependent aquatic habitats has been added as a technique under section 2 of Appendix A. It is possible (within the scope of this programmatic EIS) that projects involving Forest Service partnership may be considered and approved for funding. By law, however, BPA cannot and will not fund Forest Service work that they are already required to fund by law or Congressional directive.

Comment

19-04 Decrease emphasis on use of pesticides and herbicides. To prevent pollution of soil and water, protect fish, wildlife, and humans, and to foster overall system health and resilience, we ask you to decrease the emphasis upon use of pesticides and herbicides in your preferred alternative. We suggest that Alternative 6 reflect infrequent use rather than moderate use of pesticides and herbicides (Table 2-1). (See also **Alternatives.**)

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: This change has been made to the EIS.

Comment

06-04 Because your purpose and need is to mitigate lost or damaged fish habitat your considerations need to start with in-channel work but also include floodplain concerns and upslope activities, especially on private lands.

Steve Wegner

YK-16 A wide range of techniques and publics should be funded as long as the benefits accrue directly or indirectly to fish. [Also see **Priorities**.]

Response: This EIS considers a watershed-based approach to the mitigation and restoration of lost fish habitat. This includes a variety of in-stream, riparian, and upland practices that may be useful in implementing a variety of improvement projects. The standardized planning process common to all action alternatives provides for identification of degraded conditions, improvement needs, and restoration options on either a project or watershed basis, and requires the involvement of as many stakeholders as possible, including private landowners.

Comment

17-02 The . . . techniques are appropriate although some may be more helpful in promoting effective agriculture, forestry, or urban development strategies rather than being priority fish habitat techniques. More efficient irrigation practices would not benefit fish if they only free more water to irrigate additional land.

Preston A. Sleeger
Acting Regional Environmental Coordinator
U.S. Department of the Interior

Response: In drafting this programmatic EIS, we tried to include as many techniques as possible that would in some way help improve fish habitat. The reasons for this were 1) that we wanted to encourage a true watershed approach that recognizes the connectedness of the entire watershed, from ridge-top to ridge-top, and 2) to provide as much flexibility as possible. We agree that not all of the techniques would be appropriate in all cases, and that we need to make sure that proposed techniques will actually result in improvements to fish habitat. Steps 3, 5, 6, 7, and 8 of the eight-step standardized planning process include requirements that any technique proposed for implementation be consistent with the desired future condition and project goals, that conditions be monitored and results evaluated, and that techniques be adapted based on the results obtained.

Comment

LW-8 [Appendix] Section 8.4.1: Reasoning is not correct or complete. Some chemicals with rapid decomposition ability can be used with a Streamside Management Area (SMA). That would be more environmentally responsible and effective than hand techniques that cause more site disturbance.

LW-9 Totally eliminating all chemicals within a SMA is incorrect.

Response: Technique 8.4 (Appendix A) does not always preclude chemical use in SMAs; it is recognized as a prudent practice in some situations. Fertilizer and pesticide techniques included in other sections of Appendix A (e.g., section 3, agriculture/crops) were not repeated in the forestry techniques section. Many of them still apply, however. In the final EIS, technique 8.4 includes references to other appropriate chemical management techniques, and the title of the technique has been changed to "Appropriate Chemical Usage in SMA."

Comment

BS-1 Is anything being done, or can anything be done, about the cyanide leaching that is affecting watersheds?

Response: A mining reclamation techniques section (section 11) has been added to Appendix A in the final EIS, and discussions on mining have been added to Chapter 4.

Comment

LW-10 Section 8.2: The worst action to take is to completely prohibit any harvesting within a SMA. Proper harvest planning and TIMING can improve the condition and health of the riparian vegetation. Total prohibition of harvesting is nothing more than a CYA technique. The problem you have in Washington on private timber land is poor administration of the Washington Forest Practices Act.

Response: Section 8.2 generally does not prohibit harvesting within a SMA or change forest management objectives for a particular site. Appendix A to the final EIS has been modified to clarify the use of BMPs to avoid, minimize, reduce, or rectify disturbances while operating within a SMA.

Comment

YK-4 Alternatives to tensiometers. ➔ Soil moisture monitoring

Response: Technique 4.3 of Appendix A has been modified to clarify that soil moisture monitoring is an appropriate practice for identifying irrigation needs.

Comment

LW-11 Your EIS does not mention snag management or snag recruitment techniques.

Response: Snags, or standing dead trees, are considered terrestrial ecosystem features that primarily benefit wildlife. Once they fall in and near streams, they become aquatic habitat features typically called large woody debris. Large woody debris was not addressed specifically in the draft EIS, but was referenced in or as an objective of Techniques 2.1, 8.1, 8.5, 8.7, and 8.13 in Appendix A. A new technique directly addressing large woody debris has been included in Appendix A, Section 2, in the final EIS; Table 2-1 in the EIS reflects those changes.

Comment

LW-12 Section 8.15: Properly planned and executed timber harvest can increase the snow pack, while maintaining and enhancing productivity. The problem is that the technique most effective (small 1-2 acre clearcuts that are properly oriented) is also controversial or at least not politically correct or palatable. You can also reintroduce several timber species with this technique.

Response: The drawback list for this technique has been revised in Appendix A to the final EIS to indicate that the method may be controversial, would require relatively large areas to generate significant results, and would require changes in the silviculture and rotation of the managed stands.

Comment

YK-3 Other water management technique - non-irrigation. Frost protection (Spring) Evaporative cooling (late Summer) > usage of water

Response: We would need more information to address this comment or address the technique(s) that appear to be referenced.

Comment

YK-6 Add acquisition of key habitats as a measure.

BS-2 Add land acquisition/conservation easements for key riparian and upland habitats.

Response: A technique for the acquisition for sensitive riparian habitat has been added to Appendix A, Section 2, in the final EIS.

Comment

YK-7 Good list of agricultural management techniques for irrigation.

YK-8 Agricultural management - encourage on-farm sedimentation reduction projects.

YK-9 Rehabilitate and restore agricultural return drains., e.g., Marian Drain

SP-9 Would like to see bank stabilization/vegetation projects.

Response: These techniques are included in those presented in sections 3, 4, and 1 of Appendix A in the draft and final EISs.

Comment

13-03 [Reference: Tucannon River] Project managers should focus on large pool habitat improvements [here]. A second analysis of the river indicated that water temperatures exceed the preferred range for salmonids. To decrease water temperatures, tree planting and riparian protection has been prioritized. Dormant stock plantings are hard to establish in rip rap or river cobbles, and rodents prefer them as food. Project sponsors should be encouraged to develop techniques to plant rooted-stock at construction (it's easier to excavate a hole while the equipment is on site than to try to establish dormant plants with hand tools) and to protect them from beavers. This requirement should be included in the Watershed Management Program; project managers must implement such a planting strategy in their proposal for BPA funding. Environmental impacts are much greater after construction if revegetation is not successful.

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: We agree with your revegetation experience. Technique 2.1 (Appendix A) has been modified in the final EIS to consider the use of rooted stock, planting instead of seeding during project implementation, and protection of plantings from animal damage. Your site-specific comments on the Tucannon River watershed have been passed on to BPA Watershed Management Program personnel.

Comment

18-03 Some of the in-channel modifications and techniques [described as conservation and rehabilitation actions in the DEIS] are technological fixes that are inappropriate in critical habitat, unless rehabilitating natural processes or natural features is not possible. Because they are often inappropriate and counterproductive, in-channel structures and modifications should only be used when other techniques fail. [Cites several sources for assertion; see letter.] Some concerns are:

- Grade structures completely disrupt the natural bedload movement essential for developing normal pool/riffle complexes and allowing lateral channel movement [citations];
- woody debris installation typically fails (or has unintended consequences), and is not a substitute for natural debris recruitment [citation];
- "other habitat complexity structures" - it is not clear what these would be, but artificial structures should be used only as a last resort;
- structural bank protection disrupts normal channel migration and often inhibits development of vegetative cover; and
- debris removal should be contemplated with extreme caution as it is rarely an appropriate rehabilitative action.

Elizabeth Holmes Garr
Director, Habitat Conservation Program
National Marine Fisheries Service

Response: These various techniques with which you are concerned are included because each is felt to have potential in restoring fish habitat under the Watershed Management Program. For example, fish habitat in one stream may be maintained through the construction of grade control structures or check dams in a gullying tributary channel. We agree that these techniques are not necessarily preferred over the restoration of natural fluvial processes and features, especially in areas designated as critical habitat. However, given the frequent, complex constraints of multiple management objectives by numerous landowners, the techniques can be effective tools or "technological fixes." DEIS techniques 1.1, 1.8, 1.9, and 1.10 (now 1.1, 1.9, 1.10, and 1.11 in the FEIS) have been modified to clarify their use. A new technique, Restoration of Channelized River and Stream Reaches, has been inserted as technique 1.3 in Appendix A of the final EIS.

Comment

16-10 Projects should not assume static land use. The DEIS characterizes the environment as rural and sparsely populated. This is not necessarily true for most basins in the lower watershed. Conversion of forest and agricultural lands to rural residential or suburban and urban land uses is occurring rapidly in Washington, putting inordinate pressure on fish and wildlife resources and perhaps limiting the long-term success of habitat projects. Low intensity land use has been found to be a fundamentally sound and successful method for protecting fish and wildlife habitat.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Technique 9.1 has been modified to clarify the concept that zoning for low-intensity land uses, including zoning in rural areas during community development, can be a successful method for protecting fish and wildlife habitat. Also, section 9 in Appendix A has been renamed *Community Development and Management Techniques*, to correct for the emphasis on urban areas.

Comment

16-12 Re: Management techniques (Table 2-1 and Appendix A) There should be some room for adjustment or addition to the list of techniques, regardless of alternative selected. The list could use some additional or region-specific techniques for instance. Example: Restoration of channelized reaches, dike removal or set backs should be included under In-channel modifications and habitat improvement techniques. [See letter for other suggestions.] Perhaps early in the implementation phase, this list could be customized to more closely fit our region.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Modifications to techniques through adaptive management has been built into the planning process for all action alternatives. Techniques could be added to the list under all alternatives, but would need additional NEPA review. Also, please see responses to comments 05-07, YK-10, and 18-03 in this section on techniques. Regarding stream-crossing structures: these are included in Appendix A under section 1, In-channel Modifications, rather than in section 7, Road Management Techniques. DEIS technique 1.12 (now 1.13) has been modified per your suggestion.

Comment

16-18 Table 2-1: The Council's Wildlife Program is habitat based and so are the Basin's wildlife mitigation projects. The Wildlife EIS included a table similar to this one. Since the Wildlife Program uses habitat techniques for riparian, wetland, agriculture, grazing, road management, forest management, and recreation management, are the techniques and use frequency consistent with those identified in the Wildlife EIS?

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Please see response to comment LB-32, page CR/66.

Comment

YK-14 Add off-road vehicle (ORV) controls for stream crossings and trail erosion.

Response: A technique for the management of ORVs near sensitive riparian habitat has been added to Appendix A, Section 2, in the final EIS, and is reflected in Table 2-1 in the main text.

Comment

KL-5 Concern about augmenting peak flows through forest practices (App. A, Sect. 8.16). Believes there are studies that show that this is a detriment - not a benefit. Does this mean forest harvest could be funded because it would clean gravels?

Response: DEIS Technique 8.16, Increase Peak Flows for Gravel Flushing, has been removed from the Forest Management section of Appendix A (and the remaining forest management techniques have been renumbered).

FUNDING/PRIORITIES

Comments

03-05 The concept of a future condition that is self-sustaining should be an accepted dictate in granting money for any kind of a project. Periodic checking should be an accepted provision.

Roberta Bates

LW-3 Alternative 4 - Be careful—you don't necessarily want the cheapest technique, but the technique or project that will give you the <u>best value.</u> The two are not always the same. Spend your money wisely, not frugally. [Also see **Alternatives**]

YK-20 How do you prioritize projects? If money is spread too thin, will have little to show for it.

Response: Selecting and prioritizing projects in the current watershed programs is based upon meeting a set of defined goals and objectives developed by the watershed councils. Projects to meet these goals are evaluated, first on a set of biological criteria, and second on social, economic and other criteria. This evaluation is usually carried out by a combination of reviews by a technical group and then by the watershed councils. Projects may not always be put in areas of highest need. This is a *voluntary* program, based on the willingness of the landowner to work on his or her property. Levels of funding are not always adequate to meet all of the needs. Overall prioritization within the region is based on the same criteria. Regarding Alternative 4: it is specifically designed to give the same results in the long-term, i.e. fish habitat recovery, but results may be over a longer period of time. Ultimate quality would not be sacrificed, but cost-conscious application of projects would be a dominant criterion. Please see also the responses to various comments under **Watershed Approach** (pages CR/16-23).

Comment

SP-19 Need stable program—long-term—that outlives political changes.

Response: Effective long-term watershed planning and implementing do require a long-term commitment of funding and participation. Many of the watershed processes will require long-term efforts to restore proper functioning condition to insure fish habitat productivity. BPA has a funding budget specified through fiscal year 2001. The region and BPA will explore ways to budget fish and wildlife after 2001. At the present time, however, fish, and wildlife project funding is accomplished on a yearly basis by the Council and the Columbia Basin Fish and Wildlife Authority. Watershed projects could receive long-term funding if they continue to meet their long-term goals in a cost-effective manner and have the continued support of the fish and wildlife managers and other watershed participants.

Comment

16-01 Regarding habitat modification projects, monies should be set aside for evaluation of the projects' effectiveness in meeting program objectives.

Barbara Ritchie
Environmental Review Section, Washington Department of Ecology

Response: All projects are required to have a monitoring and evaluation (M&E) plan. Project implementation funds may be used to conduct this monitoring beyond the initial implementation monitoring. In addition, the Northwest Power Planning Council is developing programmatic level M&E guidelines for the entire region. Please see also comments under **Watershed Approach.**

Comment

16-11 Re: relationship between this program and wildlife mitigation program. We understand watershed projects will be funded out of the anadromous fish budget. Will BPA be given Habitat Unit credits for wildlife benefits [under benefits expected for Alt. 6]? Relationship between this funding process and wildlife funding is unclear. Concerns have been expressed in the Wildlife Caucus that the wildlife part of BPA's budget may be expected to provide funding for wildlife benefits and that BPA would receive mitigation credit for watershed projects. [The Caucus has developed a 5-year budget, goals, etc but has not received funding.] Will funding for wildlife benefits under this program affect the Wildlife Caucus budget? How will cost sharing between the Fish Caucus and Wildlife Caucus be determined? The Northwest Power Planning Council and BPA require some kind of permanence associated with wildlife mitigation projects. Does the Watershed Program have a similar requirement? What steps have been taken by the Watershed Program to ensure consistency with the Council's Wildlife Program?

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: This EIS is not intended to answer questions of funding or crediting in relation to the wildlife portion of the Council's Fish and Wildlife Program. This comment has been forwarded to the Council.

Comments

SL-2 Is more money going to be available for watershed planning in other watersheds? When?

LB-24 What types of projects would BPA fund? How would projects be identified? [See also **Miscellaneous.**]

06-06 [Commenter is a USFS district hydrologist in Libby, MT] [The USFS] would be interested in using some of these funds to implement restoration projects.

Steve Wegner

SP-7 How much funding is available for watershed work?

SP-8 That's not much money for the amount of work that needs to be done.

SP-18 Is the watershed program funded year-to-year? Budgeted by BPA, not NPPC?

Response: The process of selecting and prioritizing projects is conducted on a yearly basis by the Council. BPA, in cooperation with other Federal agencies, has established an overall budget available for funding fish and wildlife projects. BPA negotiates funding agreements with project sponsors after receiving final recommendations from the Council. Project types are identified to meet a specific need in the Council's 1994 Fish and Wildlife Program, or from specific watershed plans such as the Model Watersheds. The overall level of funding for the watershed programs will be recommended by the Council; funding may vary up or down in any given funding cycle.

Comments

LG-7 Concern that "balanced" approach gives equal weight to cost, other environmental resources, and fish mitigation. Fish mitigation should have a priority. [Also see **Alternatives**.]

YK-16 A wide range of techniques and publics should be funded as long as the benefits accrue directly or indirectly to fish. [Also see **Techniques.**]

Response: Alternative 6 does give a balanced approach to cost, environmental resources, and aquatic habitat objectives. However, fish habitat improvement would be recognized as the project priority. Alternative 6 represents the current reality of implementing projects *voluntarily* on private lands. BPA is not a regulatory agency. Neither does BPA have an unlimited pool of funds available for watershed mitigation. In FY97, funding requests were double the available amount of funds. Cost-share opportunities are also a useful means to promote watershed health and open up new mitigation opportunities.

All watershed projects must have a direct measurable benefit to fish habitat productivity. That will always be the bottom line for watershed project funding. This EIS considers a watershed-based approach to the mitigation and restoration of lost fish habitat. This includes a variety of in-stream, riparian, and upland practices that may be useful in implementing a variety of improvement projects. The standardized planning process common to all action alternatives provides for identification of degraded conditions, improvement needs, and restoration options on either a project or watershed basis, and requires the involvement of as many stakeholders as possible, including private landowners.

Comment

17-03 The FEIS should limit the use of "hard to get" fish money. Programs for agriculture and urban problems usually are adequately financed, and BPA's Water Program should avoid linkages to those types of aid programs. The FEIS needs to emphasize aquatic habitat improvement projects.

Preston A. Sleeger
Acting Regional Environmental Coordinator
U.S. Department of the Interior

Response: The EIS is not intended to prioritize funding for watershed projects. See the responses to comments SL-2, LB-24, 06-06, SP-7, SP-8, and SP-18 for a description of the funding prioritization process; and the response to LG-7 and YK-16 regarding the emphasis on aquatic habitat improvement.

Comments

LW-16 Money should go to on-the-ground projects. Habitat work you do for anadromous fish should also benefit instream wildlife. Make sure wildlife and fish projects are coordinated - carry wildlife projects into the stream.

SP-21 Realistically, what percentage of money for the watershed program will actually get spent on the ground?

SP-22 Concern that most of money goes toward planning and very little actually gets implemented, e.g., county conservation districts.

Response: Indirect benefits to other wildlife, and to non-game or non-native fish and wildlife, are often weighed as part of the project selection. Many of the projects that deal with restoration of function of a riparian or floodplain system will have benefits beyond those for the intended target species. In some cases, both fisheries and wildlife funds are combined for land acquisition that will benefit both. The amount of funds that go directly to the ground within the current Model Watershed programs is about 75% to 80% of the total budgets. The other 20% to 25% is used to develop, design and implement the project, a necessary part of the process. In the first one-to-two years of a watershed program, a bulk of the funds may be used for planning and assessment. These funds are also a necessary part of the process to develop the road map for ensuing years.

Comment

13-01 The Washington Department of Fish and Wildlife (WDFW) supports the concept of the Model Watershed Program. . . . We encourage the BPA to adopt a set of policies and procedures that address the following deficiencies in the model watershed program to ensure that public monies are used effectively to enhance fish resources in the northwest. [Related comments appear under appropriate topic headings.]

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: Thank you for your comments. See the responses to your specific comments.

Comment

13-02 [Reference: Tucannon River Model Watershed Program] Critical habitat areas for spring chinook salmon were identified, but numerous 1996 projects were completed in areas outside of the critical habitat [perhaps because landowners outside those areas were willing to cost share on projects that provided them bank protection]. Stable banks are important; however, actions outside the critical habitat areas provide negligible benefits to critical stocks. Perhaps instream habitat improvement projects in the critical habitat areas should be funded at 100% in

1997 so that land owners do not have to cost share for such projects. Funding should be based on priorities for improving fish habitat in the critical habitat areas.

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: One of the major purposes of the Model Watershed program was to cooperate with private landowners. The decisionmaking process in the Tucannon includes a review of projects by a technical committee, of which WDFW is a member. The 1996 private-land bank stabilization projects also included specific fish habitat mitigation techniques approved by the WDFW. If the WDFW does not feel that these or future projects are being placed in critical habitat areas, this issue should be raised with the Tucannon Model watershed coordinator. Critical habitat needs on WDFW lands or on USFS lands needs to be presented to the technical and landowner steering committee. In-stream habitat projects with no clear benefit to a private landowner could be 100% funded. There would be a requirement of cost sharing if such projects were done on WDFW or USFS lands.

Comment

13-07 We support the concept of local involvement in planning and decision making encompassed in the model watershed program. We ask that BPA and committees associated with the Fish and Wildlife Program carefully evaluate all model watershed programs to ensure effective use of monies and substantial benefits to salmonids. (Also see **Public Involvement.**)

Steve Martin
WDFW Area Habitat Biologist, Southeast Washington
Washington Department of Fish and Wildlife

Response: Steps five through eight of the EIS eight-step planning process will provide the basis for the development, implementation, monitoring, and possible changing of watershed projects. Cost effectiveness as well as cost-versus-benefit to salmonids will always be a part of the consideration of project funding. Other factors will also be considered in Alternative 6, for a balanced approach, but clear salmonid benefits will always be a part of the analysis at the watershed, by the Council in its project review, and by BPA in the contracting process.

Comments

LG-13 Need to prioritize so that the stream itself is given priority over upland practices (e.g., noxious weed control). This can also be looked as giving Alternative 3 the priority alternative. [Also see **Other Alternatives**.]

LG-4 Would like to see money concentrated on priority basis so that results can be seen and not diluted through many small projects on scattered streams.

Response: Watershed goals and objectives are established based on the analysis of the need to maintain and improve fish habitat productivity. Environmental factors that will ultimately affect streams and fish must be reviewed from ridge-top to ridge-top. In some cases, effects from upland management can be as or more important than in-stream factors. This is decided on at the watershed level by local technical team analysis. The areas with highest biological need may not always receive treatment first, because the BPA-funded watershed projects are done on a voluntary basis. It is ultimately the goal to treat all high priority areas by showing the benefits of good land management to non participants.

Comments

SP-24 Cost sharing helps in getting projects funded. [See also **Coordination**.]

SP-27 How do fish and wildlife groups, e.g., Trout Unlimited, get funded for watershed enhancement projects? Can use their memberships to magnify benefits - free labor, monitoring. [See also **Coordination**.]

LB-25 How will all the different watershed groups being formed be coordinated? Some are funded by state, some by BPA, others? [See also **Coordination**.]

YK-18 Concern for "partnerships" regarding the funding for watershed projects approved by the Northwest Power Planning Council. [See also **Coordination**.]

Response: Cost sharing and forming partnership has been and will be a consistent goal of BPA-funded watershed programs. The current Model Watersheds have had a cost share rate of 25% to 50% on almost all projects. The Council has established a minimum cost-share level of 10% for all watershed projects that have a benefit to other landowners. All project proponents have to submit their project proposals annually to the Council, through BPA, for consideration in the prioritization process. Names and addresses for future project solicitations can be submitted to BPA at any time.

Comments

LG-9 Tribes would like funding to do ethnographic/oral history consultation for cultural resources. [Also see **Environmental Impacts**.]

Response: All cultural resource surveys—whether on-the-ground for project review or for ethnographic/oral history surveys—will be conducted if the watershed project could affect the character or use of historic properties. Funds for the watershed project would include funding for any legally required culture resource compliance. See also FEIS section 4.6.4 regarding Programmatic Agreements for Cultural Resources.

Comments

LB-17 Operations for one species are constraining to other species' needs (e.g., drawdowns for salmon affect resident species in reservoirs).

LB-23 What are the considerations for non-native fisheries? Will they be considered in the prioritization process?

LB-18 Consider multi-species management.

11-05 Please require multi-species approaches to mitigation projects: integrating the habitat needs of terrestrial and aquatic lifeforms into one comprehensive restoration/mitigation strategy. A suite of "umbrella" or "indicator" species can be protected, restored, and monitored to determine if BPA mitigation measures are as effective as projects. . . . [Single-species approaches are often reactive, and not beneficial; the commenter cites the "great salmon hatchery (and barging) debacle" that further disrupted ecological balance of all native fishes, including the target species.] BPA funded projects should ensure that projects designed to benefit one targeted species does not succeed at the expense of other species living in the same ecosystem.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc./Alliance for the Wild Rockies, Inc.

Response: Operations of the mainstem Federal reservoirs are not considered in this EIS, but are considered in the System Operations Review (SOR) EIS (see FEIS section 1.5.2). Within planning for a specific watershed, goals may or may not be set for non-native fish stocks. This depends on many factors and on the overall fish production goals set by the fish management agencies, i.e. the states and tribes. Non-native fish projects can be submitted to the Council in its yearly project prioritization process. They will receive consideration based on the overall selection criteria and how they relate to the Council's overall 1994 Fish and Wildlife Program. The scope of many of the watershed plans has been to focus on one or more native anadromous or resident species. Potential adverse effects on other species are considered as part of the biological criteria in project prioritization. The types of watershed projects have generally been such that they are not species-specific in their effects, but rather designed to restore some stream, riparian, floodplain or upland watershed function that will benefit all fish and wildlife using this area. These watershed projects are also often limited in scope due to limited funding for planning and implementation. This is overcome to some extent by the interagency cooperation developed by the watershed planning efforts.

ENVIRONMENTAL IMPACTS

Socioeconomics

Comments

SL-7 The Idaho governor's comment statement on the listing of steelhead on the threatened and endangered species list asked for an economic loss inventory (p. 42). We believe you should also consider economic loss mitigation in this EIS. The dams impacted the salmon, which in turn affected one of our livelihoods—fishing. When the salmon were listed, we were impacted even more. The timber industry was affected, and that, in turn, resulted in the shutdown of our mill. Therefore, your watershed mitigation efforts should address these economic losses.

SL-4 Forest (timber cutting) funds to schools have also been cut due to the listing of the salmon.

Response: Economic effects of previous and unconnected actions, such as over-fishing and timber harvest, are outside the scope of this EIS. The purpose of this EIS is to streamline the funding and implementation process for projects that mitigate for fish habitat lost during the development of the Federal Columbia River Power System. Economic impacts addressed in it are those associated with the implementation of mitigation projects under various alternative funding guidelines. As summarized in Table 2-2 of the Draft (and Final) EIS, effects of most alternatives result in minor to moderate, short-term economic benefits associated with employment during project implementation.

Comments

04-05 *Other environmental resources you should consider:* Farming, logging, camping and/or recreational use. Commercial ocean fishing! They all have benefited so they all should help restore. [Study these] not what will happen to them, but what they have done to the ecosystem. Turn the table when they start to whine about something.

Mike Keppler

Response: Various techniques that may be used to address restoration needs in agricultural, forested, and recreational areas are included in this EIS (Appendix A: Sections 3, 4, 5, 6, 8, and 10). This EIS concentrates on the mitigation and restoration of fish habitat lost during the development of the Columbia River. Commercial ocean fishing and other influences on fish populations, such as hatcheries and fish stocking efforts, are outside the scope of this EIS.

Comments

03-06 Page 2/23: Section 2.1.7, Description of Alterrative 6: The phrase ". . . and to avoid adverse impacts on land use, local economies related to the environment [emphasis added]" should be eliminated or more precisely explained. It is too broad and could be a loophole for unwanted but necessary restructuring.

Roberta Bates

Response: The referenced sentence has been modified to explain that project managers will apply watershed mitigation measures in a manner that avoids or reduces adverse impacts on local economies dependent on agriculture, forestry, and recreation. BPA has no authority to fund measures to compensate for the impacts of fish mitigation on local economies.

Comments

04-06 [The EIS should] stop being concerned with impacts to man and commercial use and look at strictly Nature's need for free flowing unmanipulated use of the water ways and adjacent lands. [Ref: Alt. 5] [Also see **Alternatives.**]

Mike Keppler

Response: NEPA, the authority which directs EIS protocol, requires that the impacts of land management activities be assessed for both the natural and human environments.

Comment

YK-1 Social/Economic Effects: Look at the USFS Eastside EIS for information to use in the Watershed EIS. Also, consider other anaysis; i.e., fish/wildlife, landscape, etc.

Response: A draft Forest Service report on population, employment, and income patterns in the interior Columbia River Basin was the basis used to characterize socio-economic conditions in this EIS (reference McGinnis and Christensen, 1994, in the Draft and Final EISs).

Comment

YK-2 Keep Social and Economic separate!

Response: NEPA does not designate any specific format for addressing social and economic issues. However, the EIS was developed in accord with commonly used standards for socioeconomic issues.

Comments

YK-17 Make sure social and economic considerations are covered.

MS-5 Sociological analysis. Even a qualitative analysis on aspects of how different local population segments view natural resource(s) management should be included.

Response: Social and economic considerations were addressed in sections 3.9 and 4.7 of the draft EIS. Based on the project goals and scope of this EIS, a sociological analysis would likely have no effect on how natural resources are managed overall.

Comment

MS-4 On-site interpretation programs are important to watershed programs. Coordinate with other agencies, i.e. Montana [Department of Natural Resources]. Work with common interpretive goals, e.g., the why vs. don't do it. USFS Lake Koocanusa a scenic byway interpretive plan is an example. [Also see **Coordination.**]

Response: On-site interpretation programs have not been a significant part of the watershed program. There are examples of information signs at projects and of education seminars and classes developed by the watershed groups. These have been directly related to projects on the ground for a hands-on basis of referral. There will continue to be small-scale interpretive efforts involved with many of the projects. Agency cooperation within a watershed, on a watershed council or technical advisory level, will generally lead to the development of this sort of cooperative effort. Any large-scale interpretive sites would likely have to be proposed as separate projects within the yearly prioritization process. Interpretive programs are included under Technique 10.4, Outdoors Education Programs, in Appendix A.

Comment

16-13 All alternatives: there should be more discussion of the positive aspects of watershed integrity on human health and safety. Example: land use zoning that restricts development on floodplains generally results in less flood impacts to structures. Watershed treatments that facilitate natural hydrology result in available water for other uses. Land use practices that reduce unnatural sedimentation may avoid the need for expensive treatment of domestic water supplies.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Your comments have been noted and used to modify FEIS sections 4.1.3, 4.2.3, and 4.5.3.

Fish and Wildlife

Comments

LB-16 How many species will have to be mitigated for. i.e., bull trout.

KL-6 Concerned about impacts to resident fish---don't restore anadromous fish at the expense of resident fish.

LB-22 Why is there no special consideration for the Blue Ribbon Resident Trout Stream on the Columbia System?

MS-6 What would be the impact of the watershed program on overall salmon/fish populations? How much of an increase could be expected?

SL-5 Bull trout will wipe out salmon and steelhead smolts if they are protected because the populations will be out of balance.

14-03 We are not only concerned with anadromous fisheries, but the often overlooked inland native fish are also in trouble. The bull trout, redband trout and westslope cutthroat trout are in decline leading towards extinction if immediate action is not taken soon. This should be brought out in the EIS so that the necessary watershed management activities are developed rapidly and more are completed sooner than later.

Robert Ament
Resource Specialist, American Wildlands

Response: The focus of the Watershed Management Program and the purpose of this EIS is the restoration of fish and aquatic *habitat*. Species-specific management techniques, including the funding of hatchery and stocking programs that might favor one or more species, are not within the scope of this EIS. Populations listed under the Endangered Species Act and other sensitive species identified by cooperating agencies would receive protection by being identified early in the planning process under all action alternatives (planning step 1 under section 2.1.3 in the draft EIS); however, no specific species/populations would be targeted at the expense of other populations.

It is possible that, in stream reaches/habitats in one watershed or across the Columbia River Basin, more habitat restoration projects could be approved that are preferred by one species over others. For example, more projects in fast-water habitats than slower riffles, slack water areas, and pools may favor steelhead or bull trout over rearing coho salmon. BPA would determine the funding and subsequent distribution of projects after a review of the planning processes behind each of the projects submitted for funding. In making its determinations, BPA would probably initially rely more heavily on the number of stakeholders involved in the planning process, the characterization of present and desired conditions and trends, and the justification behind project goals and actions plans (planning steps 2 through 6 under section 2.1.1 in the draft EIS). With time, BPA would shift its review to consider more monitoring results and adaptive management ideas (planning steps 7 and 8).

Consideration of high-quality aquatic habitats, such as blue-ribbon trout streams, and their recognition as refugia are considered in the planning process in Alternative 3 (Section 2.1.4, steps 1 and 5) and Alternative 6 (Section 2.1.7, steps 1 and 5). The overall effect of the watershed program is expected to be an increase in the quantity and quality of various fish habitats and in water quality in project areas. Whether fish populations increase proportionally to increases in habitat depend on the limiting factors affecting the population. Genetics, fishing pressure, predators, and access to related habitats are just a few factors that may limit the growth and health of fish populations more than overall habitat quantity and quality.

Comment

19-05 Eliminate "wildlife harvest" as a management technique. If forage is lacking, it makes more sense to reduce cattle grazing and restore areas degraded by human alterations of the ecosystem than to eliminate wildlife. Compared to the effects of cattle grazing and other human-induced alterations to the ecosystem, wildlife have little impact and are a natural, integral component of the system. (See also **Techniques.**)

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: This technique will be retained as a possible, though infrequently used, management tool. A watershed analysis will indicate whether livestock grazing controls are needed for vegetation management. It may be possible that, even after livestock management controls, wildlife are still a part of the problem. This technique would be used only after a thorough analysis of all alternatives, but should be retained as one of the tools.

Comment

16-19 Page 3/49: Wildlife discussion and preceding map: Wildlife mitigation projects use a well-established standard habitat classification scheme (cover typing). To ensure consistency, the same system should be used for Watershed Management projects. [Commenter notes types of habitat— more than the three types mentioned in this EIS.]

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

16-22 Appendix A: Are the effects identified consistent with those identified in the Wildlife Mitigation EIS?

Response: The Watershed Management Program EIS addresses the funding and implementation of fish habitat and watershed restoration projects at a programmatic scale. The Affected Environment chapter intends to paint only a broad picture of wildlife habitat in the Columbia River Basin landscape where these projects are to be implemented. Though the techniques in this EIS and in the Wildlife Mitigation Program EIS may share similar titles, many are not identical between EISs, so one-to-one comparisons are not possible. The use of wildlife cover typing information may be valuable on a watershed-specific basis, however.

Comment

15-03 Re: Table 2-2 [compares environmental consequences of alternatives]. It is hard to compare the alternatives because language is not parallel across the comparisons. Example: Fish/Water Resource and Quality. Alt. 1 says it may cause temporary exceedences of state water quality (sediment) standards via construction disturbance. But Alt. 6 states that short-term, construction-related impacts are mitigated to the extent practicable. Would such impacts also be mitigated to the extent practicable under Alt. 1? Similarly: Alt. 1 would benefit fish and water quality as aquatic and riparian habitat is restored/protected. Alt. 6 states that moderate improvements in fish and riparian habitat would result, including immediate and sustained benefits to fish. Would this same language apply to Alt. 1?

Candace Thomas
Chief, Environmental Analysis Branch, U.S. Army Corps of Engineers

15-04 Chapter 4 begins with a statement that the primary objective of the program is to increase and sustain anadromous and resident fish populations by increasing the amount of high quality habitat available to these populations. Sec. 4.2.2 states that Alt. 1 would benefit these resources overall because of mitigation and restoration projects, and that State water regulations would be followed under all alternatives, so no significant impacts are expected. This section does not support the statement made in table 2-2 [see comment 15-03]. Are significant beneficial impacts expected? Will high quality habitat become available to anadromous/resident fish?

(con't)

It is stated that Alt. 6 would increase fish habitat and water quality at new mitigation sites over the long term as the diversity of in-stream habitats increases and as riparian habitat establishes and expands, and that no significant long-term impacts are expected. Again, this section does not support the statement made in Table 2-2. Will high quality habitat become available to anadromous/resident fish? Are significant short-term impacts expected?

Candace Thomas
Chief, Environmental Analysis Branch, U.S. Army Corps of Engineers

Response: Alternatives 1 and 6 will both have mitigation of effects and similar expected benefits. Temporary exceedance of water quality will occur and be allowed only if the effects are short-term in nature and are permitted by the appropriate state regulatory agency. No adverse long-term effects on water quality, or reduction in benefits, will occur. The primary difference between Alternative 1 (No Action) and Alternative 6 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.

Water

Comment

LB-20 Overall river health should be considered.

Response: Action Alternatives 3, 5, and 6 incorporate watershed as well as reach-scale information in characterizing proposed project areas, which becomes the basis for developing and refining project goals (planning step 4 under sections 2.1.4, 2.1.6, and 2.1.7 , respectively).

Comment

MS-7 Impacts of development on watersheds, especially small parcel owners removing riparian vegetation along streams.

Response: This EIS addressed the impacts of restoration and mitigation projects, not the impacts of unrelated land developments. Some land use techniques, such as planning and zoning in floodplains and riparian areas (Appendix A sections 9.1 and 9.7) may affect development in urban areas. Also, please see the response to comment 06-04 under the **Techniques** section of these responses.

Comment

SP-15 How would this program affect or be affected by the lead contamination in Coeur d'Alene coming into the Spokane? Flooding makes this worse.

Response: A watershed planning process set up under this EIS would need to consider this contamination. If it were identified as a priority project, had willing landowner cooperation, and were not being funded under other programs, clean-up or restoration of the contaminated area could be considered for funding by BPA through the Council's prioritization process. A mining reclamation techniques section has been added to Appendix A in the final EIS.

Cultural Resources

Comment

LG-8 Use CRMP process to get broad-based overview of cultural resources on each smaller watershed - protect confidentiality by identifying as "sensitive sites."

Response: All action alternatives include provision for identifying the presence of historic and archeological resources during the planning process—well before any ground-disturbing activity in the area of concern for proposed projects (planning step number 1 under section 2.1.3 in the draft EIS).

Comment

16-20 Pages 3/50 and 4/119. Cultural Resources. Does Watershed Program have similar requirement to wildlife mitigation projects for cultural resource survey before ground-breaking activity? What program-wide measures would help protect cultural resources?

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Yes, requirements are similar between the two programs, including consultation with SHPOs, tribes, and others, and surveys where cultural resources may be adversely affected. See the program-wide mitigation measures for cultural and historic resources in section 4.6.4 of the draft or final EIS.

Comment

LW-13 Reference Tribal treaty and statutes, as well as Tribal rights in EIS/ 1855 Treaty and Statutes (CRITFC Tribes); Executive Orders for Executive order Tribes (P. 94, under all Alternatives; p.11. [Also see **THE EIS**.]

Response: Thank you for your comment. Tribal treaty rights have been addressed under section 4.6.1 of the FEIS. Please also see response to comment TR-3, below, page CR/63.

Comment

LG-9 Tribes would like funding to do ethnographic/oral history consultation for cultural resources. [Also see **Funding.**]

Response: Please see response to this comment under the **Funding** section, page CR/53.

The following comments (TR-1 - 4) were submitted orally by the Shoshone-Bannock, Shoshone-Paiute, and Umatilla tribes in conversation with environmental specialists at BPA.

Comment

TR-1 Section 4.6.1: The section providing legal context for cultural resources impacts makes no mention of legal rights accruing to Tribes.

Shoshone-Bannock tribal representatives
Shoshone-Paiute tribal representatives

Response: We have amended this section by adding language (already present in Chapter 3), describing the Native American tribes' legal rights to activities and resources.

Comment

TR-2 Section 4.6.1: This section seems to focus on the minimum requirements for compliance. We would like to see BPA take a more pro-active stance in anticipating cultural resource impacts and preventing damage.

Shoshone-Bannock tribal representatives
Shoshone-Paiute tribal representatives

Response: You are correct. The focus of the "Legal" section is strictly on basic requirements. We have amended this section to include additional language referencing Native American legal rights (see comment TR-1). BPA does intend to follow a more pro-active path regarding cultural resource impacts: the specific steps are documented in section 4.6.4, which focuses on the program-wide mitigation measures and on the vehicle of Programmatic Agreements with SHPOs and affected tribes to ensure consultation, documentation, development of cultural resource management plans (as appropriate), and active steps to educate the public.

Comment

TR-3 Section 3.8: This section seems very limited in detail; far more information is available and would be appropriate to document the nature and extent of cultural resources in the watersheds of the Columbia River.

Umatilla tribal representatives

Response: We recognize that there is information about the rich cultural history of the Pacific Northwest tribes than is contained in the DEIS. The summary of that history in the DEIS was not intended to minimize its importance but reflects our view of the role of a programmatic EIS such as this. In this programmatic EIS, we have established a framework for looking at activities in the model watershed program and have only briefly described the potentially affected resources, including cultural resources. If a specific project is proposed and cultural resources are present, BPA will determine, in conjunction with the interested tribe or tribes, how cultural resources in the project area might be affected by the associated activity.

In the DEIS, we have referenced cultural resources information, including Tribal statements, reports, and testimony, which may be found in Appendix D of the System Operations Review EIS. While these materials do not cover all of the area included in the model watershed program, they do provide valuable information on cultural resources near the Columbia River and how we can work with the Tribes to protect those resources. Much of the information in Appendix D was provided by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

While we appreciate the CTUIR's concerns regarding the coverage of cultural recourse in the DEIS, we believe that the coverage is sufficient for purposes of a programmatic EIS. This approach conforms with regulations of the Council on Environmental Quality, including 40 CFR 1502.2, 1508.28, and 1500.1.

Comment

TR-4 The site-specific cultural resource surveys referenced are too limited. BPA should carry out watershed-wide cultural resource surveys.

Umatilla tribal representatives

Response: BPA is committed to identifying potential cultural resources that might be damaged by individual BPA-funded watershed projects. We recognize that such resources are important and require due consideration and protection. However, it is not appropriate for BPA to carry out such surveys on a watershed-wide basis because BPA funding of watershed projects does not give BPA control of whole watersheds. Please see also the response to comment TR-3, above.

THE EIS: STRUCTURE, ANALYSIS, RESULTS

Comment

12-01 The DEIS addresses a portion of the program that is very important to the [Northwest Power Planning] Council. Improvement of fish and wildlife habitat using an ecological approach is vital to rebuilding these populations. We believe that implementation of projects by local subbasin interests is one of the most effective ways to meet this need. The draft EIS should add efficiency and effectiveness to this program by fully addressing the requirements of the National Environmental Policy Act in a simpler more coordinated method. Our review of the draft EIS found it to be well done, generally.

John Etchart
Chairman
Northwest Power Planning Council

14-01 We appreciate BPA's efforts to look at the issue of the Power System's future management actions in the Columbia River Basin as a programmatic whole rather than ad hoc piecemeal site-specific projects.

Robert Ament
Resource Specialist, American Wildlands

16-05 Maintaining and restoring watershed functions necessary to sustain fish and wildlife resources is a daunting task, and we applaud your efforts to standardize a planning and implementation approach for watershed projects funded in whole or in part by BPA.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your comments.

Comment

19-01 Based on a limited review [of the EIS], we do not foresee having environmental objections. However, we do wish to submit the enclosed comments. (See other **19-** comments.)

Richard B. Parkin,
Manager, Geographic Implementation Unit
US EPA

Response: Thank you for your comment. Please see also responses to other **19-** comments.

Comment

LW-13 Reference Tribal treaty and statutes, as well as Tribal rights in EIS/ 1855 Treaty and Statutes (CRITFC Tribes); Executive Orders for Executive order Tribes (P. 94, under all Alternatives; p.11. [Also see **Impacts/Cultural Resources.**]

Response: Thank you for your comment. BPA addresses tribal rights in section 4.6.1 of the FEIS. Also see response to comment TR-3, at page CR/63

Comment

YK-11 Need to add comprehensive storm water and sewer planning. Need an area discussing overall planning.

Response: Storm water and sewer planning are addressed in the appendix on techniques (Appendix A). See Techniques sections 9.2, 9.3, and 9.4.

Comment

YK-12 Comprehensive permitting of animal waste facilities; i.e., Clean Water Act (state rules and regulations).

Response: Animal waste management is addressed in Appendix A, section 5. See especially section 5.3 on waste management planning.

Comment

LB-32 How is the EIS related to the Wildlife Programmatic EIS (BPA's)?

Response: As with the Watershed Management Program, BPA proposes to establish standards and guidelines for planning and implementing wildlife conservation and rehabilitation projects throughout the Columbia River Basin. Many of the Wildlife Program's techniques are similar to those for watershed mitigation, although they may have different frequencies of use. Most of the environmental impact analysis and many of the potential standards and guidelines addressed in the Watershed Management Program EIS are also included in the Wildlife Mitigation Program EIS.

Comments

LB-27 Upper Columbia River Basin scientific analysis is flawed - How much is that information going to be used in the watershed planning?

LB-33 Look at scientific assessments for the Upper Columbia River Basin EIS.

SP-12 Make sure that qualified people (biologists) do threatened and endangered species surveys.

Response: This EIS will not be *directly* coordinated with the Upper Columbia River Basin EIS (UCRB EIS). Nevertheless, we have attempted to integrate this EIS with other Federal ecosystem-type EISs by proposing to adopt the watershed-based project planning process developed for the US Forest Service's Ecosystem EISs. Our eight-step planning process is adapted from *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, a report of the Interagency Ecosystem Management Task Force, June, 1995. Note also that watershed groups will be able to use the data gathered for the UCRB analysis.

Yes, qualified people will be doing environmental analysis on threatened and endangered species.

Comments

KL-4 Difficulty in making it both specific and broad. Don't want EIS written too narrowly so that valid projects aren't covered.

SP-1 EIS is too generic.

Response: The EIS is a programmatic document specifically written to cover a broad array of projects throughout the Columbia River Basin. Site-specific review of projects that rely on this EIS will also occur; see section 1.3 of the EIS.

Comment

BS-4 Is the principle of wildlife/fish working together incorporated in EIS?

Response: Wildlife is considered in this Watershed EIS as an environmental resource. However, the Wildlife Mitigation Program Final EIS, which is similar in approach to the Watershed EIS, establishes standards and guidelines for planning and implementing wildlife conservation and rehabilitation projects throughout the Columbia River Basin.

Comment

LW-4 Define SMA.

Response: The following definition has been added to the Glossary: Streamside Management Areas: Width of the managed riparian area, as defined by applicable Federal, state, and local statutes; subject to on-site review of such factors as slope steepness, class of watersources, depth to water table, soil type, type of vegetation, and intensity of management.

Comment

06-05 I think this effort [environmental analysis] would be much better if you had a base document but then had sections of more site-specific information on the river reaches such as river basins like the Kootenai, Clarkfork, Snake, etc.

Steve Wegner

Response: Thank you for your comment. More site-specific information will be included in the watershed plans themselves. More site-specific information would be developed during the eight-step planning process proposed for Alternatives 2 - 6.

Comments

08-04 Regarding Glossary definition: Resident fish can be either resident, fluvial or adfluvial. Adfluvial and fluvial fish spawn in tributaries. Once fluvial fish become adults, they migrate to larger streams or rivers and then migrate back to tributaries to spawn. Once adfluvial fish become adults, they migrate to either lakes or reservoirs and then migrate to tributaries to spawn.

Joseph R. Maroney
Fisheries Program Manager,
Kalispel Tribe of Indians

08-03 Please correct references on page 3/51 and 8/135 of the DEIS to read "Kalispel Tribe" [not "Kalispel Tribe of Idaho"].

Joseph R. Maroney
Fisheries Program Manager,
Kalispel Tribe of Indians

Response: Thank you. These changes have been made.

Comment

14-02 Commenter recommends recently released reports for BPA to consider in developing "a meaningful Watershed Management Program." ["Integrated Scientific Assessment for the Ecosystem Management" and "Status of the Interior Columbia Basin, Scientific Findings," which indicate the aquatic condition and many of the dependent species of salmonids plus other riparian/aquatic species in serious decline.]

Robert Ament
Resource Specialist, American Wildlands

14-06 "Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem" developed by The Independent Scientific Group and funded by BPA developed a conceptual foundation for recovery efforts for salmon and steelhead, and should be incorporated into the FEIS as completely as possible.

Robert Ament
Resource Specialist, American Wildlands

Response: BPA will acquire copies of "Integrated Scientific Assessment for the Ecosystem Management" and "Status of the Interior Columbia Basin, Scientific Findings," for future reference. Although "Return to the River" was funded by BPA at the Council's direction, the principles of this document have not been adopted as part of the Council's Fish and Wildlife Program. "Return to the River" may contain many laudable principles of watershed management, but BPA uses the Council's Fish and Wildlife Program of 1994 as its basis of policy development for watershed actions. The development of the six alternatives within this EIS are consistent with the 1994 Program. If and when the Council amends that Program to include new concepts of watershed management from "'Return to the River,'' we will review the potential to amend this EIS. See also the response to LB-31, 18-07, and LB-34 under **Process/Coordination.**

Comment

15-01 Environmental consequences of the alternatives are not presented in the summary.

Candace Thomas
Chief, Environmental Analysis Branch, U.S. Army Corps of Engineers

Response: CEQ regulations for implementing NEPA state what is to be included in the summary (in section 1502.12). We have included each of these items in our summary. A comparison of environmental consequences of each alternative is shown in Table 2.2.

Comment

15-02 Re: Sec. 1.7 list of issues identified during scoping. Listing is a categorization, not a detailed statement of what the issues are. For example, what specific aspects of wetlands resource management are at issue is not presented. We are interested in knowing more of the specifics of the issues regarding waters of the US, including wetlands, raised during scoping.

Candace Thomas
Chief, Environmental Analysis Branch, U.S. Army Corps of Engineers

Response: BPA, under CEQ regulations for implementing NEPA (Section 1500.4 on reducing paperwork), is required to reduce paperwork by reducing the length of EIS's. After scoping, BPA prepared a "For Your Information" document summarizing all of the comments received during the initial scoping period. We will provide you with a copy of this document.

Comment

16-02 Re: Sec. 4.2.1 (1): the description of WDOE's areas of regulatory authority related to the protection, use, and management of water resources should also include: flood control, dam safety and inspection, water right permitting, and well construction.

Barbara Ritchie
Environmental Review Section, Washington Department of Ecology

Response: Thank you for your comments. We have made the changes.

Comment

16-21 Ch. 6: references. To be consistent with other EIS documents BPA has prepared, this EIS should identify those EIS documents which use the same types of management techniques.

Cyreis Schmitt
Conservation Services Division Manager, WDFW
included in: *Barbara Ritchie*
Environmental Review Section, Washington Department of Ecology

Response: We agree. Changes have been made.

FIGURE 3-1

Comments

LW-5 Figure 3-1 Check pink cropland vs. yellow-mixed.

LW-6 Palouse is marked yellow - is totally cropland.

LW-7 Okanogan, near Canadian border is pink - rangeland, not cropland.

Response: We have corrected the maps to reflect conditions accurately.

MISCELLANEOUS

Comment

LW-14 How much available anadromous fish habitat is not being used in Washington State? (Columbia River Basin)

Response This information is not available at this time. There are some studies underway, such as in the Yakima Basin, to determine this, but they are only just beginning.

Comment

LW-15 Pristine, or near pristine, habitat not being utilized indicates that it is not a habitat problem.

Response Thank you for your comment. Through the Model Watershed studies, we have found that there are habitat problems in many areas.

Comment

YK-13 Required flood insurance.

Response BPA is not a regulatory agency, and therefore cannot require people to acquire flood insurance as part of an overall watershed plan. However, BPA will consider flood insurance if asked to do so by the watershed council.

Comment

SL-3 How were the original 6 model watersheds identified? - They (especially Idaho ones) are so far upstream in the watershed. [Also see **Process.**]

Response The original model watersheds were identified through a prioritization process involving state and Federal agencies and a variety of biological and social factors, in response to Council direction. For more information, see response to this comment under **Process.**

Comment

SP-4 Is the planning/watershed process working in the model watersheds?

Response Yes, we believe it is successful. The eight-step process outlined in this EIS was not specifically applied to the Model Watersheds, but similar steps with the same intended outcome have been successfully applied. Each is still in a different stage of implementation, but all are moving in a positive direction. The Council will publish a review of the Model Watershed program sometime in mid-1997. This review will discuss both positive and negative aspects of the model watersheds.

Comment

SP-16 How do you form a watershed group?

Response Consult with your local tribes, State Fish and Wildlife/Water Resources/ Environmental Protection agencies, conservation districts, other environmental groups, and adjacent landowners to see whether any groups exist at present. If not, determine the interest in forming such a group. Once a group is formed, or is in the process of forming, you can apply for funding for coordination, project implementation, monitoring, education or other activities through the Northwest Power Planning Council's process. There are other organizations with funding for watersheds such as Oregon's Governors Watershed Enhancement Board (GWEB), Natural Resources Conservation Service (NRCS), state conservation commissions, and For the Sake of the Salmon. The Pacific Rivers Council (Eugene, Oregon) has also published a document with potential watershed funding sources

Comment

SL-6 Is there a project list somewhere for all of the BPA Fish and Wildlife projects?

Response Yes, it is available on the Internet at www.efw.bpa.gov:8080. If you don't have access to the Internet, you can call Kasi Beale at (503) 230-5885 to get a copy.

Comment

LB-4 Would like to know process of how application for project funding is done. (i.e. NPPC ⇒ CBFWA ⇒ BPA ⇒ Applicant).

Response The Council develops a list of projects that are proposed to BPA for funding under its fish and wildlife mitigation program. This is done annually, generally beginning in January, with a solicitation of proposals for continuation of ongoing and new projects. Projects are generally selected by August or September, with new funds available by October 1 of each year. You can ask BPA or the Council to be included on proposal mailing lists. For more information on the project application and prioritization process, please contact the Council.

Comment

LB-24 What types of projects would BPA fund? How would projects be identified? [See also **Funding.**]

Response BPA funds most projects recommended by the Council. (See Comment LB-4 above for a review of the overall selection process.) Individual project selection and prioritization within a watershed is based upon the eight-step process outlined in this EIS. These projects are then reviewed for consistency with the overall fish and wildlife program objectives and the watershed objectives by BPA before funding. The bottom line for funding is increased habitat productivity for fish and wildlife species.

Comment

10-02 Here, on the upper Flathead River, we have two power dams that affect fish habitat and welfare. Nearby, on the Kootenai River, is another. In these affected environments we have three threatened or endangered species and, at least, one more that is critical. Yes, we are concerned.

Gordon Stewart,
President
Flathead Wildlife, Inc.

LB-22 Libby Creek and Fisher River need to be considered for project work.

SP-6 Latah or Hangman Creek (tributary to Spokane River) is one of the worst in Washington, maybe even Washington, Idaho and Oregon. Major sedimentation problem.

Response Thank you for your concerns and comments. We have passed these suggestions on to the appropriate watershed groups for consideration.

Comment

SL-8 We believe the old sawmill site [in Salmon] would be an ideal location for a hatchery. A hatchery at that site would help mitigate some of the economic impacts on the town of Salmon.

SL-9 Also, our relatively new high school [in Salmon] must be converted from a sawdust-fired boiler to other fuel, because the mill was our sawdust fuel supplier.

Response Thank you for your comment, but mitigation for economic impacts is outside the scope of this EIS.

Comments

LB-1 River fluctuations are important around Libby Dam. Fluctuations need to be gradual over a certain period of time.

LB-2 Can Libby Dam be eliminated from the River System without having an effect on the hydropower system? Is it possible for Libby Dam to function without being a part of the hydroelectric power on the Kootenai River?

LB-3 People would like to see the Kootenai River have more gradual fluctuations in CFS. Right now, fluctuation is far too great and fast.

LB-5 Recreation loss - The reservoirs by Libby and Hungry Horse Dams are always about 20 feet below pool during peak recreation times (summer) while reservoirs down river are only about 5 feet below pool.

LB-6 Other reservoirs should "give up" some water too, instead of it always coming out of the upper river dams, which deplete our recreation resources.

LB-10 When reservoir levels (Koocanusa) are so far down in late summer, wind blows through the canyon and causes severe dust and sediment, degrading the air quality.

LB-13 Consider varial zone in Kootenai River due to fluctuating summer low levels for anadromous fish, which cause the overall population of aquatic insects to decline, and stranding fry.

LB-14 Consider gradual flow changes, i.e. about 10% flow/day.

LB-15 Better coordination between dams, i.e., Hungry Horse and Libby need not be the only river with fluctuations.

LB-19 Consider economics of river operation on tourism and guiding for fishery.

LB-21 What is BPA's position on the variable drawdown possibility?

LB-28 Drawdowns at Libby Dam affect fishing and recreation income and economies to counties and local communities. Pool controlled by others outside the area.

LB-29 Murray Springs Hatchery was supposed to be mitigation for Libby Dam, but most fish go to lakes in other areas - Flathead and Lake Counties.

Response: Thank you for your comments. However, theyfall outside the scope of this EIS. These comments from the Libby public meeting pertain to the drawdowns at Libby and Hungry Horse dams. These drawdowns are due to the operations of the hydrosystem, and are therefore outside the scope of this EIS. These operations were covered under the System Operation Review EIS. We have passed these comments on to the BPA group that reviews the operations of these dams.

Comments

11-03 Please fund contingency plans for dam deconstruction after their useful half-life is spent. [Commenters give example of deconstruction plan for Hungry Horse Dam after aluminum plant ceases operating, with a goal of eventually restoring the entire Swan Range to its original wild state.] Deconstruction is the ultimate form of mitigation.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc/Alliance for the Wild Rockies, Inc.

11-04 [Commenters suggest specific dam locations where fish passage structures might be built.] There are many dams without fish passage that deserve to be studied and fitted with fish passage structures. Adfluvial and fluvial forms of bull trout would benefit greatly. Throughout its range, BPA should fund fish passage projects to reconnect the former migratory range of bull trout.

Steve Kelly and Mike Bader
Friends of the Wild Swan, Inc/Alliance for the Wild Rockies, Inc.

Response We suggest that the commenters direct their ideas to the Northwest Power Planning Council for potential funding; this EIS does not cover site-specific actions.

Comment

LB-30 If Kootenai Coordinator is being hired by Montana F&W, why haven't they advertised locally and/or coordinated with County government.

Response We have passed this comment on to the Montana Department of Fish and Game.

Comment

SP-17 Who is funding the work at Hanford to clean up contamination?

Response The Federal Department of Energy is funding this work.

Comment

SP-23 Is BPA doing land trusts for wildlife purposes?

Response: No, we are not.

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GLOSSARY

Anadromous fish - Fish species that spend adult life in marine or estuarine water and migrate to spawn in fresh water.

Best Management Practices (BMPs) - Techniques used to minimize impacts from various land use activities; in particular, on quality and quantity of surface water.

Economic impact - Impact on individuals, businesses, and governments from the positive or negative changes that occur in personal income, land values, taxes, operation and maintenance costs, sales, and other forms of income and expenses.

Economic mitigation - Proposed payments, employment, and other measures to mitigate for the economic impacts of development or action, including salaries, taxes, payments in lieu of taxes, fees, and so forth.

Environmental Justice - The effort under Executive Order to determine whether any impacts fall disproportionately on minority, low-income, or other disadvantaged populations.

Filter strip - A buffer adjacent to a water body or other sensitive area which will prevent or reduce the transport of contaminants or deleterious substances from one habitat to another.

Hardened fords - A stream/river crossing that has been paved or otherwise reinforced; occasionally referring to shoreline reinforcements only.

IPM Methods - (Integrated Pest Management) A systems approach that combines a wide array of crop production practices with careful monitoring of pests and their natural enemies.

Mitigation - Any activity added to a proposal to avoid, reduce, or compensate for environmental impacts.

Project - A specific action that, by itself, accomplishes a specific goal or goals.

Plan - A detailed scheme or set of activities intended to accomplish a specific objective.

Program - A broad set of procedures, activities, and projects under one management, and intended to coordinate specific activities or plans.

Resident fish - Fish that are permanent residents to streams, tributaries, lakes or reservoirs and do not migrate to marine or estuarine water.

Riparian - Adjacent to or associated with the bank of a water body.

SMA - **(Streamside management area)** Width of the managed riparian area, as defined by applicable Federal, state, and local statutes; subject to on-site review of such factors as slope steepness, class of watersources, depth to water table, soil type, type of vegetation, and intensity of management.

Talus - A sloped mass of debris at the base of a cliff.

Terracing - Contouring slopes to stepped or flat areas; these can be used to trap or slow down nutrients, sediments, or water.

Tribal cultural values - The world views and religious beliefs held by tribal members and elders about the relationship of people to animals, plants, the surrounding environment, their ancestors, and their children/heirs on or off reservation lands.

Tributary - Any stream or river flowing into a larger stream or river.

Watershed - The geographic and topographic region draining into a specific river.

Windbreaks - Trees, bushes, or structures placed to protect a resource from the harmful effects of wind.

Xeriscaping - The practice of landscaping with drought-tolerant vegetation.

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APPENDIX A

AVAILABLE MANAGEMENT TECHNIQUES

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Appendix A: Available Management Techniques

A wide range of techniques is available to create, protect, enhance, and manage aquatic habitat both directly and through those riparian and upland processes which influence aquatic habitat. This section summarizes some of the primary techniques that may be implemented under the Model Watershed Program and other efforts under the Northwest Power Planning Council to mitigate and restore lost fisheries habitat in the Columbia River Basin. USEPA (1993) is a primary source for many of these techniques. The techniques are not necessarily appropriate for all watersheds or for BPA funding; indeed, misapplication of these techniques could result in worsened habitat conditions. However, all of these techniques can be a viable part of a sound watershed management plan, and properly implemented alone and with other techniques, can result in improvements in the quantity and quality of aquatic habitat.

The techniques are classified in this EIS into 11 major categories:

- In-channel Modifications and Habitat Enhancement Techniques
- Special Vegetation Treatment Techniques, including Techniques for Wetlands and Riparian Areas
- Agricultural Management Techniques--Crops
- Agricultural Management Techniques--Irrigation
- Agricultural Management Techniques--Animal Facilities
- Agricultural Management Techniques--Grazing
- Road Management Techniques
- Forest Management Techniques
- Community Development and Management Techniques
- Recreation Management Techniques
- Mining and Mine Reclamation Techniques

For each major category, a series of specific management techniques is listed and described below. Each technique includes an overview of the technique followed by a brief listing of some general benefits and drawbacks inherent to the technique.

1 IN-CHANNEL MODIFICATIONS AND HABITAT ENHANCEMENT TECHNIQUES

1.1 MODELING THE EFFECTS OF RIVER CHANNELIZATION

1.1.1 Overview of Technique

Use available computer models to evaluate effects of proposed channelization and channel modification projects on physical channel characteristics and flow regimes. Similarly, hydraulic models can be used to aid in the design of natural channel conditions for the restoration of channelized reaches and the removal of control structures. Simulation models can integrate physical transport processes and other parameters over time to aid in decision making during planning level evaluations.

1.1.2 General Benefits

- both physically-based and empirical models force consideration of a variety of factors (input parameters)
- choice of models already developed and in use for many applications
- allows proactive management through predictive capability of modeling

1.1.3 General Drawbacks

- assumptions behind a model may not apply to a site-specific project
- can be difficult and expensive to apply to smaller projects

1.2 PROHIBIT FURTHER CHANNELIZATION

1.2.1 Overview of Technique

Discourage or prohibit any projects that result in increased channelization including channel relocation, dredging, permanent bank armoring with rip-rap or concrete, and disruption of high-flow or side channels.

1.2.2 General Benefits

- maintains naturally operating processes necessary to creation and maintenance of channel structure and fish habitat
- natural channel systems usually result in an optimum configuration unless the river regularly leaves the channel or creates new channels.
- maintains a greater quality and quantity of fish and riparian habitat

1.2.3 General Drawbacks

- some heavily impacted or less resilient systems may require very long periods of time to recover
- dynamic river beds with extreme floods or new channel development are unpredictable

1.3 RESTORATION OF CHANNELIZED RIVER AND STREAM REACHES

1.3.1 Overview of Technique

Channels which have been modified or "trained" using control structures to meet flood control and other land use concerns often experience a reduction in the quantity and/or quality of fish habitat they contain. Where land uses have changed or occur in areas where fish habitat restoration is a priority, restoring channelized reaches may be an appropriate technique.

This technique involves the careful design of natural channel conditions, the removal of control structures (dikes, levees, structural bank protection, other engineered or created structures), and the reclamation of the natural, active floodplain. Good design considers data and results from current and historic aerial photos, maps, hydraulic models, original channelization plans, local knowledge of historic conditions, and recent literature. Heavy equipment excavates the current conditions into a channel and floodplain which mimics natural conditions for gradient, width, sinuosity, and other hydraulic parameters. Bioengineering methods are employed to help stabilize the banks and floodplain as the new channel performs minor self-adjustments during bankfull (and larger) flood events.

1.3.2 General Benefits

- restores naturally operating processes necessary to the sustaining of channel structure and fish habitat
- natural channel systems usually result in an optimum configuration unless the channel frequently convulses (high sinuosity or braided channels)
- maintains a greater quality and quantity of fish and riparian habitat

1.3.3 General Drawbacks

- conflicts with existing land uses
- may require significant land area (channel and floodplain)
- dynamic river beds with extreme floods or new channel development are unpredictable

1.4 PRE-IMPLEMENTATION EVALUATION OF PROPOSED ENHANCEMENTS

1.4.1 Overview of Technique

Proposed enhancements should be based on observed and documented resource conditions and processes. Assess conditions and impacts of enhancements before project design and implementation using any of a number of biological and channel stability check lists and methodologies. Examples include: Habitat Evaluation Procedures (Cooperrider et al., 1986); Rapid Bioassessment Protocols (Plafkin et al. 1989); Rosgen Stream Classification (Rosgen 1994; Rosgen and Fittante 1986); Pfankuch Channel Stability (Pfankuch 1978).

1.4.2 General Benefits

- fosters understanding of habitat-limiting factors
- matches suitability of enhancement methods to habitat needs
- characterizes baseline or reference conditions for post-enhancement habitat evaluation

1.4.3 General Drawbacks

- none

1.5 INSTALL GRADE CONTROL STRUCTURES AND CHECK DAMS

1.5.1 Overview of Technique

Grade control structures are hydraulic barriers placed in a channel to provide stability by controlling headcuts, scour of the stream bed, and upstream degradation. Examples include gabions and concrete weirs, which generally do not impound water, and check dams, which do.

1.5.2 General Benefits

- useful in controlling stream flow velocity and direction
- stabilizes sediments behind structure
- retards gully advancement
- enhances fish habitat by creating deeper pools and holding areas

1.5.3 General Drawbacks

- gradient alterations influence many other channel parameters (width, depth, etc.) and may cause detrimental changes to channel morphology
- can affect sediment transport processes resulting in deposition of fine sediment through a reduction in channel steepness (aggradation)
- could inhibit fish passage if improperly designed

1.6 INSTALL LARGE WOODY DEBRIS STRUCTURES

1.6.1 Overview of Technique

Large woody debris (LWD) in stream channels provides hydraulic roughness which promotes grade control, complex velocity distributions, localized scour, and a variety of naturally maintained stream bed and bank forms. This hydraulic and structural diversity provides an array of habitat features including clean spawning gravel, pools, and protective cover. A reduction in instream LWD through riparian harvest and stream "cleaning" may lead to a simplification and degradation of fish habitat. LWD structures, such as wing deflectors, bank protection logs, and upstream and downstream vee log weirs, can restore lost habitat.

1.6.2 General Benefits

- provides hydraulic and structural diversity
- mimics natural processes
- slow, long-term decay of structures can provide transitional return to natural conditions

1.6.3 General Drawbacks

- LWD insertion requires anchoring either through cabling, or bed/bank disturbance and partial burial, or both
- improperly designed structures can create adverse hydraulic conditions and exacerbate flooding and local bank erosion
- flooding can displace structures to less optimal location

1.7 INSTALL OTHER HABITAT COMPLEXITY STRUCTURES

1.7.1 Overview of Technique

Boulders and concrete structures can be installed in longer reaches with higher stream flow velocities to provide localized scour pools and resting areas. They can also provide additional cover or direct streamflow to preferred channel areas (spawning gravels, side channels, etc.).

1.7.2 General Benefits

- enhances existing habitat
- encourages upstream migration through higher velocity reaches

1.7.3 General Drawbacks

- improperly designed structures can create adverse hydraulic conditions (flooding or scour)
- some bed/bank disturbance may accompany placement or construction of structures

1.8 BANK PROTECTION THROUGH VEGETATION MANAGEMENT

1.8.1 Overview of Technique

Maintenance of existing and/or natural streambank vegetation and replanting of native vegetation are non-structural techniques of protecting streambanks and the habitat features they provide. Trees and shrubs (woody plants) offer the most protection and provide cover to habitat; herbaceous plants retain surface soils on-site; aquatic (under the waterline) vegetation stabilizes banks and absorbs stream energy otherwise directed at soil particles in the bank. This method relies on the rooting strength of streamside plants to stabilize streambank soils.

1.8.2 General Benefits

- promotes natural processes (e.g., repairs itself when damaged, eventually replenishes instream woody debris)
- inexpensive
- visually attractive

1.8.3 General Drawbacks

- vegetation--natural or planted--may be inadequate for natural or man-made reasons
- seasonal limitations and time to effective cover
- high-value property may be lost to rapidly eroding streambanks

1.9 STRUCTURAL BANK PROTECTION USING BIOENGINEERING METHODS

1.9.1 Overview of Technique

Tree boles and root wads installed in the river bed at the banks are effective in stabilizing streambanks by absorbing stream energy otherwise directed to streambank soils. They are especially useful on the outside of curves such as meander bends, where stream energy is greatest. They generally require the use of heavy equipment to either push sharpened boles into the banks, or to excavate, partially bury, and backfill around them.

Other soil bioengineering methods are useful where steep, eroding slopes abut streambanks. Live brush cuttings in bundles (fascines) on narrow contour terraces are effective in reducing sheet and rill erosion and shallow sliding. Branch packing of cuttings and backfill in deeper slumps perpendicular to the slope are effective in reinforcing soil and increasing slope stability.

Bioengineering methods are usually accompanied by planting of trees and shrubs.

1.9.2 General Benefits

- natural materials, often obtainable in riparian stands
- mimics natural processes of LWD recruitment
- gradual decay provides transition to naturally stable banks
- also provides excellent bank cover and localized scour pools for fish

1.9.3 General Drawbacks

- soil disturbance during installation
- heavy equipment near or possibly in stream
- may disrupt natural channel migration

1.10 STRUCTURAL BANK PROTECTION USING ENGINEERED STRUCTURES

1.10.1 Overview of Technique

Direct protection of streambanks may be obtained by lining banks with stone riprap, geotextiles, burlap or jute fabric, and/or bulkhead walls constructed of wood or concrete. Structures provide indirect protection by redirecting stream flow and include dikes, gabions, and fences.

1.10.2 General Benefits

- helpful in highly disturbed areas, or where high quality habitatand high value property require immediate protection
- generally long design life

1.10.3 General Drawbacks

- expensive
- design, labor, and resource intensive
- may require greater maintenance than other measures
- visually unattractive
- disrupts natural channel migration
- inhibits development of vegetative cover
- may simply "transfer" problems downstream
- may result in increased channelization

1.11 REMOVE DEBRIS FUNCTIONING AS BARRIERS TO PASSAGE

1.11.1 Overview of Technique

Some accumulations of debris in channels can be large enough and configured in such a way as to preclude passage by migrating adults or access by rearing juvenile fish to preferred habitats. Examples include large jams of introduced large woody debris at channel constrictions, landslide deposits, and beaver dams.

1.11.2 General Benefits

- access to critical or high quality habitat

1.11.3 General Drawbacks

- hydraulic "side-effects" can create higher flow velocities and downstream scour
- loss of slower-water habitat and cover provided by debris to existing fish population

1.12 HARDENED FORDS

1.12.1 Overview of Technique

Where livestock, farm equipment, and other machinery must cross stream channels only occasionally, and then at low flows, culvert installation or bridge construction may not be warranted. Hardened fords (cobbles, concrete blocks, geotextiles, concrete) at established pathways may adequately protect channel structure (Saskatchewan Environment and Resource Management 1995a).

1.12.2 General Benefits

- resists bank trampling and destruction
- generally easier to install (compared to culverts)
- less resource damage if/when removed

1.12.3 General Drawbacks

- allows direct contact of equipment/livestock with stream
- no sideboards to encourage/require use

1.13 CULVERT REMOVAL/REPLACEMENT TO IMPROVE FISH PASSAGE

1.13.1 Overview of Technique

Improperly installed, designed, or damaged stream crossing structures (culverts, etc.) can cause partial or complete barriers to fish migration. Replacement with properly sized sructures, placed at gradients and depths conducive to fish passage, can restore fish migration routes. Generally, preferred structures are, in order: no structure at all (avoid crossing); bridges; bottomless arch culverts; oversized culverts; temporary culverts; and permanent culverts (whether pipes or boxes; whether metal, concrete, or plastic; etc.). Replacement with properly sized structures, placed at gradients and depths conducive to fish passage, can restore fish migration routes (Baker and Votapka, 1990).

1.13.2 General Benefits

- restored fish migration
- improved capacity

1.13.3 General Drawbacks

- temporary impacts due to instream construction

1.14 REDUCE SCOUR AND DEPOSITION AT HYDRAULIC STRUCTURES

1.14.1 Overview of Technique

Improperly installed, designed, or damaged stream crossing structures (culverts, bridges) can result in the scour of the streambed, stream banks, and road fills, and/or the deposition of both fine and coarse sediments. Deleterious effects may include the removal of spawning gravels, sedimentation of spawning gravels, the fill of downstream soils, the perching of culverts precluding fish passage, and the influences of catastrophic road failures after clogging or undermining of the structures. Removal and/or replacement of poorly functioning structures can alleviate such chronic and potentiallycatastrophic conditions (Saskatchewan Environment and Resource Management 1995a).

1.14.2 General Benefits

- reduces in-channel erosion and sedimentation
- maintains clean spawning gravels
- reduces pool filling
- maintains road and crossing structure investment

1.14.3 General Drawbacks

- temporary sediment increase due to construction

1.15 FISH PASSAGE ENHANCEMENT—FISHWAYS

1.15.1 Overview of Technique

The enhancement of fish passage over or around natural barriers and man-made structures may provide the highest and most immediate benefit to the fisheries resource (Rainey, 1991; Powers and Orsborn, 1985). Barriers may be effective for all or some fish, all or various ages of fish, and at all or some of the time (and stage of flow). Barriers and other deterrents to fish passage associated with fast water include waterfalls, velocity chutes, boulder-strewn reaches, and extremely turbulent areas. Braided reaches and streams with wide, shallow flows can be slow water barriers. Debris-laden reaches may also limit fish passage by creating frequent obstacles. Culverts, dams and diversions, other instream structures, fill areas, and ponds can be human-made obstacles to passage by physically blocking or dewatering streamcourses.

Fish passage enhancement projects include the construction of fish ladders, fish screens, side channels, baffled culverts, fish locks and fish elevators (Rainey, 1991). Simpler approaches may include blasting to remove barriers or create pools. The removal of roughness elements and obstacles such as debris, beaver dams, boulders, and sediment may be appropriate in some cases (see Technique 1.10). Existing culverts may also be replaced to correct passage problems (see Technique 1.12) (Baker and Votapka, 1990).

Design criteria for passage enhancement will include biological, engineering, and hydraulic considerations. Biological considerations should include fish capabilities such as swimming and burst speeds, endurance, and leaping abilities, quality and quantity of upstream habitat, relative frequency of other barriers upstream and downstream, upstream channel stability, and upstream management activities. Engineering considerations should include elements such as structure selection, construction materials, streambed foundation, site access, regulatory and arbitrary design constraints, and the desired life expectancy of the structure. Hydraulic considerations should include design peak flows, hydraulic parameters such as gradient, cross-section, and roughness coefficient, bedload, expected debris load and type, and water storage capacities at the upstream and downstream ends of the structure. Plans should be submitted for peer technical review prior to approval and implementation.

1.15.2 General Benefits

- facilitates increased fish migration
- provides access to unused or under utilized habitat

1.15.3 General Drawbacks

- temporary increase in construction related sediment
- increased maintenance requirements (e.g., cleaning trash racks, etc)
- potential adverse effects by changing channel hydraulics
- potential adverse effects on individuals and fish populations isolated or protected by existing barriers (e.g., introduction of anadromous fish to trophy trout waters)

1.16 SPAWNING HABITAT ENHANCEMENTS

1.16.1 Overview of Technique

Where available spawning area is limiting in areas of otherwise good potential production, enhancement projects may be implemented to increase the quantity or improve the quality of spawning habitat. Approaches to spawning habitat enhancement include placement of log or rock structures to function as gravel traps (see Technique 1.6), augmentation of riffled areas with clean river gravel, and the construction of side spawning channels accessible from natural streams (Seehorn, 1992; Bonnell, 1991). The appropriate method depends on the channel type of the enhancement reach (Rosgen and Fittante, 1986).

1.16.2 General Benefits

- increased or improved available spawning area
- potential to increase spawning success

1.16.3 General Drawbacks

- increased or improved habitat may remain under utilized
- useful design life can be shortened by peak flow events or sedimentation
- some improvements may require maintenance or repeated applications

1.17 REARING HABITAT ENHANCEMENTS

1.17.1 Overview of Technique

Where available rearing area is limiting in areas of otherwise good potential production, enhancement projects may be implemented to increase the quantity or improve the quality of rearing habitat. Approaches to rearing habitat enhancement include using log structures to create pools and glides; enhancing bank cover through riparian planting and the use of log structures; improving access of juvenile fish to tributary channels adjacent to mainstem rivers and spawning areas; reconnecting streams to remnant channels, ponds, oxbow lakes, and perhaps reclaimed borrow pits; and the creation of small side channels to provide accessible rearing habitat (Seehorn, 1992; Cedarholm and Scarlett, 1991). The appropriate method is depends on the channel type of the enhancement reach (Rosgen and Fittante, 1986).

1.17.2 General Benefits

- increased or improved available rearing area
- potential to increase rearing success

1.17.3 General Drawbacks

- increased or improved habitat may remain under-utilized
- useful design life can be shortened by peak flow events or sedimentation
- some improvements may require maintenance or repeated applications

2 SPECIAL VEGETATION TREATMENT TECHNIQUES, INCLUDING TECHNIQUES FOR WETLANDS AND RIPARIAN AREAS

2.1 MAINTAIN HEALTHY RIPARIAN PLANT COMMUNITIES

2.1.1 Overview of Technique

Maintaining a streamside vegetation zone with a complex of woody and herbaceous riparian plants has multiple benefits. Avoid clearing riparian vegetation to support other land uses. Where riparian vegetation has been cleared, seed and/or plant herbaceous and woody vegetation as appropriate to address resource needs. Consider the use of rooted stock and protection of plantings from animal damage to accelerate vegetation establishment and site stabilization. Revegetation efforts should be part of project implementation plans on projects requiring soil disturbance. Project managers should take advantage of heavy equipment used during project implementation while it is still on-site to facilitate the planting of rooted-stock.

2.1.2 General Benefits

- sustains minimum flows in summer
- shades stream to maintain cool water temperatures
- filters sediment, nutrients and other pollutants from upland sources
- retains sediment, nutrients and other pollutants deposited during overbank flow events
- preserves off-channel habitats frequently used by rearing fish (remnant channels, pocket pools)
- provides for recruitment of large woody debris
- provides detritus and primary food production
- protects upland areas where channels tend to migrate

2.1.3 General Drawbacks

- requires commitment of land

2.2 PLANT/PROTECT CONIFERS IN RIPARIAN AREAS FOR THERMAL COVER

2.2.1 Overview of Technique

In addition to the benefits listed under 2.1.2 above, conifers can provide important thermal cover to sensitive stream reaches prone to ice development. Whereas deciduous plants allow greater winter temperature extremes, conifers can moderate riparian temperatures and reduce gravel and pool freezing and the development of ice flows. Large trees can also slow and break up ice flows.

2.2.2 General Benefits

- temperature moderation
- less freezing of fish eggs in spawning gravel
- less freezing of overwintering fry and juvenile fish
- reduced bank and riparian damage from ice floes

2.2.3 General Drawbacks

- some conifers may not adapt to excessively wet sites

2.3 CREATION OF WETLANDS TO PROVIDE NEAR-CHANNEL HABITAT AND STORE WATER FOR LATER USE

2.3.1 Overview of Technique

Constructed wetlands are designed to imitate the water filtering and purification processes of natural wetlands. Upland or riparian sites are converted to wetlands by creating poorly drained soil conditions. Near streams, small shallow channels can be constructed to encourage seasonal filling and access of aquatic species between the channel and adjacent wetland. This water slowly replenishes ground water and helps to sustain low flows later in the summer. Wetland functions such as wildlife habitat may exist in created wetlands, and they may function to moderate stormflows and filter sediment. This water may also be made available for agricultural uses given other resource protections.

2.3.2 General Benefits

- ground water recharge
- improved water quality
- possible rearing habitat enhancement
- possible duel benefit to wildlife and agriculture

2.3.3 General Drawbacks

- difficulty in wetland plant establishment after ground disturbance may result in sediment source and water quality degradation
- requires commitment of land

2.4 PROVIDE FILTER STRIPS TO CATCH SEDIMENT AND OTHER POLLUTANTS

2.4.1 Overview of Technique

Vegetated strips encircle a potential pollution source, or form a barrier between it and a receiving water body. Surface water entering the vegetated filter strip loses (reduces) sediment, nutrients, and bacteria through several processes. These may include filtration, deposition, infiltration, adsorption, absorption, decomposition, and volatilization. Vegetation can consist of an array of close-growing ground cover species. Soil conditions remain in aerobic condition (as compared to the anaerobic conditions of wetlands).

Shrubs and herbaceous cover should be encouraged along the perimeter of roads, including cutslopes, fillslopes, ditches, and adjacent topography. Sediment generated from the road surface, ditches, cutslopes, and fillslopes will, with adequate cover, remain stabilized on or near the road prism. Maintenance may be required where growth is vigorous, especially in ditches, in order to retain the hydraulic capacity to transport water downslope of the road.

2.4.2 General Benefits

- reductions in sediment reaching receiving waters
- nutrients taken up by vegetation
- ancillary benefits for wildlife forage and nesting
- road prism erosion is reduced
- running surface erosion is retained roadside

2.4.3 General Drawbacks

- may require maintenance or removal of sediment
- roadside vegetation can be slow to establish on eroding cutslopes
- may require continued maintenance to meet transportation safety requirements

2.5 PLANT WINDBREAKS

2.5.1 Overview of Technique

Tightly spaced trees planted on field borders can decrease wind shear on the soil surface and reduce the mass of soil removed by the wind. Detached sediment may be stored where it can be secondarily transported by water, or it may deposited directly in surface waters.

2.5.2 General Benefits

- soil stays on site; productivity maintained
- reduced deposit of/transplant of sediment to surface waters

2.5.3 General Drawbacks

- commitment of land
- transpiration of soil water that might otherwise be used by deeper-rooted crops

2.6 NATIVE SEEDS INVENTORIES

2.6.1 Overview of Technique

Local sources of seeds for grasses and legumes ensure plants adaptedto local climate and soil chemistry. Hardiness of plants selected for restoration is assured.

Tree and shrub cuttings selected for slope stabilization should also beobtained from local sources-preferably near to the site.

2.6.2 General Benefits

- sources available for immediate needs
- seeds and plants well-suited to local or area ecosystems

2.6.3 General Drawbacks

- some seed types difficult or expensive to obtain and/or germinate

2.7 AVOID EXOTIC SPECIES

2.7.1 Overview of Technique

While nonnative plants can have positive stabilizing influence on a disturbed site, they can also overtake native species. Negative effects include increased maintenance problems, a reduction in plant diversity, increased disease and pest problems, and detrimental secondary effecs on coexisting plants and wildlife. Avoidance measures may include using only approved native seed mixes, planting only mature plants, removal of existing non-native plants through hand/mechanical means, and eradication of existing non-native plants through chemical means

2.7.2 General Benefits

- ecosystem interactions not interrupted
- benefits of native plant species maintained

2.7.3 General Drawbacks

- mechanical removal may generate temporary sediment source (see 2.10)
- chemical eradication can have toxic side-effects (see 3.29)

2.8 CONSTRUCT WETLANDS TREATMENT SYSTEMS

2.8.1 Overview of Technique

Constructed wetlands are designed to imitate the water filtering and purification processes of natural wetlands. Upland sites are usually converted to wetlands by creating poorly drained soil conditions. Vegetation is generally not as diverse as in natural wetlands. Though other wetland functions such as wildlife habitat may exist in created wetlands, they are primarily managed in this context to treat agricultural wastewater. Pollutant removal occurs through sediment trapping, assimilation by plants, bacterial decomposition, and adsorption.

2.8.2 General Benefits

- pollutant removal
- sediment retention
- wildlife habitat

2.8.3 General Drawbacks

- if underdesigned, contaminated stormflows may be discharged from the wetland (before pollutants are stabilized)
- land commitment required
- maintenance may require harvest of overgrowth or sediment removal

2.9 MECHANICAL VEGETATION REMOVAL

2.9.1 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).

2.9.2 General Benefits

- generally high efficiency
- no chemicals

2.9.3 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

2.10 BIOLOGICAL VEGETATION CONTROL

2.10.1 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.

2.10.2 General Benefits

- involves fewer risks to water quality than chemical removal methods

2.10.3 General Drawbacks

- requires intensive monitoring
- may be difficult to obtain appropriate insects or other control agents
- potential risk of disrupting natural systems

2.11 HAND PULLING

2.11.1 Overview of Technique

Hand pulling of vegetation can be effective on small areas targeted for plant control, and on areas sensitive to chemical or mechanical treatment.

2.11.2 General Benefits

- target specific species
- involves much less disturbance of soils

2.11.3 General Drawbacks

- labor intensive
- not practical for covering large areas

2.12 PRESCRIBED BURNING

2.12.1 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.

Properly planned prescribed burns (e.g., USFWS 1995) 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 stages
- 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)

2.12.2 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

2.12.3 General Drawbacks

- possible air pollution and soil erosion
- increased nutrient transplant to stream
- 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 if burns are too hot or if fire escapes to sensitive areas

2.13 REDUCE SHADE TO INCREASE PRIMARY FOOD PRODUCTION

2.13.1 Overview of Technique

Energy from the sun is a significant driver in primary food web production. Opening formerly shaded lakes and stream reaches to sunlight by vegetation removal can result in the growth of food organisms favored by some species of fish. This practice probably occurs most often coincidentally with, for example, single tree or small group selection timber harvest, or after mass wasting events in headwaters areas.

If lakes and stream reaches are marginally temperature sensitive, however, shade removal can cause temperatures to rise to stressful and lethal levels for fish and other aquatic organisms. Further, even if temperatures are adequately maintained on-site, effects can be translated to temperature sensitive reaches downstream. This practice is not recommended at large scales within a watershed.

2.13.2 General Benefits

- increased primary production
- greater food supply available to fish

2.13.3 General Drawbacks

- disrupts the natural energy flowthrough small streams
- gains in productivity are often localized and short lived
- increases in temperature extremes may more than compensate for fisheries benefits derived from primary productivity

2.14 ENHANCE LARGE WOODY DEBRIS RECRUITMENT

2.14.1 Overview of Technique

This technique is similar to Technique 1.5, which addresses installation of large woody debris structures for structural and habitat enhancement of channels. The intent of this technique is to enhance the natural recruitment of streamside trees with the potential of becoming large woody debris. Approaches include:

- planting trees in floodplains and riparian areas

- riparian harvest restrictions on individually marked trees, trees leaning toward or over streams, or other appropriate restrictions
- falling select trees to bridge across streams
- girdling select trees with strong potential as large woody debris
- selective harvest of trees to increase size of remaining trees

2.14.2 General Benefits

- ensures long-term supply of large woody debris
- mimics natural processes and allows for an element of "natural selection" in the placement of large woody debris
- can provide transitional return to natural conditions
- minor implementation impacts relative to large woody debris placement per Technique 1.5

2.14.3 General Drawbacks

- long time frames for effectiveness
- effectiveness uncertain

2.15 ACQUISITION OF SENSITIVE RIPARIAN RESOURCES

2.15.1 Overview of Technique

Sensitive riparian areas may be specifically acquired and designated as a riparian management "set-aside" using fee-title, easement and leasing approaches.

Fee-title acquisition and transfer is a three-step process: (1) directly purchasing property (Brumback and Brumback 1990), (2) placing restrictions or protective covenants on the title, and (3) reselling or transferring ownership of the property. For the Watershed Management 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.

Easement acquisition is the purchase of partial rights to a property (Brumback and Brumback 1990). Easements may be temporary, but 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.

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).

2.15.2 General Benefits

- allows restrictive yet flexible use of sensitive riparian areas
- can provide for management/protection of wildlife as well as aquatic species/habitat

2.15.3 General Drawbacks

- may diminish local property tax base on commodity revenue generation

Note: Please also see Section 3. 29 for Herbicide/Pesticide Application that would apply to Special Vegetation Treatment Techniques as well.

3 AGRICULTURAL MANAGEMENT TECHNIQUES--CROPS AND GENERAL

3.1 PLANT/PROTECT VEGETATIVE/CONSERVATION COVER

3.1.1 Overview of Technique

On lands withdrawn from crop production, establish and maintain perennial vegetative cover.

3.1.2 General Benefits

- maximizes infiltration
- minimizes erosion caused by raindrop splash, sheetwash, and overland flow
- sustains minimum flows by encouraging groundwater recharge
- maintenance of soil productivity

3.1.3 General Drawbacks

- maintenance costs of nonproductive land

3.2 CONSERVATION CROPPING SEQUENCE

3.2.1 Overview of Technique

Crop rotations which alternate a variety of crop types provide adequate organic residue and improve soil tilth. Erosion is decreased due to surface roughness and deeper infiltration because of increased soil organic matter.

3.2.2 General Benefits

- sediment and associated nutrients remain on-site
- the need for pesticides may decline with use
- the need for nitrogen fertilizer may be reduced

3.2.3 General Drawbacks

- deep percolation may carry nutrients and other pollutants to ground water

3.3 CONSERVATION TILLAGE

3.3.1 Overview of Technique

Where water erosion is a primary concern, maintain at least 30% of the soil surface covered by residue after planting. Where wind erosion is the primary concern, maintain 1,000 pounds or more of flat, small-grain residue on the surface during critical erosion periods. Surface residues reduce the impact of raindrop energy and increase surface soil roughness, simultaneously increasing infiltration and reducing the amount of water available to runoff.

3.3.2 General Benefits

- additional organic matter at the surface reduces erosion
- reduced tillage systems (as compared to no-till methods) break down preferred flow pathways (macropores) which develop under no-till methods; the result is reduced runoff with reduced pollutants in the runoff

3.3.3 General Drawbacks

- by reducing incorporation of organic matter into the soil, applied pesticides and fertilizers in/on vegetative material may be subject to removal by surface runoff
- increased infiltration may transport nutrients and other soluble substances to groundwater

3.4 CONTOUR FARMING

3.4.1 Overview of Technique

Following the established grades of hillslopes and terraces, prepare, plant, and cultivate farm land on the contour.

3.4.2 General Benefits

- reduces erosion
- decrease in sediment and related pollutants reaching surface waters

3.4.3 General Drawbacks

- increased infiltration may transport nutrients and other soluble substances to groundwater

3.5 CONTOUR ORCHARDS AND FRUIT CROPS

3.5.1 Overview of Technique

All cultural operations should be done on the contour. This may include creation of inward sloping terraces for planting.

3.5.2 General Benefits

- erosion, sediment yield, and pesticide concentrations in runoff are decreased

3.5.3 General Drawbacks

- increased pesticide and fertilizer applications which accompany orchard management may reach ground water with increased infiltration

3.6 COVER AND GREEN MANURE CROP

3.6.1 Overview of Technique

Plant grasses, legumes, or small grains (close-grown plants) for seasonal protection and soil improvement. These are usually grown as an alternate crop for less than one year. Erosion resulting from conventional tillage practices can decrease due to the extended period vegetation covers the soil.

3.6.2 General Benefits

- plants take up available nitrogen and prevent its leaching to ground water and surface waters
- organic nutrients are added to the soil and may reduce the volume of fertilizer needed for application
- reduced erosion and soil loss

3.6.3 General Drawbacks

- extra work/cost in planting

3.7 CRITICAL AREA PLANTING

3.7.1 Overview of Technique

Plant trees, shrubs, vines, grasses, or legumes on severe, actively eroding areas, and areas with high erosion potential.

3.7.2 General Benefits

- reduce erosion and sediment yield
- nutrient loss to surface and ground waters is reduced

3.7.3 General Drawbacks

- no immediate effects - erosion and chemical loss from site prior to plant establishment

3.8 DELAYED SEED BED PREPARATION

3.8.1 Overview of Technique

Maintain crop residue and volunteer vegetation on soil surface until about 3 weeks before planting. The period that bare seed beds occur during critical erosion periods is therefore reduced.

3.8.2 General Benefits

- raindrop splash and surface runoff during the spring erosion period are reduced
- soil moisture is conserved for crop use and sustaining stream flow

3.8.3 General Drawbacks

- risk of additional weather delays
- risk of encroachment of weeds or undesirable species

3.9 GRASSES AND LEGUMES IN ROTATION

3.9.1 Overview of Technique

Establish a mixture of grasses and/or legumes and maintain the stand for several years as part of a conservation cropping system.

3.9.2 General Benefits

- reduced erosion and sediment yield
- crops supply organic nitrogen reducing need for nitrogen fertilizer
- grasses and legumes take up phosphorus reducing phosphorus loading to lakes and streams
- decreased pesticide applications
- opportunities for animal waste management because manures are applied for longer periods on/with established vegetation

3.9.3 General Drawbacks

- commitment of land

3.10 CONTOUR STRIPCROPPING

3.10.1 Overview of Technique

Arrange crops so that close growing crops or grasses alternate with bands of clean-tilled crops which follow the contour

3.10.2 General Benefits

- reduced erosion and sediment yield
- increased infiltration

3.10.3 General Drawbacks

- increased infiltration during wet periods may result in the leaching of soluble substances to ground water

3.11 FIELD STRIPCROPPING

3.11.1 Overview of Technique

This method is similar to contour stripcropping (3.10) but the bands cross the general slope and not necessarily the contour.

3.11.2 General Benefits

- reduced erosion and sediment yield
- increased infiltration

3.11 3 General Drawbacks

- increased infiltration during wet periods may result in the leaching of soluble substances to ground water

3.12 TERRACING

3.12.1 Overview of Technique

Terraces are earthen embankments constructed across a slope. A slope with several terraces takes on a stair-step or inclining ridge and swale appearance. Terraces reduce erosion by shortening the length of slope down which water and sediment can flow once concentrated in a rill. A terrace with negative or no slope (relative to the original unterraced hillslope) intercepts and slows water causing the deposition of any sediment it might be carrying. With appropriate soil maintenance, the water can infiltrate and be stored in the soil.

3.12.2 General Benefits

- the erosive energy of the overland flow of water is abated
- sediment and associated nutrients remain on the slope and available to crops

3.12.3 General Drawbacks

- increased infiltration during wet periods may result in the leaching of soluble substances to ground water

3.13 DIVERSION DITCH

3.13.1 Overview of Technique

Similar to terraces, diversions are channels constructed across a slope with a supporting berm on the downslope side. Placed intermittently on a slope, they reduce the slope length on which sheet and rill erosion might otherwise develop into gullies. The slope distance between diversion ditches is a function of the steepness of the slope and the cover crop.

3.13.2 General Benefits

- the erosive energy of the overland flow of water is abated
- sediment and associated nutrients remain on the slope
- easier to construct than terraces

3.13.3 General Drawbacks

- oversteep diversion ditches can accelerate rill and gully erosion by concentrating runoff

3.14 FIELD BORDER

3.14.1 Overview of Technique

A field border is strip of perennial vegetation along the edge of a field consisting of shrub and or herbaceous cover. It may have been converted from trees or cropland. They are the end points for contour features (terraces, diversions, strip crops) and should contain any lateral water movement from a contour feature. They also prevent the parallel-with-slope furrows that might be created when a contour feature is turned to return back across the slope.

3.14.2 General Benefits

- concentrated flow in furrows is reduced
- water and sediment flow across slope, if any, is filtered

3.14.3 General Drawbacks

- reduced tillable area

3.15 FILTER STRIP

3.15.1 Overview of Technique

Vegetated filter strips encircle a potential pollution source, or form a barrier between it and a receiving water body. Surface water entering the vegetated filter strip loses (reduces) sediment, nutrients, and bacteria through several processes. These may include filtration, deposition, infiltration, adsorption, absorption, decomposition, and volatilization. Vegetation can consist of an array of close-growing ground cover species. Soil conditions remain in aerobic condition (as compared to the anaerobic conditions of wetlands). This technique is the same as 2.4.

3.15.2 General Benefits

- reductions in sediment reaching receiving waters
- nutrients taken up by vegetation

3.15.3 General Drawbacks

- may require mowing or removal of sediment
- may be less effective with suspended sediments and soluble materials
- when flooded they may release a large load of pollutants into surface waters

3.16 GRASSED WATERWAY

3.16.1 Overview of Technique

A grassed waterway is natural or constructed waterway, often with a swale cross-section to assure bank stability and retain vegetation, with vegetation suitable for conveyance of runoff. The filtering of coarser materials is seen as a secondary benefit.

3.16.2 General Benefits

- stable drainage system
- nutrient uptake
- waterfowl habitat
- reduces erosion in concentrated flow areas
- reduced sediment yield to receiving waters

3.16.3 General Drawbacks

- chemical treatments applied to fields are easily transported to streams and/or ground water
- may deliver dissolved and suspended substances which might otherwise be incorporated on an unchanneled slope to streams

3.17 SEDIMENT BASINS

3.17.1 Overview of Technique

These basins are constructed to decrease flow velocity of runoff and allow sedimentation. Detention time of water is relatively short before it is passed on downstream.

3.17.2 General Benefits

- removal of sediments and debris, especially coarser sediments

3.17.3 General Drawbacks

- may not dampen significant storm event
- not as effective in sediment removal at higher flows
- opportunity for leaching soluble materials to ground water
- regular maintenance required

3.18 SEDIMENT AND WATER CONTROL BASINS

3.18.1 Overview of Technique

These larger basins are formed from earthen embankments and are designed to detain stormflow volumes and encourage the settlement of sediment. Overflow and drain pipes are placed to allow the discharge of the cleanest water. Storage and gradual release of stormflow is an advantage over simple sediment basins.

3.18.2 General Benefits

- removal of sediments and debris
- storage and slow release of stormflow
- wildlife habitat

3.18.3 General Drawbacks

- opportunity for leaching soluble materials to ground water
- regular maintenance required; basin cleaning may generate some sediment laden runoff
- discharge temperatures may increase due to longer exposure of water to warming during its impoundment

3.19 ZONING/LAND USE PLANNING

3.19.1 Overview of Technique

Zoning ordinances based on land use plans can alleviate future demands for withdrawal (fresh) and discharge (exhaust) of agricultural water from surface and ground water sources.

3.19.2 General Benefits

- adequate water supplies
- estimated pollutant loadings within capacity of system to recover

3.19.3 General Drawbacks

- limits use of land

3.20 PLANT WINDBREAKS

3.20.1 Overview of Technique

Tightly spaced trees planted on field borders can decrease wind shear on the soil surface and reduce the mass of soil removed by the wind. Detached sediment may be stored where it can be secondarily transported by water, or it may deposited directly in surface waters. This technique is the same as 2.5.

3.20.2 General Benefits

- soil stays on site; productivity maintained

3.20.3 General Drawbacks

- transpiration of soil water that may be used by deeper-rooted crops

3.21 AVOID IMPOUNDING NEEDED FLUSHING FLOW

3.21.1 Overview of Technique

Impounded water obtained from streams for later agricultural uses incurs an opportunity cost of cleaning spawning gravels. On a watershed scale, impounded water that would have been left in the stream could have increased the "winnowing" capacity of higher streamflows to flush fine sediments from around larger gravels and cobbles containing fertilized eggs and alevins. This often occurs in conjunction with spring melt events after a period of winter low flows.

3.21.2 General Benefits

- water remains available to flush gravels
- increased spawning success is assumed

3.21.3 General Drawbacks

- seasonal uses of impounded water must be obtained from other sources
- excessive peak flows may be detrimental--flushing out eggs as well as fine sediment
- flood recurrences may increase with loss of storage

3.22 RELEASE IMPOUNDED WATER TO FLUSH GRAVELS

3.22.1 Overview of Technique

Release of water that is already impounded (as compared to not impounding streamflow in 3.21) can be made available to flush spawning gravels for the same opportunity costs. The release of impounded water, given high seasonal streamflow, may result in higher peak flows and greater scour than without the release of impounded water. Most scour effects are likely to be localized near the outlet of farm impoundments, however.

3.22.2 General Benefits

- water remains available to flush gravels
- increased spawning success is assumed

3.22.3 General Drawbacks

- seasonal uses of impounded water must be obtained from other sources
- excessive peak flows may be detrimental--flushing out eggs as well as fine sediment

3.23 CHEMICAL MANAGEMENT PLANS

3.23.1 Overview of Technique

Management plans for nutrients, fertilizers, pesticides, and other chemicals should be developed, implemented, monitored, and updated periodically for all agricultural operations and some intensive forestry operations. Such a plan should specify, at a minimum, nutrient loading rates needed to achieve realistic crop yields, the recommended fertilizer, the best time for application, and crop production technology useful for increasing the nutrient use efficiency of managed vegetation.

Spill contingency planning (Section 7.15) should coincide with the development of these plans.

3.23.2 General Benefits

- information/data needs are identified

3.23.3 General Drawbacks

- none

3.24 FERTILIZER APPLICATION: RATES AND TIMING

3.24.1 Overview of Technique

Use of fertilizers should be regularly preceded by soil testing for Ph, phosphorus, potassium, and nitrogen; plant tissue testing; manure, sludge, compost, and effluent testing; consideration of site factors; and consideration of timing, formulation and application methods. Also consider:

- split applications,
- banding of nutrients,
- use of nitrification inhibitors and slow-release fertilizers, and
- incorporation or injection of fertilizers, manures, etc.

3.24.2 General Benefits

- maximize plant utilization of nutrients
- minimize nutrient loss to surface water and ground water

3.24.3 General Drawbacks

- analytical costs

3.25 FERTILIZER RECOVERY AND STABILIZATION

3.25.1 Overview of Technique

Consider the use of small grain cover crops to scavenge remaining nutrients that remain in the soil after harvest of the principal crop. Establish cover crops on highly permeable land receiving animal manure and sludge.

3.25.2 General Benefits

- reduced leaching of soluble nutrients to ground water
- "year-round" vegetative cover reduces erosion and sediment yield

3.25.3 General Drawbacks

- none

3.26 EVALUATE FIELD LIMITATIONS

3.26.1 Overview of Technique

An evaluation of areas at high-risk to chemical applications should occur before application. These high-risk areas include:

- karst topography,
- land adjacent to surface water,
- soils with high leaching ability,
- irrigated land in humid areas,
- highly erodible soils,
- lands prone to surface loss of nutrients, and
- shallow aquifers.

3.26.2 General Benefits

- maximize plant utilization of nutrients
- minimize nutrient loss to surface water and ground water

3.26.3 General Drawbacks

- none

3.27 EQUIPMENT CALIBRATION AND USE

3.27.1 Overview of Technique

Assure that equipment used for spray or other application of chemicals are properly maintained. This includes not improperly mixing chemical compounds, calibrating equipment, and training workers in their application. Backflow prevention devices should be used (see Section 4.16). Environmental conditions for application should be met, including the avoidance of windy and excessively wet weather.

3.27.2 General Benefits

- correct concentrations of fertilizers and pesticides applied
- risk of ground water and surface water contamination is reduced

3.27.3 General Drawbacks

- none

3.28 ALTERNATIVE PEST MANAGEMENT STRATEGIES

3.28.1 Overview of Technique

Pesticides are only one means of controlling unwanted vegetation or bothersome, detrimental pests. Many alternatives exist to minimize the amount of pesticides applied to a land parcel. A common approach is to combine one to several alternatives into one integrated pest management (IPM) strategy. Some of the many alternatives listed in EPA (1993) are:

- Use of biological controls:
  - introduction and fostering of natural enemies
  - preservation of predator habitats
  - release of sterilized male insects
- Use of pheromones:
  - for monitoring populations
  - for mass trapping
  - for disrupting mating and other behaviors of pests
  - to attract predators/parasites
- Use of crop rotations to reduce pest problems
- Use of resistant crop strains
- Use of more efficient application methods
  - spot spraying
  - banding

3.28.2 General Benefits

- pesticide application is reduced or avoided
- risk of ground water and surface water contamination is reduced

- farmers can receive higher price for organically grown crops

3.28.3 General Drawbacks

- pesticides may be the most effective and timely method of preserving existing vegetation and its soil stabilizing capability
- some IPM strategies may involve mechanical tillage resulting in increased erosion and sediment yield
- if methods are ineffective at stopping pests, inadequate vegetative cover and increased soil loss could occur

3.29 HERBICIDE/PESTICIDE APPLICATION

3.29.1 Overview of Technique

Herbicides are chemicals applied to kill plants; pesticides control unwanted vegetation or bothersome, detrimental pests. They are typically applied in liquid form via: (1) aircraft; (2) wand or broom sprayers mounted on 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.

Typical uses of herbicides and pesticides are site preparation for planting, control of undesirable plants that are competing with desirable plants, noxious weed control, pest control, right-of-way maintenance, and recreation site and facility maintenance.

Each of the wide variety of herbicides and pesticides carries its own risks, benefits and drawbacks. An analysis of each type is beyond the scope of this assessment. Refer to the USFS (1988) and BPA (1983) for additional considerations.

3.29.2 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

3.29.3 General Drawbacks

- can carry substantial risk to environmental and human health, including impacts on water quality
- can kill non-target species
- can be controversial
- concern over risks may require extensive permitting or environmental review.

Note that Category 3.29 also applies to Special Vegetation Techniques (Section 2.0), including techniques for Wetland and Riparian Areas.

3.30 APPLY HERBICIDES/PESTICIDES SELECTIVELY

3.30.1 Overview of Technique

Where the potential for herbicide or pesticide loss from a site is high, seek to minimize losses by consideration of the following physical characteristics:

- karst topography,
- proximity to surface water,
- potential to generate runoff,
- wind erosion and prevailing wind direction,
- highly erodible soils,
- wetlands and water tables near the soil surface, and
- wellhead protection areas.

3.30.2 General Benefits

- maximize chemical efficiency
- minimize chemical loss to surface water and ground water

3.30.3 General Drawbacks

- can carry substantial risk to environmental and human health, including impacts on water quality
- can kill non-target species
- can be controversial
- concern over risks may require extensive permitting or environmental review

3.31 HERBICIDE/PESTICIDE APPLICATION RATES

3.31.1 Overview of Technique

When pests must be addressed and pesticide application is deemed necessary, or when herbicides are used for vegetation control, consider the persistence, toxicity, and runoff and leaching potential in selecting a pesticide. Follow label recommendations for application rates.

3.31.2 General Benefits

- maximize chemical efficiency
- minimize chemical loss to surface water and ground water

3.31.3 General Drawbacks

- can carry substantial risk to environmental and human health, including impacts on water quality
- can kill non-target species
- can be controversial
- concern over risks may require extensive permitting or environmental review

3.32 ANTI-BACKFLOW DEVICES ON HOSES

3.32.1 Overview of Technique

Fertilizers, various pesticides, and other chemicals may be applied to farmland directly through irrigation water in a process known as "chemigation". They can also be applied by special equipment filled from appropriate chemical storage facilities. In both cases precautions should be taken to prevent backflow of chemicals to the irrigation water source, or backflow and spillage at tank filling locations. Several systems used to prevent backflow are available.

3.32.2 General Benefits

- for irrigation surface water sources, risk of chemical contamination is reduced
- for irrigation ground water sources, risk of aquifer pollution is reduced
- for tank filling locations, risk of both surface water and ground water contamination is reduced

3.32.3 General Drawbacks

- none

3.33 ENFORCE CURRENT HERBICIDE/PESTICIDE USE REGULATIONS

3.33.1 Overview of Technique

Many local, state, and federal regulations adequately address and protect aquatic resource concerns but are not implemented or enforced. If these regulations are adhered to, however, soil and water resources and fisheries habitat enhancement efforts should be protected.

3.33.2 General Benefits

- reduced risk of surface water and ground water contamination

3.33.3 General Drawbacks

- assumes regulations are adequate

3.34 AERIAL SPRAY APPLICATIONS: BUFFER ZONES

3.34.1 Overview of Technique

When applying fertilizers and pesticides via aerial methods, assure that appropriate setbacks are observed and boundaries clearly identified on the ground. Appropriate buffer widths would generally be 100 feet from surface waters and riparian areas, but may vary by state.

3.34.2 General Benefits

- reduced chemical loading near surface water supplies

3.34.3 General Drawbacks

- none

3.35 AERIAL SPRAY APPLICATIONS: ATMOSPHERIC CONDITIONS

3.35.1 Overview of Technique

When applying fertilizers and pesticides via aerial methods, assure that appropriate weather conditions are observed. Aerial applications should not be attempted under very wet or very windy conditions in an effort to minimize surface runoff and windblown drift.

3.35.2 General Benefits

- reduced surface runoff and reduced surface water contamination
- reduced windblown drift to inappropriate areas, including direct deposition in surface waters

3.35.3 General Drawbacks

- marginal weather conditions could be adequate but the decision to apply chemicals should err conservatively--do not apply

3.36 SLOW-RELEASE FERTILIZERS

3.36.1 Overview of Technique

The use of slow-release fertilizers should be considered.

3.36.2 General Benefits

- application rates automatically controlled
- risk of surface water contamination is reduced
- risk of nutrient leaching to ground water is reduced

3.36.3 General Drawbacks

- none

3.37 SPILL CONTINGENCY PLANNING

3.37.1 Overview of Technique

Any storage and/or application of chemical compounds should be subsequent to preparation of a spill contingency plan. The plan should include, at a minimum, identificaion of potential hazards; designation of responsible parties, technical assistants, and reporting agencies; an incident management plan including spill containment and recovery, access restriction, and incident termination criteria; and inventory and monitoring plan.

3.37.2 General Benefits

- risk of surface water contamination is reduced
- risk of nutrient leaching to ground water is reduced

3.37.3 General Drawbacks

- none

4 AGRICULTURAL MANAGEMENT TECHNIQUES--IRRIGATION

4.1 IRRIGATION WATER MANAGEMENT

4.1.1 Overview of Technique

Careful planning and a good land and crop knowledge base is needed to determine and control (Canessa and Hermanson 1994; Saskatchewan Environment and Resource Management 1995b):

- the amount of irrigation water to apply,
- the rate at which it is applied, and
- when it should be applied.

Irrigation water management should seek to effectively use the available water supply to:

- control the soil water available to crops,
- promote the desired crop response,
- minimize soil erosion,
- minimize the loss of nutrients,
- minimize water loss, and
- protect water quality.

4.1.2 General Benefits

- water loss minimized
- sediment yield (to streams) minimized
- other sediment-attached and soluble pollutants (e.g., nutrients, herbicides) minimized

4.1.3 General Drawbacks

- increased water temperatures downstream of irrigation return
- percolation of salts and pollutants may reach ground water

4.2 WATER MEASURING DEVICES

4.2.1 Overview of Technique

Depending on the irrigation method used, a metering device should be installed on delivery lines between the diversion and the field distribution system to document volume and rate of irrigation water applied. For example, flumes or weirs can be installed on ditches or canals; various water meters can be installed on water pipelines.

4.2.2 General Benefits

- the total amount of water applied is known and controlled
- the rate at which water is applied is known and controlled
- useful in application of proper chemical concentrations through irrigation water
- monitors water rights allocations

4.2.3 General Drawbacks

- cost and maintenance (relatively small)

4.3 SOIL AND CROP WATER USE DATA

4.3.1 Overview of Technique

Information is available from various publications regarding the characteristic soil water content profiles of the rooting zones of various soils and the water use information of various crops. With this information, both the available water-holding capacity of the soil and the amount of water that can be extracted by a crop can be estimated. Soil moisture contents can be validated through monitoring using bulk samples, or a variety of sensors including probes and gypsum blocks. When the crop demand is calculated to be greater than the available soil water, the decision to irrigate is made (Canessa and Hermanson 1994).

4.3.2 General Benefits

- water loss is reduced
- loading rates of nutrients, chemicals can be calculated
- rooting zone leaching can be estimated

4.3.3 General Drawbacks

- published data is often not site-specific, and may include generalizations or assumptions not appropriate to some lands and crop

4.4 SOIL WATER BY TENSIOMETERS

4.4.1 Overview of Technique

This technique follows that of 4.3 above, but uses tensiometers or other devices and methods of detennining soil water content. Variation and error associated with published infomation is bypassed and site specific data is used in irrigation scheduling.

4.4.2 General Benefits

- water loss is minimized
- loading rates of nutrients, chemicals can be calculated
- rooting zone leaching can be estimated

4.4.3 General Drawbacks

- expense and maintenance of tensiometers

4.5 DRIP OR TRICKLE IRRIGATION

4.5.1 Overview of Technique

Drip irrigation and trickle irrigation are water conservation approaches to watering crops. Irrigation water that may nonnally be lost to evaporation, transpiration by non-crop plants, and overland flow (without benefit to the crop) is conserved as water is applied directly to the rooting zone of the crop. Applicators such as porous tubing or perforated pipe installed on or just beneath the soil surface transport and deliver the water under low pressure so surface ponding and runoff is reduced.

4.5.2 General Benefits

- water use (quantity) vastly reduced
- reduced sediment and chemical losses from soil

4.5.3 General Drawbacks

- salts and chemicals may not be adequately leached causing increased concentrations in the rooting zone
- more appropriate for row crops than broadcast-seeded crops

4.6 SPRINKLER IRRIGATION

4.6.1 Overview of Technique

Sprinkler irrigation involves the application of water under pressure in a network of perforated pipes or nozzles. This pipe network can be fixed or mobile, as with central pivot irrigation. The area of application depends on the range covered by the pipes plus the reach of the pressurized sprinklers or jets.

4.6.2 General Benefits

- commonly used

4.6.3 General Drawbacks

- water loss (and perhaps chemical transfer) by wind drift
- easier to over-irrigate

4.7 IRRIGATION BY SURFACE OR SUBSURFACE MEANS

4.7.1 Overview of Technique

Irrigation by surface methods includes furrows, contour ditches, and portable gated pipes. Subsurface methods include piped delivery with low-pressure individual or multiple-orifice risers. Area of application includes the pipe network and furrows, ditches, or depressions which carry the irrigation water downslope.

4.7.2 General Benefits

- commonly used

4.7.3 General Drawbacks

- water concentrated in furrows can gain velocity and erode soils
- water in furrows is subject to loss through evaporation

4.8 WATER CONVEYANCE: DITCHES AND CANALS

4.8.1 Overview of Technique

Ditches and canals are generally permanent features used to convey irrigation water from the supply source to the fields. They are most often formed in/with earthen materials. A design discharge of 25 ft^3/second is frequently used.

4.8.2 General Benefits

- water available to wildlife

4.8.3 General Drawbacks

- some water lost to soil through ditch/canal
- some water lost to evaporation
- water susceptible to contamination between source and target areas
- scour and erosion of conveyance channel can lower water quality and increase maintenance requirements
- saline seeps can occur beneath channels due to leaching processes

4.9 WATER CONVEYANCE: DITCH AND CANAL LINING

4.9.1 Overview of Technique

This technique improves the method in 4.8 by lining conveyance channels in permeable, well-drained soils with impermeable (or less permeable) materials to reduce water loss through the wetted perimeter of the channel. Options include applications of paving, concrete blocks, plastic, clay liners, and "time-release" bentonite clay pellets to the bed and/or banks of the channel.

4.9.2 General Benefits

- reduced water loss through seepage
- salt concentrations available to leaching processes are reduced

4.9.3 General Drawbacks

- water lost to evaporation
- water susceptible to contamination between source and target areas
- scour and erosion of conveyance channel may wear or remove some liners, and can lower water quality

4.10 WATER CONVEYANCE: PIPELINE

4.10.1 Overview of Technique

Water can be delivered from an irrigation source to the application system or directly to the field under pressure in a contained pipeline.

4.10.2 General Benefits

- no water losses to seepage or evaporation
- quality of source water is maintained
- maintenance requirements are reduced

4.10.3 General Drawbacks

- ancillary benefit as a wildlife water supply is lost

4.11 TAILWATER RECOVERY

4.11.1 Overview of Technique

Water reaching the downslope end of a field has basically gone unused in satisfying the water needs of a crop. Irrigation efficiency can be improved with a means to recycle this recoverable tailwater for reuse in the irrigation distribution system.

4.11.2 General Benefits

- downstream surface water yields of sediment and pollutants are reduced
- water from the irrigation source is augmented by recycled tailwater resulting in decreased demand on the supply source

4.11.3 General Drawbacks

- accumulation of contaminated sediments in collection ponds will require proper treatment and/or disposal

4.12 FILTER STRIP

4.12.1 Overview of Technique

Vegetated filter strips near field borders, tailwater areas, and intermittently across fields function as a filter between concentrated irrigation water and a receiving water body. Surface water entering the vegetated filter strip loses (reduces) sediment, nutrients, and bacteria through several processes. These may include filtration, deposition, infiltration, adsorption, absorption, decomposition, and volatilization. Vegetation can consist of an array of close-growing ground cover species. Soil conditions remain in aerobic condition (as compared to the anaerobic conditions of wetlands).

4.12.2 General Benefits

- reductions in sediment reaching receiving waters
- nutrients taken up by vegetation

4.12.3 General Drawbacks

- may require mowing or removal of sediment
- may be less effective with suspended sediments and soluble materials
- when flooded they may release a large load of pollutants into surface waters

4.13 SURFACE DRAINAGE DITCH

4.13.1 Overview of Technique

This is simply a graded ditch for collecting excess water in a field. Field characteristics such as slope and soil erodibility and the density of drainage ditches in a field influence the usefulness and effectiveness of this technique.

4.13.2 General Benefits

- reduction in sheet, rill, or gully erosion if ditch placement reduces erodible slope length
- water concentrated in ditch can be more easily collected and treated or reused

4.13.3 General Drawbacks

- possible increased sediment yield to downstream receiving waters when draining highly erosive soils or steep slopes
- increase in salinity and pollutant loading in receiving waters

4.14 SUBSURFACE DRAINAGE COLLECTION

4.14.1 Overview of Technique

Perforated conduit or gravel-filled trenches can be installed beneath the ground surface to collect and/or convey excess drainage.

4.14.2 General Benefits

- discharges to surface waters are generally low in sediment and sediment-related pollutants
- water temperature in receiving streams may be reduced by subsurface-source discharges
- water can be collected and reused

4.14.3 General Drawbacks

- soluble pollutants (e.g., nitrates) can be high and detrimental to either surface or ground water
- excavation required

4.15 WATER TABLE CONTROL

4.15.1 Overview of Technique

The water table (depth at which ground water saturation occurs) influences the distribution of irrigation water and the removal of drainage water; it can be controlled through the proper, combined use of subsurface drains, water control structures, and water conveyance systems. Runoff from fields with controlled water tables is generally reduced, but when drainage does increase, water quality will decrease due to the increase in soluble substances. Seasonal control of the water table can both benefit crops and improve soil water quality by removing nitrates and reducing soil salinity. Seasonally controlled drainage to downstream surface waters offers some control over the effects of saline or nutrient-rich discharges.

4.15.2 General Benefits

- increased control of water available to crops
- control of drainage water quality

4.15.3 General Drawbacks

- erosion and sediment-yield hazards associated with system installation
- may alter ground water regime of nearby wetlands and riparian areas
- can affect low flow conditions of adjacent and downstream channels
- high-cost, intensive management

4.16 BACKFLOW SAFETY DEVICES

4.16.1 Overview of Technique

Fertilizers, various pesticides, and other chemicals may be applied to farmland directly through irrigation water in a process known as "chemigation". Precautions should be taken to prevent backflow of chemicals to the water source whenever the irrigation pump is shut down. Several systems used to prevent backflow are available.

4.16.2 General Benefits

- for surface water sources, risk of chemical contamination is reduced
- for ground water sources, risk of aquifer pollution is reduced

4.16.3 General Drawbacks

- none

4.17 LIMIT INTERWATERSHED DIVERSIONS AND RETURNS

4.17.1 Overview of Technique

With large-scale landscape modifications to terrace hillsides, install irrigation facilities (including pumps), excavate contour drainage ditches, and perform other soil and water conservation measures, it is not uncommon for irrigation water diverted from a source in one watershed to be returned to another adjacent watershed. This may happen as water applied to land near a divide seeps to the adjacent watershed, or irrigation water pumped uphill in canals and furrows across a divide can flow downhill by gravity.

This practice can upset the natural water balance under which aquatic life (as well as human and wildlife communities) in each of the watersheds developed. Streams in the source watershed may suffer from declining or no flows during low flow periods. Streams in the target watershed may or may not be impacted. Changes in riparian vegetation in each of the watersheds may also be observed.

Opportunities to correct existing interwatershed diversions should be studied. Proposed interwatershed diversions should be avoided or mitigated to the fullest extent possible.

4.17.2 General Benefits

- natural water balances are maintained or restored

4.17.3 General Drawbacks

- some areas may be irrigated only with great difficulty and expense (both financial and resource disturbance)
- water rights are difficult to modify

4.18 PURCHASE/NEGOTIATE WATER RIGHT

4.18.1 Overview of Technique

Adequate water supplies for current and future water supplies should be assured by water rights. When a water right is not owned, it is possible that one may be secured through negotiation, purchase, or written agreement with a legal water rights holder. This is particularly true where the owner of a perennial water right requires only seasonal use of the water. "Off season" use may be had for alternate seasonal purposes.

4.18.2 General Benefits

- water rights should provide for instream uses

4.18.3 General Drawbacks

- water rights may be over-allocated
- competing uses may limit available options
- water rights are difficult to modify

4.19 FILE FOR INSTREAM WATER RIGHT

4.19.1 Overview of Technique

Adequate water supplies for current and future water supplies should be assured by water rights. When a water right is owned, water availability is secured to the extent possible by law. Filing for an instream water right is a first step to documenting need and intent of use.

4.19.2 General Benefits

- water rights should provide for instream uses

4.19.3 General Drawbacks

- water rights may be over-allocated and actual supply or quality is not guaranteed

4.20 WELL CONSTRUCTION FOR PRIMARY WATER SOURCE

4.20.1 Overview of Technique

Using a well as a primary water source for irrigation water may alleviate demands on surface sources such as streams. Wells can be preferred water sources for the long term as long as regional or subregional watershed planning occurs. Unchecked ground water pumping can reduce the quantity and quality of both surface water and ground water resources.

If wells tap deep aquifers, effects on streamflows in the near term should be negligible. Over years and decades, however, ground water elevations may be lowered resulting in reduced quality and higher access costs.

If wells tap shallow aquifers, dry season pumping may result in a lowered water table, increased leaching of salts and other pollutants to ground water, and vegetation impacts in wetlands and riparian areas. These impacts may be negligible at first, or undetectable for one or more years

4.20.2 General Benefits

- local, generally clean and reliable water supply
- alleviates immediate need for surface water supplies, leaving streamflow for instream beneficial uses
- may reduce the length of ground-disturbing pipelines needed for an irrigation system

4.20.3 General Drawbacks

- pump costs
- can hurt ground water and surface supplies if mismanaged on the watershed scale
- can modify wetland and riparian areas where the water table is lowered

4.21 IMPOUNDMENTS FOR WATER SOURCE

4.21.1 Overview of Technique

Impoundments can be an irrigation water source that is both self-sustaining and one step removed from well water, surface water, and piped in sources. Properly located, some impoundments can be filled by collecting ground water, soil water seepage, and precipitation. They may also be filled with water from wells or pumped from streams at a time when water is available and demands are reduced, then used at a later date with risk of loss to seepage and evaporation.

4.21.2 General Benefits

- water collected as available and used when needed
- leaves streamflow for instream beneficial uses
- can create additional fish and wildlife habitat

4.21.3 General Drawbacks

- surface water sources more easily contaminated
- seepage water may leach pollutants to ground water
- may require additional filtering before use to preserve irrigation system integrity

4.22 AVOID EXCESS IRRIGATION FLOWS

4.22.1 Overview of Technique

Water applied to furrows, conveyance channels, and drainage ditches in excess of plant needs and minimum delivery requirements functions only to maintain hydraulic head in the channels and account for obstructions or irregularities that may reduce delivery accuracy and efficiency. Some of this water is necessary for successful irrigation.

Too much water can have negative effects. Excess water can result in scouring of furrows and ditches and an increase in sediment transport off site. Filter strips and tailwater systems may be inundated above their capacity, reducing their effectiveness. In permeable areas, excess water can flush needed nutrients and chemicals out of the rooting zone and can contaminate ground water supplies.

Excess irrigation flows can be avoided by good irrigation planning, understanding crop requirements, knowing existing soil water conditions, metering application lines, and recording times of application.

4.22.2 General Benefits

- water loss is minimized
- sediment yield is reduced
- ground water and surface water quality is maintained
- system design capacities are not stressed

4.22.3 General Drawbacks

- none

4.23 INTAKE AND RETURN DIVERSION SCREENS

4.23.1 Overview of Technique

Where irrigation diversion intake and return points coincide with surface water supplies and aquatic habitat, these contacts should be designed to prevent fish and other aquatic organisms of all lifestages from accessing the irrigation system. Protection often takes the form of screens across intake pipes or discharge channels (Saskatchewan Environment and Resource Management 1995b; Canada Department of Fisheries and Oceans 1995). Monitoring and maintenance of these barrier devices should occur on a regular basis.

4.23.2 General Benefits

- fish mortality due to stranding and/or temperature and oxygen stress is reduced

4.23.3 General Drawbacks

- maintenance required

4.24 PROTECT SPRINGS

4.24.1 Overview of Technique

Where springs are known to exist, they should be given special protection. They may be capped and used as a water supply for agricultural uses. Where a spring occurs near a stream, protect the spring from modification and maintain/create discharge to the stream channel. Protection should also include the avoidance or reduction in use of pesticides and fertilizers and ground disturbance near the spring. Springs generally produce clean and cool water effective in enhancing the quality of receiving streams.

4.24.2 General Benefits

- improved water quality
- decreased stream temperatures

4.24.3 General Drawbacks

- fewer land management options near the spring

4.25 CONSOLIDATE/REPLACE IRRIGATION DIVERSION DAMS

4.25.1 Overview of Technique

Not uncommonly, older diversion dams used for irrigation supplies are undesigned structures created through the bulldozing of river rock, earth, or fill material into embankments, or the placement of log cribs. Habitat modifications, barriers to fish passage, and water capacity and demand may not have been considerations during construction of these diversion dams.

Where diversion dams are barriers to fish passage, have created unacceptable habitat modifications, or are causing sediment concerns through deposition behind the dam or downstream scour, and where diversion dams are abandoned, are in need of repair, are considered unnecessary to meet demand, dams should be removed, consolidated, or replaced with structures designed for fish passage and habitat considerations. Projects should be supported by watershed-based analyses with the involvement of multiple owners and users. Coordinate with appropriate local governments, irrigation districts, and state and federal agencies.

4.25.2 General Benefits

- improved fish passage
- where dams are removed, increase in natural habitats
- removal/reduction of erosion source
- reduction in maintenance costs

4.25.3 General Drawbacks

- where removed, sediment retention function is lost
- construction effects on water quality

5 AGRICULTURAL MANAGEMENT TECHNIQUES--ANIMAL FACILITIES

5.1 HEAVY USE AREA PROTECTION

5.1.1 Overview of Technique

Areas that are intensively used by farm animals and livestock should be protected by establishing vegetative cover, by surfacing with other suitable materials, and/or by installing drainage, treatment, and access structures.

5.1.2 General Benefits

- reduced erosion improves surface water quality

5.1.3 General Drawbacks

- erosion and sedimentation accompanying initial construction of structures
- increased runoff from impervious areas discharges nutrients, chemicals, oils, bacteria, and organic matter to receiving waters

5.2 MANAGE RUNOFF FROM IMPERVIOUS SURFACES

5.2.1 Overview of Technique

Whether from paving, destruction of soil structure by compaction, sealing the ground surface with fine sediment and organic matter, or the construction of water repellent structures such as roofs, impervious areas can compound water quality problems by rapidly concentrating water from a large area. Managing this overland flow can be preventative (implement designs to minimize area, volume, and direction of flow) or corrective (assuring its treatment and/or dispersal).

5.2.2 General Benefits

- erosion and downstream sediment yields reduced
- volume of water polluted by animal wastes is reduced

- nutrient and pesticide loadings in discharges are decreased
- risk of local flooding reduced as drainage is improved

5.2.3 General Drawbacks

- infiltration in highly permeable areas may result in pollutants leaching to ground water

5.3 WASTE MANAGEMENT PLAN

5.3.1 Overview of Technique

A waste management plan should be developed for the various waste "streams" associated with confined animal facilities and other agricultural sources. Wastes should be characterized and alternative utilization, treatment, and disposal methods identified. Recycling and reuse of wastes are preferred.

Waste management should be tiered to a nutrient management plan developed for all agricultural operations on a parcel of land. Management options and techniques are subject to state regulations.

5.3.2 General Benefits

- the most environmentally acceptable and financially feasible alternatives for use or disposal are identified

5.3.3 General Drawbacks

- none

5.4 WASTE STORAGE AND TREATMENT

5.4.1 Overview of Technique

Earthen impoundments or fabricated structures are used to contain and temporarily store animal and other agricultural wastes. Some impoundments may serve as lagoons for the long-term biological treatment of wastes.

5.4.2 General Benefits

- reduces direct delivery and loading of nutrients, pathogens, and chemicals to surface water
- in lagoons, sediments and some insoluble nutrients settle and form sludge before runoff is discharged

5.4.3 General Drawbacks

- dissolved pollutants may leach with seepage to ground water supplies
- long-term maintenance and cleaning still results in a use/disposal issue

5.5 LAND APPLICATION OF WASTES

5.5.1 Overview of Technique

Agricultural wastes such as manure and runoff water can be used as a soil amendment beneficial to improve soil fertility and tilth. Proper site selection, rate and timing of application, and other BMPs can lower the risk of surface water and ground water degradation. Increased microbial activity near the soil surface may also assist in controlling pesticides and other pollutants.

5.5.2 General Benefits

- plant growth increased
- increased infiltration and decreased erosion
- fixing of pesticides near the soil surface

5.5.3 General Drawbacks

- risk of pollutants discharged to surface waters
- nutrients available for leaching to ground water are increased (e.g., nitrates)

5.6 COMPOSTING FACILITY

5.6.1 Overview of Technique

A facility for composting agricultural organic wastes may be built. This process uses biological decay by microorganisms to produce a stable humus-like material that may then be used as a soil amendment or mulch and a substitute for fertilizer. State regulations may apply.

5.6.2 General Benefits

- natural, biological process
- yields stable, nutrient rich product
- can improve soil tilth and infiltration when used

5.6.3 General Drawbacks

- can be time consuming
- may require large area requiring its own drainage management

5.7 CONSTRUCTED WETLANDS FOR TREATMENT OF AGRICULTURAL WASTES

5.7.1 Overview of Technique

Constructed wetlands are designed to imitate the water filtering and purification processes of natural wetlands. Upland sites are usually converted to wetlands by creating poorly drained soil conditions.

Vegetation is generally not as diverse as in natural wetlands. Though other wetland functions such as wildlife habitat may exist in created wetlands, they are primarily managed in this context to treat agricultural wastewater. Pollutant removal occurs through sediment trapping, assimilation by plants, bacterial decomposition, and adsorption.

5.7.2 General Benefits

- pollutant removal
- sediment retention
- wildlife habitat

5.7.3 General Drawbacks

- if underdesigned, contaminated stormflows may be discharged from the wetland (before pollutants are stabilized)

5.8 COMMERCIAL DISPOSAL SERVICE

5.8.1 Overview of Technique

A commercial disposal service may be best equipped to handle the disposal or treatment and recycling of agricultural wastes in an environmentally acceptable manner.

5.8.2 General Benefits

- ease
- service transports and disposes of wastes at approved sites

5.8.3 General Drawbacks

- expense
- reuse as soil amendment is an opportunity cost
- fertilizer requirements may increase
- disposal at some location is still required

5.9 LANDFILL BURIAL OF WASTES

5.9.1 Overview of Technique

Some landfills may be approved to accept agricultural wastes where disposal is favored over reuse. State regulations apply.

5.9.2 General Benefits

- ease

5.9.3 General Drawbacks

- limited landfill capacity
- expense
- reuse as soil amendment is an opportunity cost
- fertilizer requirements may increase

5.10 INCINERATE WASTES

5.10.1 Overview of Technique

Agricultural wastes can be incinerated when large volumes of waste exceed the capacity to handled by other means.

5.10.2 General Benefits

- waste reduction
- ash may yield some nutrient value

5.10.3 General Drawbacks

- reuse as soil amendment is an opportunity cost
- fertilizer requirements may increase
- air quality issues

5.11 HARDENED FORDS FOR LIVESTOCK CROSSINGS OF STREAMS

5.11.1 Overview of Technique

Where livestock and other farm animals are required to access and cross a stream channel on a somewhat infrequent basis, hardened fords can be used to reduce trampling pressure and streambank and bed damage. (Use culverts or bridges for frequent crossing locations.) Methods may include paving with concrete or placing cobbles, concrete blocks, or geotextiles at established pathways.

5.11.2 General Benefits

- resists bank trampling and destruction
- generally easier to install (compared to culverts)
- less resource damage if/when removed

5.11.3 General Drawbacks

- allows direct contact of equipment/livestock with stream
- no sideboards to encourage/require use
- temporary concrete leaching in stream channel

5.12 SEASONAL USE OF FORDS AND SURFACE WATERS

5.12.1 Overview of Technique

Where livestock or farm animals do access surface waters for drinking, or where they cross surface waters at fords, limit access to seasons when preferred fish species are not present. Additional use of fences may reduce straying off fords or watering areas into spawning gravels or large rearing pools.

5.12.2 General Benefits

- mortality and injury to fish remain low
- water quality maximized when fish are present

5.12.3 General Drawbacks

- may result in lengthy exclusions
- some fish may be present during open use-windows

5.13 ALTERNATIVE WATER SOURCES

5.13.1 Overview of Technique

Provide alternative and/or supplemental water sources to surface water supplies for livestock and farm animals. (This option is considered in greater detail as grazing techniques 6.6 through 6.10.)

5.13.2 General Benefits

- preserves stream channel or lake bed structure
- prevents direct contact of animal wastes and disturbance-generated sediments with surface water and maintains high water quality

5.13.3 General Drawbacks

- alternatives may be impractical

6 AGRICULTURAL MANAGEMENT TECHNIQUES--GRAZING

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. Conversely, range improvements can improve water quality as well as increase annual production (Johnson 1992).

Riparian grazing, however, has been linked to decreased stream bank stability, increased sediment yields to streams, and declining water tables and the recharge of aquifers. Modern grazing management (primarily cattle and sheep) addresses these concerns with intensive grazing systens that utilize fencing, rotation of use, and control of movements (Elmore 1992).

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.

The grazing techniques below are typical of those used to reduce nonpoint source pollution from farms and rangeland.

6.1 DEFERRED GRAZING

6.1.1 Overview of Technique

This management technique "rests the land" by postponing grazing for a prescribed period. With time, vegetative ground cover should increase, ground disturbance decreases, soil bulk density characteristics improve, and infiltration rates increase. The filtering qualities of the land are also improved with the establishment of vegetation as sediments are trapped and secured and available nutrients are utilized by plants. Animal waste loading is drastically reduced with less risk of adverse effects on surface water and ground water quality.

6.1.2 General Benefits

- soil conditions improve
- sediment yields and related pollutants in receiving waters are reduced
- runoff from site is reduced and slowed

6.1.3 General Drawbacks

- if not monitored or observed periodically, restoration needs or deferred grazing lands may go unnoticed or unmet

6.2 PLANNED GRAZING SYSTEM

6.2.1 Overview of Technique

This management technique involves the grazing of two or more landunits in an alternating graze and rest sequence for several years or more. The duration of the periods may be annually or during the growing season of key plants.

6.2.2 General Benefits

- quantity and quality of vegetation is increased
- rates of manure decomposition, dependent on vegetation quality, should increase and therefore reduce pollution potential
- sediment and nutrient yields are maintained at low rates compared to continual grazing

6.2.3 General Drawbacks

- commitment of land (doubling land requirements over a system of continuous grazing)

6.3 CONTROL GRAZING INTENSITY

6.3.1 Overview of Technique

Grazing should be managed and controlled at an intensity that will maintain soil conditions and sustain healthy vegetative cover. In woodland areas, grazing should be managed and controlled at an intensity that will maintain soil conditions and sustain both trees and forage vegetation. A grazing plan should document a justifiable grazing intensity.

6.3.2 General Benefits

- quantity and quality of vegetation is increased or sustained
- sediment and nutrients in runoff remain low

6.3.3 General Drawbacks

- large herds may be dispersed across several allotments or pastures

6.4 PASTURE AND HAYLAND MANAGEMENT

6.4.1 Overview of Technique

Whether grazed or harvested, pastures and hayland should be managed on a sustainable basis where vegetation is encouraged and soil disturbance is minimized.

6.4.2 General Benefits

- erosion and sediment yields are reduced as infiltration is encouraged
- more water remains on site; runoff is reduced

6.4.3 General Drawbacks

- increased infiltration may result in an increase of soluble nutrients and pesticides being leached into the ground water

6.5 WATER SUPPLY: PIPELINE

6.5.1 Overview of Technique

Pipelines are an alternative water supply method to surface water sources. Water is piped (and usually pumped) from any appropriate source to watering areas located away from stream channels or other sensitive areas. Pipes generally range from 0.5 to 4 inches, but may exceed 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.

6.5.2 General Benefits

- minimizes water losses from infiltration and evaporation

6.5.3 General Drawbacks

- requires more initial investment to install and can require more effort to maintain
- disturbs vegetation
- trenching may affect archeological resources

6.6 WATER SUPPLY: PONDS

6.6.1 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 farmer or range manager. Impoundments can range from simple earthen levees to elaborate concrete dams. Examples include simple embankments made from on-site 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.

6.6.2 General Benefits

- provides controllable water features
- ponds trap sediment and sediment-related pollutants
- may store or moderate stormflows from/on the area

6.6.3 General Drawbacks

- surface water subject to direct contamination from livestock
- impounded water from streams may prevent adequate flushing of fine sediments from spawning gravels downstream
- seepage can leach pollutants to ground water
- water temperatures will increase in ponds
- design can require extensive engineering considerations
- excavation may affect archeological resources

6.7 WATER SUPPLY: TROUGH

6.7.1 Overview of Technique

Troughs can be filled by water pipelines or wells in order to provide an alternative watering site to a stream channel.

6.7.2 General Benefits

- sediment and pollutant yields are reduced
- channel structure is maintained as bank and bed trampling are reduced
- location of troughs can help distribute grazing livestock

6.7.3 General Drawbacks

- none

6.8 WATER SUPPLY: WELL

6.8.1 Overview of Technique

Well systems involve drilling to and tapping into ground water sources to provide an alternative water supply to stream channels. 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 much less than 12 inches.

6.8.2 General Benefits

- sediment and pollutant yields are reduced
- channel structure is maintained as bank and bed trampling are reduced
- location of wells and associated watering sites can help distribute grazing livestock
- obtaining water rights for a well can sometimes be easier than obtaining surface water rights

6.8.3 General Drawbacks

- wells immediately adjacent to watering areas may be prone to surface contamination (e.g., bacteria, nitrates)
- may raise concerns regarding aquifer depletion

6.9 WATER SUPPLY: SPRING DEVELOPMENT

6.9.1 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 livestock.

Spring or seep development requires (1) a field of gravel or sand to colect 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 livestock.

In most cases, development of a spring requires excavation to install the drainage field and, if necessary, an impermeable barrier to prevent flowthrough.

6.9.2 General Benefits

- sediment and pollutant yields are reduced
- channel structure is maintained as bank and bed trampling are reduced
- can provide water for wildlife

6.9.3 General Drawbacks

- source water for springs can change naturally or by disturbance caused during spring development
- for springs near stream channels, the cooling effect of the spring on stream water temperature, if any, may be decreased

6.10 ACCESS: FENCING

6.10.1 Overview of Technique

Permanent and/or temporary fencing may be constructed to serve as a containment feature or barrier to livestock. Streambanks, lake shores, riparian areas, and wetlands are some areas which can be excluded from livestock access. Physical disturbance to these features is reducel as a result.

Fence lines will typically contain taller grass and some shrubs. Fences that are constructed on the contour may therefore slow surface runoff and result in deposition of coarser sediment.

Where fencelines cross roads, simple wire gates or cattle guards may be installed.

6.10.2 General Benefits

- sediment and pollutant yields to streams are reduced
- channel structure is maintained as bank and bed trampling are reduced

6.10.3 General Drawbacks

- livestock tend to walk along fences, creating soil-worn paths
- fences may create a concentrating effect by placing many livestock in a smaller area near fencelines--erosion and livestock waste problems may result
- seasonal access may be desired, thus requiring frequent maintenance
- abandoned fences may create access or solid waste problems

6.11 ACCESS: TRAILS/FORDS AT STREAM CROSSINGS

6.11.1 Overview of Technique

Where livestock and other farm animals are required to access and cross a stream channel on a somewhat infrequent basis, hardened fords can be used to reduce trampling pressure and streambank and bed damage. (Use culverts or bridges for frequent crossing locations.) Methods may include paving with concrete or placing cobbles, concrete blocks, or geotextiles at established pathways.

Where livestock or farm animals do access surface waters for drinking, or where they cross surface waters at fords, limit access to seasons when preferred fish species are not present. Additional use of fences may reduce straying off fords or watering areas into spawning gravels or large rearing pools.

6.11.2 General Benefits

- resists bank trampling and destruction
- generally easier to install (compared to culverts)
- less resource damage if/when removed
- mortality and injury to fish remain low
- water quality maximized when fish are present

6.11.3 General Drawbacks

- allows direct contact of equipment/livestock with stream
- unless fenced, there are no sideboards to encourage/require use of established fords
- may result in lengthy exclusions from streams
- some fish may be present during open use-windows

6.12 VEGETATION STABILIZATION: PASTURE PLANTING

6.12.1 Overview of Technique

Improve the quantity and quality of vegetative cover on pastureland by establishing or reestablishing stands of native or adapted perennial, biannual, or reseeding forage plants.

6.12.2 General Benefits

- reduced erosion and sediment yield
- increased surface water quality

6.12.3 General Drawbacks

- leaching of soluble substances to ground water may increase vith increased infiltration (this is countered, however, by healthy, vigorous vegetative cover)

6.13 VEGETATION STABILIZATION: RANGE SEEDING

6.13.1 Overview of Technique

Improve the quantity and quality of vegetative cover on rangeland by seeding and establishing native or adapted forage plants. Some ground scarification may be necessary. Application of fertilizer or some herbicides may be desired.

6.13.2 General Benefits

- reduced runoff after vegetation establishment
- reduced erosion and sediment yield over the long term
- increased surface water quality

6.13.3 General Drawbacks

- temporary minor erosion and sediment increases may result ifthe ground is scarified
- risk of fertilizer or chemical transport to surface water, or leaching to ground water

6.14 VEGETATION STABILIZATION: CRITICAL AREA PLANTING

6.14.1 Overview of Technique

Plant trees, shrubs, vines, grasses, or legumes on severe, actively erodng areas, and areas with high erosion potential.

6.14.2 General Benefits

- reduce erosion and sediment yield
- nutrient loss to surface and ground waters is reduced

6.14.3 General Drawbacks

- not immediate in effect - erosion and chemical loss may occurfrom the site prior to plant establishment

6.15 VEGETATION STABILIZATION: BRUSH/WEED MANAGEMENT

6.15.1 Overview of Technique

Noxious weeds, nonnative invasive plants, and aggressive, weedy species can take over disturbed lands and degrade range 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 range and wildlife habitat dominated by undesirable plant species. The control of such unwanted vegetation can encourage the establishment and water quality benefits of native plants.

Techniques available to control vegetation includes herbicides, mechanical removal, biological control, hand pulling, and prescribed burning. These are described in Sections 3.29 and in Sections 2.9 through 2.12, respectively. Water level manipulation is also a vegetation management tool. See Section 4.15.

6.15.2 General Benefits

- various (see referenced sections above)

6.15.3 General Drawbacks

- various (see referenced sections above)

6.16 MONITOR WILDLIFE

6.16.1 Overview of Technique

Study wildlife (e.g., deer, elk) and domestic livestock land use patterns, identify problems and develop mitigation strategies. For example, wildlife may be herded away from domestic feedlots if they exacerbate existing poor conditions.

6.16.2 General Benefits

- problem sources properly identified
- reduced erosion and waste generation
- sound basis for management

6.16.3 General Drawbacks

- may be difficult or costly to implement

6.17 WILDLIFE HARVESTING

6.17.1 Overview of Technique

Encourage proper wildlife harvesting to ensure proper population densities and forage balances.

6.17.2 General Benefits

- maintain vegetative cover and stable soil conditions

6.17.3 General Drawbacks

- secondary disturbance effects created by hunters/hunting pressure

6.18 HEAVY USE AREA MANAGEMENT

6.18.1 Overview of Technique

Areas that are intensively used by livestock (feedlots, temporary herding pens) should be protected by establishing vegetative cover; by surfacing with other suitable materials; by installing drainage, treatment, and access structures; by creating filter strips around problem areas; and/or by removal or relocation of attracting structures.

6.18.2 General Benefits

- vegetation re-establishment
- patterned dispersal and recovery of disturbed areas
- increase infiltration and reduced runoff from most areas
- reduced erosion improves surface water quality

6.18.3 General Drawbacks

- erosion and sedimentation accompanying initial construction of some structures
- leaching of soluble nutrients may reach ground water
- increased runoff from impervious areas (if created) may discharge nutrients, chemicals, oils, bacteria, and organic matter to receiving waters

7 ROAD MANAGEMENT TECHNIQUES

7.1 PRE-PLAN ROAD LOCATION

7.1.1 Overview of Technique

In addition to user safety, the avoidance of unstable, sensitive, or fragile areas are a primary consideration incorporated into the best location of roads and other transportation facilities (such as landings). Forest roads are often chronic sediment sources degrading water quality and devaluing habitat which may often be prevented by planning including aerial and on-the-ground reconnaissance, surveying, design, and the implementation of various other BMPs.

7.1.2 General Benefits

- road crossings of floodplains and alluvial fans can be minimized, and when they are required, crossing impacts can be minimized by locating roads in the narrowest, most stable locations
- unstable slopes can be avoided
- well-designed roads provide adequate drainage and reduce the erosive impact of water on road surfaces
- direct sediment inputs from roads to streams are reduced

7.1.3 General Drawbacks

- few drawbacks, if any, as well-planned roads can pay for themselves in reduced road maintenance and sustained quality habitat in adjacent streams

7.2 INSTALL HYDRAULIC STRUCTURES AT LOW STREAMFLOWS

7.2.1 Overview of Technique

Low flows have a reduced capacity for sediment transport. Therefore, in order to retain the maximum amount of disturbed sediments at the crossing site, schedule construction or installation of all stream crossing structures for low flow periods. Be prepared to suspend work or perform weather-contingent work during dry-season stormflow events.

7.2.2 General Benefits

- reduced sediment generation
- reduced downstream sediment transport during construction
- sediments have an opportunity to be stabilized in construction fills
- downstream habitat preserved--spawning gravels are less impacted by fine sediment, and loss of pool volume through pool filling is minimized

7.2.3 General Drawbacks

- construction delays and higher construction costs may result during wet weather

7.3 MINIMIZE EROSION AND SEDIMENTATION DURING STREAM CROSSING CONSTRUCTION

7.3.1 Overview of Technique

Reduce the generation of sediments during stream crossing construction. This can be accomplished through the implementation of various techniques. Examples include:

- working machinery from one side of the stream where possible (minimize unnecessary construction crossings),

- when crossing channels during construction, use pioneering techniques such as using "log culverts" to protect banks, minimize bed disturbance, and prevent contact of equipment oils with streamflow,
- construction of temporary cribs to reduce water velocities,
- using silt fences, hay bales, etc. immediately downstream of construction to retain as much sediment on site as possible, and
- using graded material less than 4 inches diameter as compacted backfill around culverts to prevent piping and continued erosion after construction.

7.3.2 General Benefits

- reduced sediment generation
- reduced downstream sediment transport during construction
- sediments have an opportunity to be stabilized in construction fills
- downstream habitat preserved--spawning gravels are less impacted by fine sediment, and loss of pool volume through pool filling is minimized

7.3.3 General Drawbacks

- short time delays

7.4 DIVERT WATER AROUND CONSTRUCTION OF LARGER STRUCTURES

7.4.1 Overview of Technique

Construction of large structures requires the diversion of streamflow around the crossing site in order to minimize sediment entrainment and water quality degradation from construction equipment. This may be accomplished by damming flow with a coffer or crib dam and pumping sediment-free water around the construction to a stable point downstream. Water may also be diverted to a temporary culvert laid adjacent and parallel to the channel. On wider streams, it may be possible to complete half the construction with weirs directing flow to the other half of the channel. The second half of the stream can then be dewatered by diverting streamflow through the newly installed structure (culvert, bridge piling). All diverted flows should be restored as soon as practicable.

7.4.2 General Benefits

- reduced downstream sediment transport during construction
- sediments have an opportunity to be stabilized in construction fills
- downstream habitat preserved--spawning gravels are less impacted by fine sediment, and loss of pool volume through pool filling is minimized
- water quality degradation by petroleum products minimized

7.4.3 General Drawbacks

- temporary impedance of fish migration
- potential for fish mortality if pumped

7.5 AVOID STREAM CROSSINGS OUTSIDE OF CONSTRUCTION WINDOWS

7.5.1 Overview of Technique

Avoid construction outside of allowable "windows" which reflect the typical lifestages of salmon and steelhead trout. Adults are protected to reduce pre-spawning mortality. Eggs should have hatched and fry emerged from spawning gravels so they may avoid active construction impacts. This window may vary by river basin and seasonal runs, but often approximates a mid-June to mid-September time frame. State fisheries departments are involved in the identification of appropriate windows for site specific stream reaches.

Other timing windows may be appropriate to ensure stable road construction. For example, blasting should not occur when soils are saturated, particularly near streams. Also, road fill should not be placed over snow which may settle and cause failure of fills and drainage structures. If these windows are neglected when appropriate, wide-spread habitat destruction may result.

7.5.2 General Benefits

- increased adult survival and spawning success
- increased fry survival
- reduced risk of road and slope failures

7.5.3 General Drawbacks

- limited construction periods requiring careful planning and resolution of conflicts

7.6 REDUCE RISK OF ROAD-RELATED MASS FAILURES

7.6.1 Overview of Technique

Where practicable, steep and unstable slopes should be avoided through the planning process. When construction occurs on steeper slopes, several guidelines can be followed to minimize the risk of road-related mass failures. These include:

- conduct subsurface investigations and stability analyses on slopes and stream crossings where stability may be suspect,
- roads on slopes should be constructed with a balanced cut/fill design to reduce the size of excavation and fill volumes,
- strictly control blasting--avoid overloading explosives, and do not blast under saturated soil conditions,
- manage road runoff to avoid concentration of water on unstable slopes,
- limit clearing widths to the minimum needed for driver safety,
- locate overburden disposal areas away from steep slopes in more stable locations,
- minimize fill slopes adjacent to designated stream courses, and
- avoid or minimize loading of steep or unstable slopes by excavating roadbed into hillslope and avoiding sidecast or fill material by "end-hauling" it to a stable location.

7.6.2 General Benefits

- reduced risk of mass-failures which may degrade streams
- reduced long-term road maintenance costs (compared to replacement)

7.6.3 General Drawbacks

- cost

7.7 REDUCE RISK OF ROAD-RELATED SURFACE EROSION

7.7.1 Overview of Technique

Linear road features on variable slopes increase the risk of sheet, rill, and gully erosion by subjecting long, bare, and compacted slope lengths to the erosive action of water. Roads and ditches near stream channels tend to function as extensions of the drainage network during wet weather and may transport sediment and other pollutants from roads directly into stream channels. Water allowed to concentrate and remain on the road surface or in an adjacent ditch or flow across a cut or fill slope will increase downstream sediment yields and cause costly maintenance problems.

Techniques to minimize the production of surface erosion from roads may include:

- sealing road surfaces with water and compaction roller, oil treatments, chip-sealing, aggregate surfacing, and paving;
- water, oil, or other treatments for dust control;
- creating rolling dips or water bars in the road surface to reduce water velocities on the road surface;
- planting bare cut and fill slopes and ditchlines;
- limiting wet weather traffic;
- using low tire pressure systems on heavy trucks ("central tire inflation" systems);
- providing adequate road drainage through the frequent use of ditch relief culverts or cross-drains; and/or
- outsloping roads or using a permeable rock overlay to preclude the need to concentrate water in a ditch.

7.7.2 General Benefits

- reduced risk of mass-failures which may degrade streams
- reduced long-term road maintenance costs (compared to replacement)

7.7.3 General Drawbacks

- cost

7.8 DRAINAGE CONTROL TO MINIMIZE EROSION AND SEDIMENTATION

7.8.1 Overview of Technique

In addition to properly sizing stream crossing structures and placing relief culverts, several other drainage control techniques may be implemented to prevent the erosion and entrainment of sediment from road-related surfaces. These may include:

- assuring culverts are placed deep enough in the road fill to prevent crushing, deformation, and a loss of capacity;
- designing water velocities in ditches so that they are fast enough to carry sediment (prevent filling), but slow enough to not scour the ditch;
- armoring ditches with coarse material;
- placing ditch blocks at relief culverts to divert water to culvert and prevent water from running down ditch line;
- using trash racks, drop inlets, and aprons at culvert inlets to prevent clogging and scour;
- dissipating discharge energy (velocities) from culverts using riprap; and
- protecting fill slopes with mechanical measures, including riprap, geo-textiles, hay bales, terracing, or application of soil tackifers.

7.8.2 General Benefits

- reduced risk of surface erosion which may degrade streams
- reduced long-term road maintenance costs

7.8.3 General Drawbacks

- cost

7.9 AVOID CONSTRUCTION DURING INCLEMENT WEATHER

7.9.1 Overview of Technique

Wet weather construction leads to an increase in the amount of sediment generated and available for runoff. Simultaneously, a water supply is present to transport the sediment toward stream channels. Construction on unstable and potentially unstable slopes is also more prone to create mass failures during wet or saturated conditions.

7.9.2 General Benefits

- reduced risk of downstream sediment yield surface erosion and mass erosion processes

7.9.3 General Drawbacks

- construction delays

7.10 EROSION CONTROL AND REVEGETATON AT PROJECT COMPLETION

7.10.1 Overview of Technique

Use grass-seeding, hydro-mulching, straw mulching, straw bales, planting of shrubs and trees, and other revegetation and erosion control techniques to complete road consruction. The goal is to protect freshly disturbed soils until natural vegetation can be established. Rough soil surfaces will help retain planted seed and help to maximize germination and establishment of vegetation

7.10.2 General Benefits

- exposure of bare soils to raindrop energy and concentrated water is reduced
- sediments are retained on site
- instream sediment yields and sediment-attached pollutantsare reduced

7.10.3 General Drawbacks

- vegetation establishment may not occur (or may be incomlete) prior to the wet/runoff season
- non-native plants may be slow to transition back to nativespecies

7.11 SLASH MANAGEMENT

7.11.1 Overview of Technique

Debris generated during road construction should be prevented from obstructing channels. Provided it is stable, large woody debris encountered at stream crossings shouldbe left in place if at all possible. Construction debris generated from rights-of-way should be disposed of by one or means to prevent the formation of slash jams and culvert blocks. These include:

- windrowing (sediment control capabilities),
- scattering.
- chipping,
- piling and burning, and
- bucked into manageable lengths and piled roadside for firewood.

7.11.2 General Benefits

- instream disturbance due to removal of natural large woody debris is prevented
- instream disturbance due to removal of introduced woody debris is prevented
- risk of unnatural debris jams and related dam-break flood events is reduced

7.11.3 General Drawbacks

- none

7.12 INTERSECTIONS WITH PAVED ROADS

7.12.1 Overview of Technique

Where sediment may be tracked from forest roads on to public highways or other paved surfaces, protect the intersections and limit the sediment transfer by paving back from intersection, using corduroy logs, wood chips or similar materials on forest roads.

7.12.2 General Benefits

- tracked and airborne sediment transfer off roads is reduced
- less sediment on impervious paved roads to be entrained in runoff

7.12.3 General Drawbacks

- maintenance required

7.13 GRADE ROAD

7.13.1 Overview of Technique

Road surfaces should be maintained by grading as needed to:

- retain a crowned or sloping cross-section to shed water,
- remove unwanted dips or berms to prevent downslope movement of concentrated water, and
- conserve road materials which might otherwise be transported and deposited in streams.

7.13.2 General Benefits

- improved road drainage
- reduced sediment generation from road surfaces
- reduced instream sediment yields

7.13.3 General Drawbacks

- maintenance costs
- risk of ditch filling with road material or incidental damage to culverts

7.14 DITCH AND CULVERT CLEANING

7.14.1 Overview of Technique

Ditches, culverts, catch basins, and other road crossing structures should be regularly cleaned of obstructions to maintain optimum drainage across the road surface and prism. Maintenance efforts should take care to minimize disturbance of ditches and roadside vegetation, especially during wet weather.

7.14.2 General Benefits

- reduced risk of structural failure and failure of road prism or adjacent slope

7.14.3 General Drawbacks

- risk of disturbing ditches or removing stabilizing vegetation

7.15 GRASSED ROAD SURFACE MANAGEMENT

7.15.1 Overview of Technique

Low use-volume roads may be kept in a vegetated state by sowing grass seed or allowing the encroachment of natural vegetation. Annual maintenance may require mowing or shrub control, especially in more arid areas where fire ignition may be a problem.

7.15.2 General Benefits

- surface erosion processes minimized

7.15.3 General Drawbacks

- coarse or rapid shrub growth may close road or reduce access

7.16 REMOVE TEMPORARY STREAM CROSSINGS

7.16.1 Overview of Technique

When roads are to be closed, or when intensity of use of a road will diminish, remove stream crossing structures which may plug and fail when abandoned. Dips and water bars should be established where culverts are removed. This reduces the risk of channel scour and downstream sediment transport should a culvert plug and fail.

7.16.2 General Benefits

- reduces maintenance requirements
- reduced risk of culvert failure

7.16.3 General Drawbacks

- water bars may become erosion sites if not constructed properly or if not maintained

7.17 ACCESS MANAGEMENT

7.17.1 Overview of Technique

Restriction of access or selected access is a preventive practice implemented on roads that are not adequate for all-weather/all-season use. Where the quality and durability of a road surface is poor and results in rutting and ponding of water during periods of wet weather or high water tables, erosion of the road prism and sediment transport is likely. Roads not constructed for or not suited for all-weather use should be closed during these saturated or thaw conditions. This can be performed by gating, cabling, posting notices, and/or placing barriers such as logs or boulders at the roadhead.

Restricting access also may benefit fish and fish habitat by reducing human pressures on sensitive areas. Seasonal or periodic closures can give chronic problem areas like trails, remote campsites, and eroding stream banks a chance to recover through a natural process of revegetation and stabilization. Also, closure of stream crossings at fords during spawning season should be prohibited to reduce damage to fish and sedimentation of spawning gravels.

7.17.2 General Benefits

- road erosion is not accelerated by mechanical disturbance
- sensitive or chronically disturbed areas recover more quickly
- not a permanent measure--applied easily and only when necessary

7.17.3 General Drawbacks

- public sentiment may resent some closures
- not easily enforced

7.18 ROAD CLOSURE

7.18.1 Overview of Technique

Road closure or road obliteration is both a preventive and corrective practice intended to reduce sediment generated from temporary or unnecessary roads and to return the land to natural production. Temporary roads allowed to remain in use beyond their prescribed time may be subject to damage, and can become chronic sediment sources.

Effective obliteration is achieved by blocking access, removing all culverts and bridges, restoring the natural surface and subsurface drainage patterns, and revegetating all surfaces to reduce surface erosion of bare soils. These efforts may also include any or all of the following: reshaping and stabilizing side slopes, removing rock overlay down to the elevation of the adjacent terrain, ripping the subgrade where compaction is identified as a problem, installing water bars where necessary, and planting both herbaceous cover and trees and shrubs.

7.18.2 General Benefits

- removal of potential (and often active) sediment sources in a watershed reduce sediment yields to streams and fish habitat
- time and cost savings through reduced maintenance requirements

7.18.3 General Drawbacks

- untraveled roads easily become un-monitored roads--it may be possible for eventual failure of even obliterated roads to go unnoticed for a long period of time

7.19 WATER BARS

7.19.1 Overview of Technique

Placement of water bars on closed roads, or water bars, broad-based dips, or hardened fords on infrequently used, low maintenance roads may be preferable to the installation of culverts to pass streams and road drainage downslope. Culverts may clog (especially where unstable slopes, undercut stream banks, or high bed load transport rates are observed or suspected upslope) and divert water down or across the road surface resulting in greater erosion and sediment generation. Maintaining water bars with armored material on infrequently used, dry season roads may generate smaller sediment yields over the life of the road. Steepness of slope is a factor to be considered in both the decision to place water bars on roads, as well as the frequency of their placement.

Roads of this nature, though sometimes warranted, should be reviewed periodically and considered for complete road closure.

7.19.2 General Benefits

- low maintenance
- reduced risk of large failures where large bed load volumes are expected
- can be armored with coarser substrate to result in minimal road erosion

7.19.3 General Drawbacks

- permits channeled water to be in contact with road prism--a potentially highly erosive situation

7.20 INSPECT CLOSED ROADS

7.20.1 Overview of Technique

Closed roads may remain unstable for years after their closure because of unobserved subsurface modifications created by the road, or by failure of revegetation efforts. Obliterated roads should be scheduled for initial inspection for mass movements, surface erosion, and the adequacy of cover of pioneering vegetation after the first winter or wet season after closure. Depending on the results of such an inspection, one, two, or more inventories can be scheduled at annual or biannual intervals. Conduct re-seeding or restoration work as needed.

Where opportunities exist, roads may be only partially closed and transformed into recreational trails. The creation of trails increases the frequency of monitoring as well as provides a recreational benefit.

7.20.2 General Benefits

- ensures the long-term reduction of sediment sources in a watershed
- recreational benefit of trails is a possibility

7.20.3 General Drawbacks

- none

7.21 RELOCATE ROADS

7.21.1 Overview of Technique

Existing, poorly located or constructed roads may be relocated if road closure is not warranted but chronic sedimentation or habitat degradation persist. Other Best Management Practices will apply.

7.21.2 General Benefits

- correction of chronic sediment problems
- opportunities for improved access

7.21.3 General Drawbacks

- relocation is a permanent access restriction

8 FOREST MANAGEMENT TECHNIQUES

Practices located in Section 2 "Special Vegetative Treatments" may also apply to this section, and vice versa.

8.1 SMA WIDTHS

8.1.1 Overview of Technique

Riparian areas should be managed in relation to various legal mandates of federal and state governments. Federal requirements include the Inland Native Fish Strategy (USFS 1995) and the Eastside Ecosystem Management Plan. State requirements include, but are not limited to, those associated with floodplains, wetlands, water quality, dredged and fill material, endangered species, wild and scenic rivers, and cultural resources.

Width of the managed riparian area is subject to state and federal regulations, but should consider site-specific factors in a determination of adequacy. These factors include: slope steepness, class of watercourse, depth to water table, soil type, type of vegetation, and intensity of management. SMAs should be delineated and evaluated on the ground before implementing any project activity.

8.1.2 General Benefits

- protection of streamcourse and influences on the streamcourse such as large woody debris recruitment, shade, detritus, slope stability, microclimate control, etc.
- protection of riparian-dependent wildlife habitat

8.1.3 General Drawbacks

- limited land management practices available within SMAs

8.2 MINIMIZE DISTURBANCES WITHIN SMA

8.2.1 Overview of Technique

Disturbances that would expose mineral soil within the SMA should be minimized. Possible disturbances include both human-induced and natural causes. Regardless of the cause, soil exposed in SMAs is subject to scour and the entrainment of sediment during periods of high flow, or it may be subject to surface erosion by water and gravity. Soil compaction and puddling can also lead to long-term changes in protective vegetative cover.

Human-induced causes of soil disturbance include the use of skidders or heavy machinery within the SMA, the ground skidding of logs within SMAs, improper road and landing location, and fire initiated by sparks from harvest equipment. Adverse effects can be avoided through the implementation of BMPs and the administration of state and federal forest practices code. These activities include, but are not limited to, proper forest harvest planning, inspection of harvest units before and after logging, proper maintenance of equipment, weather restrictions on operations, and the obliteration of temporary roads.

More "natural" causes of soil disturbance in SMAs include the windthrow of riparian trees weakened by adjacent harvest and resulting higher wind speeds, scour of floodplains and terraces by deep, fast-flowing waters at floodstage. These disturbances can be reduced by consideration of the prevailing winds and storm dynamics known about an area when designing buffers. Additional "transition buffers" of variable density may be useful in "feathering" buffer SMA boundaries to increase windfirmness. Floodplain boundaries that extend beyond regulated SMA widths may also warrant conditional management design and practices.

8.2.2 General Benefits

- reduction in soil available for entrainment by flood flows or downslope movement to streams
- maintenance of stable side slopes

8.2.3 General Drawbacks

- none

8.3 LOCATE LANDINGS AND ROADS OUTSIDE SMA

8.3.1 Overview of Technique

Roads and landings should be located outside SMAs except as noted in technique 8.1.

8.3.2 General Benefits

- reduction of bare soil and active disturbance areas adjacent to streams

8.3.3 General Drawbacks

- road location restrictions (some variances may be granted where short lengths of well-maintained road in SMAs may reduce greater road lengths on more unstable slopes or other sensitive areas)

8.4 APPROPRIATE CHEMICAL USAGE IN SMA

8.4.1 Overview of Technique

Avoid or limit use of chemicals such as pesticides and fertilizers in SMAs, particularly those where seasonal flood flows or rapid through-flow of soil water may result in transport of these chemicals or nutrients directly into streams.

There are other chemical management practices included with the agriculture/crops techniques in Section 3 of this appendix. Most apply directly to forest management situations as well; a few would require minor modifications for implementation in a forest environment. Reference the following techniques when considering chemical usage in SMAs: 3.23 Chemical Management Plans; 3.24 Fertilizer Application: Rates and Timing; 3.26 Evaluate Field Limitations; 3.27 Equipment Calibration and Use; 3.28 Alternative Pest Management Strategies; 3.29 Herbicide/Pesticide Application, 3.30 Apply Herbicides/Pesticides Selectively; 3.31 Herbicide/Pesticide Application Rates; 3.33 Enforce Current Herbicide/Pesticide Use Regulations; 3.34 Aerial Spray Applications: Buffer Zones; 3.35 Aerial Spray Applications: Atmospheric Conditions; 3.37 Spill Contingency Planning; and 8.12 Fertilization.

8.4.2 General Benefits

- risk of water quality degradation is reduced

8.4.3 General Drawbacks

- higher cost, more labor intensive techniques may need to be applied to achieve similar results

8.5 DIRECTIONAL FALLING OF TREES

8.5.1 Overview of Technique

When falling trees in/near stream channels and SMAs, fall trees away from these courses so that generation of slash from bucking and soil disturbance by skidding is minimized in the SMA. Jacking and cabling trees may be used to assist in directional falling. Appropriate responses to incidental introduction of trees and slash into streams and SMAs should be handled on a case-by-case basis. Debris may be removed by the least disturbing method, or left in place if removal will exacerbate channel instability or interfere with SMA functions.

8.5.2 General Benefits

- disturbance prevention

8.5.3 General Drawbacks

- none

8.6 HARVESTING RESTRICTIONS

8.6.1 Overview of Technique

Timber harvest in SMAs should be consistent with applicable federal and state forest practices regulations. Avoid or limit timber harvest when possible, except where safety concerns predominate. Some selective timber harvest (individual tree selection, small group selection, commercial or pre-commercial thinning) can improve riparian and instream habitat if appropriately implemented.

8.6.2 General Benefits

- maintenance of riparian vegetation functions

8.6.3 General Drawbacks

- land use restrictions

8.7 REMOVAL OF INTRODUCED TREES AND SLASH

8.7.1 Overview of Technique

Appropriate responses to incidental introduction of trees and slash into streams and SMAs should be handled on a case-by-case basis. Debris may be removed by the least disturbing method, or left in place if removal will exacerbate channel instability or interfere with SMA functions. Debris deposited in fish streams should be addressed as soon after introduction as practicable. Debris deposited into non-fish-bearing streams should be addressed before the completion of the project, or before the commencement of winter storm events or other high streamflow seasons.

8.7.2 General Benefits

- disturbance prevention

8.7.3 General Drawbacks

- none

8.8 TIMBER HARVEST UNIT DESIGN

8.8.1 Overview of Technique

This is an administrative and preventive practice in which proposed timber harvest units are evaluated to estimate site-specific impacts and determine appropriate techniques for minimizing soil erosion and water quality degradation. Harvest unit design incorporates site-specific information and field verification in order to consider:

- stream channel protection (channel incision depth and width),
- potential slope instability and erosion hazard (slope angle and soils),
- size and shape of unit,
- landform characteristics,
- road and skid trail network,
- logging system design,
- relative risk of windthrow (including local wind direction and intensity),
- wetland and riparian protection (composition and canopy structure), and
- other special watershed protection needs.

Where adverse water quality and soil productivity impacts, or undesirable streamflows may result, the harvest unit design should be modified.

8.8.2 General Benefits

- stream channel protection
- reduced sediment production from roads and skid trails
- wetland and riparian protection

8.8.3 General Drawbacks

- none

8.9 DETERMINING GUIDELINES FOR YARDING OPERATIONS

8.9.1 Overview of Technique

Yarding systems and operational guidelines are selected to protect soil and water resources and meet management objectives. In addition to silvicultural treatments and transportation systems, yarding suitability must be determined after consideration of soil and landform inventories and hydrologic information. Watershed factors to consider include:

- slope gradient and aspect,
- soil and slope stability,
- erodibility and compactability,
- vegetative cover,
- streamcourse protection needs,
- riparian areas, wetlands, and meadows, and
- other factors affecting water quality, flood, and sediment yield potential.

Yarding operations may include either or both ground-based and cable methods.

Ground-based methods include dragging (skidding) logs behind rubber-tired or tracked tractor equipped with a grapple and/or short cable and winch. Another method uses a tracked shovel to pass or "leap-frog" logs toward a landing using motion that provides more lift and less soil disturbance than conventional skidding.

Considerations for groundskidding include:

- limit skidding to slopes less than 35% to 40%;
- skid along the slope contour wherever possible;
- landings should be located upslope wherever possible;
- skid logs with one end suspended to reduce rutting or gouging;
- avoid skid trail layouts that concentrate runoff into draws and streams;
- use cables or grapple reach to winch (endlining) or pull logs out of sensitive areas where the encroachment of heavy equipment may disturb soils or impair water quality; and
- logging over frozen ground and/or snow with adequate depth can protect both the soil and residual vegetation, thereby preventing soil and water quality degradation.

Considerations for shovel yarding include:

- limit shovel yarding to slopes of about 20% or less;
- avoid broken, uneven topography and areas which are frequently dissected by deeply incised streams;
- on soils of low bearing strength, support tracks with logging slash;
- the number of turns on shovel trails should be limited, depending on soil type and vegetative cover;
- wide arc turns can reduce soil disturbance on shovel trails; and
- live streams should not be crossed without the use of a temporary structure, such as a log mat.

Cable methods are best used on steeper slopes, or in broken topography, or where yarding occurs over long distances. Cable systems such as highlead yarding and skyline yarding offer some degree of log suspension, thereby reducing soil disturbance. A special type of cable method, helicopter yarding, is a true aerial system where logs are fully suspended from the pick-up point to the landing.

Considerations for highlead yarding include:

- appropriate where resource protection does not require full or partial log suspension and where ground-based systems are inadequate or inappropriate,

- use on slopes in excess of about 40%,
- yard logs uphill wherever possible for greater control, and
- avoid yarding in or across streams by using stream courses as setting boundaries for each landing

Considerations for skyline yarding include:
- use on slopes in excess of about 40%;
- appropriate where log suspension may be required on steep or unstable slopes, over sensitive soil, and in riparian areas or wetlands;
- perform a suspension feasibility analysis and field verification, if necessary to determine required and obtainable deflection;
- partial suspension is the norm, but full suspension can be obtained where terrain is favorable;
- use lift or tail trees to increase suspension and payload; and
- yard logs uphill wherever possible for greater control.

Considerations for helicopter yarding include:

- full-suspension assures soil and water protection;
- applicable to all terrain conditions and suitable for most silvicultural prescriptions;
- requires less road construction, and may be suitable for providing access across unstable terrain; and
- time-sensitive operation which must optimize weight-yarded per unit time to be cost effective.

8.9.2 General Benefits

- method dependent, see 10.3.1
- potential benefits include reducing soil erosion, soil compaction, gullying and the disruption of sensitive vegetation

8.9.3 General Drawbacks

- method dependent, see 10.3.1

8.10 STREAM CHANNEL PROTECTION DURING TIMBER HARVEST

8.10.1 Overview of Technique

Stream channels should be protected during harvest operations to:

- maintain the natural flow regime,
- provide for unobstructed passage of stormflows,
- maintain the integrity of the riparian area to filter sediment and other pollutants,
- restore the natural course of any stream that has been diverted as soon as practicable,
- maintain natural channel integrity to protect aquatic habitat and other beneficial uses, and
- prevent adverse changes to the natural stream temperature regime.

Various other techniques included in this section and in Sections 2, 8, 9, and 11 may be applicable specifically to streamcourse protection and should be implemented to meet these objectives.

8.10.2 General Benefits

- many; see specific techniques

8.10.3 General Drawbacks

- few, variable; see specific techniques

8.11 EQUIPMENT SERVICING

8.11.1 Overview of Technique

During the servicing or refueling of logging, road construction, and other equipment, petroleum products may be spilled and potentially enter a water course. This risk is minimized by locating service and refueling sites 100 feet from stream channels and wetlands (or per state/federal regulations). Minor oil spills can be prevented by using good housekeeping techniques including:

- collecting used oil, oil filters, and grease tubes;
- requiring equipment operators to carry oil absorbent pads;
- providing containment and cleanup for portable fuel tanks;
- following approved disposal methods for waste products; and
- repairing equipment leaks promptly.

When spills do occur, it is important to contain and clean up the spill quickly and notify all proper authorities. It is important to have a written spill contingency plan before spills occur to assure these procedures are done promptly and properly without omissions. A spill contingency plan should be prepared for each project requiring the operation of heavy equipment.

8.11.2 General Benefits

- reduced risk of contaminating surface water and ground water with petroleum products

8.11.3 General Drawbacks

- none

8.12 PRESCRIBED BURNING

8.12.1 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)

8.12.2 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

8.12.3 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

8.13 STAND THINNING

8.13.1 Overview of Technique

Commercial or pre-commercial thinning may have benefits in addition to the added-value of timber. Forest stand characteristics may be modified through thinning to provide benefits to:

- understory vegetation, including shrub and herbaceous cover of soil;
- primary aquatic food production;
- size of trees available for large woody debris recruitment; and

- wildlife habitat, including the production of snags and multi-story canopies.

Thinning operations should follow other best management practices including timber falling, slash management, and yarding practices, if appropriate.

8.13.2 General Benefits

- soils protected against surface erosion as well as mass movements
- increased solar energy input supports primary food production
- large wood available for large woody debris recruitment

8.13.3 General Drawbacks

- impacts from harvest/thinning on soils and residual trees
- potential for slash to enter streams from riparian areas

8.14 PLANT/PRESERVE TREES IN UNDERSTOCKED AREAS

8.14.1 Overview of Technique

Depending on management objectives, harvested forestland should be returned to natural or optimum production of trees. Stocking characteristics (density, spacing, canopy development) vary by site (climate, elevation, aspect, soils, and species) and management objective. Sites which are understocked or unstocked are both less than fully productive and generally subject to increased surface erosion and/or mass movements.

Where forestland is understocked or unstocked following timber harvest or other land clearing, reforestation by tree planting may be an option for stabilizing sites. On a watershed scale, reforestation can influence the hydrology of the basin by moderating extreme hydrologic events (e.g., decreasing peak flows and increasing summer base flows).

Reforestation in riparian areas has other benefits to the aquatic environment. See techniques 2.1, 2.2, and 9.1.

Some land may be "understocked" or marginally productive for natural reasons (e.g., unproductive soils, harsh climates at high elevations, etc.). In these areas planting may have limited success. In these cases preserve existing trees as natural seed sources, and consider planting along the perimeter (especially the downslope perimeter) to help stabilize sediments moved off-site.

Planting may be done mechanically, with wheeled or tractor-pulled planting machines, or by hand. Planting machines should be limited to flatter slopes and should be done on the contour where possible.

8.14.2 General Benefits

- improved soil protection through rooting strength, wind and raindrop energy dissipation, and development of organic soil horizons.
- maintained site productivity
- reduction in downslope sediment yields

8.14.3 General Drawbacks

- planting machines may cause some site disturbance

8.15 MANAGE STANDS TO ENHANCE SNOWPACK

8.15.1 Overview of Technique

The amount snow under a dense forest canopy is extremely limited by the interception and ablation of snow in the canopy. The depth of snow in an open field is similarly limited by ablation (and re-distribution) driven by sun and wind. Managing forest stands at densities which increase canopy openings intermediate to these two situations can increase both the depth of the snowpack and the length of time that it is stored on the ground surface. Ablation of the snowpack is slowed by the reduction in direct solar radiation received by the snowpack (it is transmitted to the tree crowns) and the reduction in wind shear at the snow surface (wind speed reduced by forest vegetation). With the snowpack slowly feeding ground water as it melts, as compared to surface runoff of rapid snow melt, ground water supplies to support summer base flows is increased.

8.15.2 General Benefits

- risk of surface erosion generated by rapid runoff is reduced
- risk of degraded channel conditions as a result of increased peak flows is reduced
- increased ground water to support base flow conditions

8.15.3 General Drawbacks

- requires relatively large areas to generate significant results
- requires changes in the silviculture and rotation of the managed stands
- controversial

8.16 STUDY REWARD/PENALTY SYSTEM

8.16.1 Overview of Technique

The impacts of many forest practices are in a large way dependent directly on the skill and care with which they are implemented. A prescribed "best management practice" may be ineffective solely for reasons of incompetence or apathy on the part of the forest worker. An "acceptable practice" implemented on the same site may be extremely effective and environmentally sound when performed by a skilled, knowledgeable, individual.

Currently there are no known avenues or standards for recognizing the quality of work done in a forest environment. A system which recognizes good forest work and rewards or penalizes performance may increase the standard by which work is accomplished and result in reduced environmental impacts. The design and implementation of such a system may be warranted.

8.16.2 General Benefits

- potential to reduce environmental impacts

8.16.3 General Drawbacks

- difficulty in administration

8.17 SEED AND SPECIES SELECTION

8.17.1 Overview of Technique

Disturbed areas with exposed bare soil need to be protected by vegetation as soon as practical. Herbaceous seed mixtures (generally grasses and legumes) should be adapted to the site. Exotic species should be avoided. Once the site is "secured" by herbaceous cover, the goal is succession of natural shrubs and trees. Therefore seed mixtures should include a proportion of annuals which will stabilize soils for the first year, but yield to natural, native vegetation in successive years. Seed selection for late growing season applications should include a high proportion of annuals with plans to seed again in the spring.

8.17.2 General Benefits

- established vegetation stabilizes or secures soil in place
- seed selection can be adapted to seasonal variability
- native species are adapted to climate and soil conditions and are hardy

8.17.3 General Drawbacks

- none

8.18 PRIORITY AREAS

8.18.1 Overview of Technique

Disturbed areas should be prioritized for revegetation based on severity of disturbance, disturbed area, slope steepness and slope length, soil erodibility, season, expected success of natural revegetation, expected success of seeded or planted vegetation, availability of suitable seed mixtures, and the quantity and quality of potentially degraded habitat.

8.18.2 General Benefits

- maximized reduction in erodible area

8.18.3 General Drawbacks

- risk of failure to germinate often tied to site-specific factors

8.19 OPTIMUM SEEDING PERIODS

8.19.1 Overview of Technique

Seed at the start of optimum periods for growth and establishment. Timing will depend on the site location. species planted, and, for disturbances associated with proposed projects. scheduled completion date.

8.19.2 General Benefits

- maximize chances for establishment; maximize quality of cover

8.19.3 General Drawbacks

- none

8.20 MULCHING

8.20.1 Overview of Technique

Reseeded areas should be mulched to prevent translocation of seed by wind or water. reduce erosion by raindrop splash, and maintain soil moisture. Mulches can also be used to temporarily stabilize unseeded slopes until seeding or other stabilization techniques are implemented. Type and amount of mulch varies by region, erosion potential, and available materials.

Native, biodegradable materials should be used wherever possible. Mulch should be free of noxious weeds and other non-native seed.

8.20.2 General Benefits

- maximize vegetation establishment
- reduce erosion potential of recovering sites

8.20.3 General Drawbacks

- none

8.21 FERTILIZATION

8.21.1 Overview of Technique

Fertilization is probably necessary to help establish vegetation on disturbed forested areas, especially along roads and on mass wasting slopes and deposits. where often thin topsoil is removed or buried. Sampling soils to be planted or seeded for available nitrogen, phosphorus, potassium, and sulphur will verify that fertilization will satisfy the requirements of the seed mixture to be sown. Fertilization may be applied in lifts--at seeding, at germination, and then periodically thereafter until establishment.

8.21.2 General Benefits

- increased quantity and quality of vegetative cover
- shortened time to establishment

8.21.3 General Drawbacks

- risk of nutrient fluxes to streams or ground water given wet weather conditions

8.22 SITE PROTECTION

8.22.1 Overview of Technique

Seeded or planted areas should be protected from disturbance by foot and vehicle traffic, cattle grazing, and the like. Protection options may include the use of flagging, rope fencing, conventional fencing, and/or posting of notices. Re-seeding vegetation may be necessary if disturbance occurs before establishment is sufficient.

8.22.2 General Benefits

- increased quantity and quality of vegetative cover
- shortened time to establishment

8.22.3 General Drawbacks

- none

8.23 MONITOR REVEGETATED AREAS

8.23.1 Overview of Technique

All seeded areas should be inspected for establishment on a regular basis, including a germination inventory about 2 weeks after seeding. Where failures are evident, implement additional stabilization techniques, if necessary, and reseed.

8.23.2 General Benefits

- assure quantity and quality of vegetative cover

8.23.3 General Drawbacks

- none

8.24 VEGETATE STEEP SLOPES

8.24.1 Overview of Technique

Grass seeding may have limited success in preventing surface erosion from slopes exceeding the angle of repose. Additional stabilization techniques may need to be implemented and supported by planting and seeding efforts. Native woody plants should also be planted as sprigs, cordons, or wattles in rows on slope contours.

8.24.2 General Benefits

- assure quantity and quality of vegetative cover
- faster establishment of larger roots and adventitious roots
- maximized reduction in erodible area

8.24.3 General Drawbacks

- none

8.25 INTERIM STABILIZATION METHODS

8.25.1 Overview of Technique

Implement interim surface stabilization methods to control surface erosion during non-growing seasons. Methods may include mulching, installation of erosion-control fabric, and terracing or other mechanical methods. Seeding should occur as soon into the growing season as practicable.

8.25.2 General Benefits

- reduction in surface erosion
- reduction in offsite removal of eroded material which may be stabilized by subsequent vegetation

8.25.3 General Drawbacks

- requires additional site visit

8.26 AGGRESSIVE FIRE SUPPRESSION

8.26.1 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.

8.26.2 General Benefits

- more predictable and controllable than natural fire
- can be used to protect developed areas or other areas where fire would be detrimental

8.26.3 General Drawbacks

- requires relatively high devotion of resources
- requires thorough understanding of natural systems and processes, some of which may not be fully understood

8.27 NATURAL FIRE CONTROL

8.27.1 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.

8.27.2 General Benefits

- allows natural processes to occur
- if natural fires occur frequently, then the severity of each fire may be relatively low

8.27.3 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

8.28 PRESCRIBED BURNING TO REDUCE FUELS

8.28.1 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)

8.28.2 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

8.28.3 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

8.29 SEASONAL GRAZING MANAGEMENT TO REDUCE FUELS

8.29.1 Overview of Technique

Grazing involves releasing livestock onto rangeland for the purpose of providing forage and shelter to the animals. As an ancillary benefit, grazing serves as a vegetation manipulation management tool. Shrub density is reduced, thus releasing trees from competition and reducing fire fuels.

Modern grazing management involves intensive grazing systems that utilize fencing, rotation of use, and control of movements. These same strategies applied on a time scale of 2 to several years can minimize the buildup of fire fuels while sustaining adequate vegetative cover.

8.29.2 General Benefits

- can cause desired changes in vegetation relatively inexpensively, compared with chemical or mechanical techniques
- reduces need for prescribed burning

8.29.3 General Drawbacks

- land and water resources may sustain damage from livestock

8.30 WILDFIRE CONTINGENCY WATERSHED RESTORATION PLANS

8.30.1 Overview of Technique

Good watershed management plans will include contingency wildfire restoration plans. Plans will include at a minimum:

- revegetation plans including seeding, planting, and fertilizing
- temporary erosion control measures such as water bars, windrowing, mulching, etc.
- stream channel clearing to prevent debris damming
- sources of materials, supplies, equipment, and manpower for the above measures

8.30.2 General Benefits

- interagency support as consultants
- rapid response to minimize erosion and reduce sediment yields

8.30.3 General Drawbacks

- fire fighting efforts are outside the scope of plan
- complex land ownership patterns will make implementation difficult

9 URBAN AREA TECHNIQUES

9.1 ZONING/LAND USE PLANNING

9.1.1 Overview of Technique

Zoning ordinances based on land use plans can alleviate future demands for withdrawal and discharge of water from surface and groundwater sources for urban, suburban, and rural uses. Zoning for low-intensity land use can be a sound and successful method for protecting fish and wildlife habitat.

9.1.2 General Benefits

- adequate water supplies
- estimated pollutant loadings may be maintained within capacity of system to recover, (or exceedences may be anticipated, monitored, and mitigated)

9.1.3 General Drawbacks

- limits use of land

9.2 URBAN RUNOFF FACILITIES

9.2.1 Overview of Technique

This technique involves the operation and maintenance of runoff facilities, such as infiltration basins and trenches, vegetated filter strips, grassed swales, constructed wetlands, porous pavement and concrete grids, and detention ponds (Puget Sound Water Quality Authority 1989).

9.2.2 General Benefits

- increased infiltration and reduced runoff
- pollutant loading to storm drains and receiving waters is reduced

9.2.3 General Drawbacks

- increased infiltration may enable pollutant leaching to reach the water table

9.3 LIMIT FUTURE DEVELOPMENT OF SEWER SYSTEMS

9.3.1 Overview of Technique

Within the context of Section 12.1, sewer system construction may be replaced by the construction of septic systems in selected areas.

9.3.2 General Benefits

- natural treatment and dispersal of wastes
- construction disturbance consists of localized trenches rather than lengthy continuous trenches--sediment yields may be decreased

9.3.3 General Drawbacks

- septic maintenance problems may result in release of contaminants to surface water and/or ground water

9.4 IMPROVE EXISTING SEWER SYSTEMS

9.4.1 Overview of Technique

Where problems with existing sewer systems, such as leaks or capacity shortages are known, make repair of these systems a priority.

9.4.2 General Benefits

- reduced loading of organic and bacterial wastes to surface water

9.4.3 General Drawbacks

- localized and temporary ground disturbance to repair sewer lines and facilities

9.5 INDUSTRIAL/CONSTRUCTION CHEMICALS/FUELS

9.5.1 Overview of Technique

This technique, or collection of techniques, expands on the Chemical Management Techniques of Section 7. Industrial and construction chemicals concerns in urban areas may include the generation, transfer and transport, storage, and release of large quantities of pesticides, fertilizers, petroleum products, solvents, paints, and other pollutants.

After spill prevention, containment and collection of spilled pollutants on-site is the preferred technique for maintaining high water quality. Safe containment and recycling features should be designed and constructed, for example, at industrial plants, gas stations, car washes, and heavy construction fueling and maintenance areas. Containment design should consider maximize storage volume, 100-year or greater design storm for the size (area) and location of the facility, and an additional factor of safety. Such features should be required on all new construction and retrofitted on existing facilities. State and federal regulations apply.

9.5.2 General Benefits

- reduced risk of accidental introduction of pollutants to surface and groundwaters
- recycle/save recovered chemicals

9.5.3 General Drawbacks

- high cost for design and implementation
- continued maintenance required
- additional treatment of spilled material required

9.6 PROHIBIT FURTHER CHANNELIZATION

9.6.1 Overview of Technique

Natural channel systems, including natural variability in physical channel structure, know how to best maintain themselves and do not need to be "trained". New construction should occur outside of the zone lateral migration. Minimal channel "training" should occur, and then to protect existing infrastructure. Habitat enhancement structures may be a satisfactory alternative to channel "training".

9.6.2 General Benefits

- maintains as much as possible the naturally operating processes necessary to creation and maintenance of channel structure and fish habitat

9.6.3 General Drawbacks

- existing infrastructure may limit success of desired channel condition and management goals

9.7 AVOID BUILDING ON FLOODPLAINS

9.7.1 Overview of Technique

Floodplains belong to the domain of the fluvial channel. Any structures, debris, or activity occurring on the floodplain is subject to inundation and scour and deposition by the channel. Conversely, these features may reduce the water quality of the overbank stream. Avoiding construction on floodplains minimizes the risk of water quality degradation.

9.7.2 General Benefits

- risk of water quality degradation and property damage is reduced
- peak flow events are moderated to the maximum extent possible
- sediment yield is reduced

9.7.3 General Drawbacks

- many floodplains already contain structures

9.8 PUBLIC EDUCATION PROGRAMS

9.8.1 Overview of Technique

Teach proper use and disposal of household supplies hazardous to the environment (Puget Sound Water Quality Authority 1989).

9.8.2 General Benefits

- risk to water quality degradation from storm drains and sewers is reduced

9.8.3 General Drawbacks

- public education often may not reach the "worst offenders"

9.9 RECYCLING PROGRAMS

9.9.1 Overview of Technique

Used motor oil, antifreeze, paint, cleaning supplies, and other hazardous household chemical recycling programs should be implemented for the protection of the aquatic resource and the public's convenience.

9.9.2 General Benefits

- volume reduction in public waste stream of materials which frequently are deposited in or near storm drains
- improved downstream water quality

9.9.3 General Drawbacks

- none

9.10 LAWN CARE AND LANDSCAPING

9.10.1 Overview of Technique

The cumulative impacts of individual lawn care practices for entire urban areas can contribute significantly to nonpoint source pollution. Broad based educational efforts are necessary to encourage proper lawn management and landscaping. All of the following practices are applcable to home and yard owners in the Columbia River Basin:

- proper pesticide and herbicide use, including reduced applications;
- implement Integrated Pest Management (IPM) methods (see Technique 3.28 and scale as appropriate for single owner or subdivision lawncare);
- reduced rates of fertilizer application and improved timing;
- limited lawn watering;
- xeriscaping;
- reducing runoff by increasing infiltration; and
- training and certification programs for lawn care professionals.

9.10.2 General Benefits

- nutrient concentrations available to lawns remain high
- reduced runoff

- chemicals available to runoff are reduced
- water quality remains high

9.10.3 General Drawbacks

- public education often may not reach the "worst offenders"

9.11 ENCOURAGE ONSITE RECYCLING OF YARD TRIMMINGS

9.11.1 Overview of Technique

Nutrients contained in yard trimmings can be recycled in a home composting program. Compost releases nutrients more slowly than many fertilizers, increases organic matter in the soil, increases infiltration, decreases runoff, sustains high moisture contents in the soil, and contains trace metals and other nutrients. Home composting programs may include features such as:

- free composting bins,
- pamphlets explaining the process and its benefits,
- workshops, and
- waste reduction credits (financial) to composters.

9.11.2 General Benefits

- reduced fertilizer loading
- increased infiltration
- decreased need for lawn watering
- decrease in nutrients available for leaching to ground water

9.11.3 General Drawbacks

- compost piles near waterways can result in surface water contamination through leaching

9.12 BIODEGRADABLE CLEANERS

9.12.1 Overview of Technique

Biodegradable cleaners should be encouraged through community education efforts.

9.12.2 General Benefits

- reduction in chemical pollutant loading to surface waters
- reduction in compounds toxic to aquatic organisms

9.12.3 General Drawbacks

- none

9.13 PET EXCREMENT

9.13.1 Overview of Technique

Implement programs to manage pet excrement in order to minimize pollutant runoff to surface waters. Programs may include, for example, "pooper-scooper" laws, zoning ordinances to control horses, and public education efforts.

9.13.2 General Benefits

- reduced bacteria and nutrient loading in surface water
- reduction in "grazing pressure" (vegetation and soil disturbance) by animals in high public visibility areas

9.13.3 General Drawbacks

- public education often may not reach the "worst offenders"

9.14 STORM DRAIN STENCILING

9.14.1 Overview of Technique

Storm drain stenciling of downstream beneficial uses can be an effective tool in preventing the input of toxic, other chemical, and organic wastes into the environment. Stenciling serves as a continual, educational lesson that downstream beneficial uses are directly influenced by a local storm drain.

9.14.2 General Benefits

- reduced pollutant loading at storm drains
- improved downstream water quality

9.14.3 General Drawbacks

- none

9.15 PARKING LOT DESIGN AND STREET MAINTENANCE

9.15.1 Overview of Technique

Sediments which collect on parking lots, streets, and other impervious surfaces can have many pollutants adsorbed to the individual particles. Street sweeping can actually reduce aquatic pollution by removing the sediment before it has a chance to be entrained in stormflow in street gutters and storm drains. Other features such as rectangular designs and the removal of parking space bumpers can increase the efficiency of street sweepers.

Other efforts which achieve similar goals include wet-sweeping for the removal of oil and grease from streets, and grassy swales designed to filter water as it infiltrates.

9.15.2 General Benefits

- reduced pollutant loading at storm drains
- improved downstream water quality
- reduction in downstream sediment yield

9.15.3 General Drawbacks

- none

9.16 WATER CONSERVATION PROGRAMS

9.16.1 Overview of Technique

Water overuse can directly affect the quantity and quality of runoff in streams, especially during the dry season when low flow quantities are unable to dilute polluted runoff. Conservation techniques range from volunteer lawn watering to required water rationing.

9.16.2 General Benefits

- increased water available for low flows
- improved assimilation and dilution of polluted waters

9.16.3 General Drawbacks

- educational efforts may do little to change private habits (as opposed to public habits)

9.17 SEPTIC SYSTEM ADDITIVES

9.17.1 Overview of Technique

Discourage the use and dumping of septic system additives, such as household cleaners, down household drains. This chemicals are persistent in ground water.

9.17.2 General Benefits

- reduction in the loading of toxic pollutants to ground water
- improved downstream water quality

9.17.3 General Drawbacks

- educational efforts may do little to change private habits (as opposed to public habits)

9.18 LITTER CONTROL

9.18.1 Overview of Technique

Litter control can improve the quality of urban runoff where regular sweeping or litter disposal is of low quality. Some common litter control programs include:

- "green" business practices,
- mandatory recycling laws,
- providing technical and financial assistance in establishing community waste collection programs, and
- developing user-friendly recycling programs (curbside pickup, volunteer efforts).

9.18.2 General Benefits

- reduced litter
- improved quality of urban runoff
- visually pleasing

9.18.3 General Drawbacks

- none

9.19 ADOPT-A-STREAM PROGRAMS

9.19.1 Overview of Technique

Communities may promote Adopt-a-Stream programs to provide local citizens an opportunity to focus on watershed influences on a stream. Opportunities include litter pickup, riparian vegetation planting, fish habitat enhancement structures, aquatic insect surveys and other methods of improving and monitoring stream health.

9.19.2 General Benefits

- improved, watershed-scale consideration of the limiting factors on a stream
- improved water quality
- monitoring may detect changes early

9.19.3 General Drawbacks

- un-mentored groups may do more harm than good for a stream's overall health

9.20 DIRECT POLLUTANTS AWAY FROM BRIDGES

9.20.1 Overview of Technique

Design or redesign bridge decks to direct storm water away from stream channels. Divert collected stormflow to land for treatment in vegetated filter areas or storm drains. Adequately design bridge stormflows for 50-year, 24-hour event.

9.20.2 General Benefits

- reduced loading of sediment and other pollutants directly in stream

9.20.3 General Drawbacks

- may be impractical or result in high flow velocities on long bridges

9.21 RESTRICT USE OF BRIDGE SCUPPER DRAINS

9.21.1 Overview of Technique

Scupper drains allow direct discharge of storm water from bridge decks to stream channels below. Restrict the use of scupper drains on all bridges less than 400 feet in length, especially those bridges across high quality habitat.

9.21.2 General Benefits

- reduced loading of sediment and other pollutants directly in stream

9.21.3 General Drawbacks

- may require periodic bridge deck cleaning

9.22 CONSTRUCTION: EROSION AND SEDIMENT CONTROL PLANS

9.22.1 Overview of Technique

All construction efforts with ground-disturbing activity should develop an erosion and sediment control (ESC) plan in accordance with state regulations. The plan should contain erosion and sediment control provisions to reduce erosion and contain sediment on site. The following elements should provide the minimum requirements for an effective ESC plan:

- predominant soil types and known hazards,
- site grading details, including existing and proposed contours,
- structural controls--location and design (mulching, sediment basins, filter fabric, etc.),
- topsoil management,
- stabilization measures--both temporary and permanent, and
- construction plan of work (sequential).

9.22.2 General Benefits

- documented contingency plans/instructions
- reduced runoff and reduced sediment yields

9.22.3 General Drawbacks

- construction staff may not be knowledgeable about plan

9.23 CONSTRUCTION: EROSION AND SEDIMENT CONTROL STRUCTURES

9.23.1 Overview of Technique

Implement structural controls to help reduce erosion and contain sediment on site. Structural controls may include:

- wind erosion controls such as snow fences and hay bales,
- runoff interception structures such as dikes and drainage ditches,
- contour benches, terraces, or ditches across long slopes,
- retaining walls,
- lined conveyance channels,
- check dams,
- seeding and fertilizing,
- mulch/mats,
- sod,
- sediment basins or traps,
- filter fabric fence,
- straw bale barriers,
- storm drain inlet protection,
- paved or graveled construction entrances, and
- vegetated filter strips.

9.23.2 General Benefits

- reduced erosion
- reduced water velocities and increased sediment deposition on site
- sediment-related pollutant loading is decreased

9.23.3 General Drawbacks

- structures are not 100% effective
- frequent maintenance required

9.24 CONSTRUCTION: INSPECT EROSION AND SEDIMENT CONTROL STRUCTURES

9.24.1 Overview of Technique

Monitoring and maintenance of the structures listed under 12.24.1 must occur on a daily basis, especially during inclement weather.

9.24.2 General Benefits

- frequency of structure maintenance is increased
- effectiveness of structures increased

9.24.3 General Drawbacks

- structures are not 100% effective

9.25 CONSTRUCTION: MINIMIZE RUNOFF TO/FROM SITE

9.25.1 Overview of Technique

This preventive erosion control measure seeks to minimize water flowing through or near construction sites. A series diversion and storage structures such as dikes, diversion ditches and water and sediment detention basins may be constructed upslope of a planned construction site. Similar downslope facilities also exist for collecting site runoff. With a reduction in the volume and velocity of runoff and the length of the slope it travels on, erosion of construction sediments is minimized.

9.25.2 General Benefits

- reduced runoff
- reduced erosion
- sediment yields are reduced

9.25.3 General Drawbacks

- structures are not 100% effective (efficiency increased with implementation of multiple structures)

9.26 ROAD SALT STORAGE AND APPLICATION

9.26.1 Overview of Technique

Salt storage piles and other deicing materials should be located outside the 100-year floodplain. Keep them covered when not in use to reduce contamination of surface waters.

Regulate the application of deicing salts to prevent oversalting of pavement and to minimize saline runoff to streams.

9.26.2 General Benefits

- surface water quality is maintained

9.26.3 General Drawbacks

- moderate to high risk of salt leaching into ground water under large storage piles

9.27 ALTERNATIVE DEICING MATERIALS

9.27.1 Overview of Technique

Where high quality fish habitat and other sensitive ecosystems occur immediately adjacent roads or bridges, or lie within a short distance downstream but are without undeveloped tributaries, use alternative deicing materials. Examples include sand or salt substitutes.

9.27.2 General Benefits

- maintain high quality water quality and related habitat

9.27.3 General Drawbacks

- fine sediments can clog spawning gravels

9.28 ACCUMULATED SNOW DISPOSAL

9.28.1 Overview of Technique

Accumulated snow along roadsides and in urban areas may be high in sand, salts, and other debris and pollutants. Prevent dumping of this snow into surface waters.

9.28.2 General Benefits

- maintain high quality water quality and related habitat

9.28.3 General Drawbacks

- spring snowmelt runoff from impervious areas can be very poor quality; high flow velocities may scour the bed and banks of receiving streams

10 RECREATION MANAGEMENT TECHNIQUES

10.1 RELOCATE TRAILS AND CAMPGROUNDS

10.1.1 Overview of Technique

Trails, campgrounds, and other recreational facilities may in some areas provide user benefits at high cost to fisheries and/or resources which affect the quantity or quality of fish habitat. Concentrating fishermen or hikers on trails near sensitive streambanks may accelerate bank erosion and loss of undercut banks. Campgrounds in riparian areas may alter the hydrology of a site by compacting soils with normally high infiltration rates. The same campgrounds could encourage harvest of dead and/or downed trees that are potential sources of instream large woody debris. And wherever a concentration of people exists, the likelihood for water pollution by litter, fecal coliform, and petroleum products is high.

When such conditions exist, an obvious improvement technique is the relocation of the faulty facilities to more stable, less sensitive sites. Relocation would include both construction of new facilities and restoration of the re-located sites. New construction may generate temporary conditions conducive to water quality degradation, but correction of long-term chronic conditions should offset these impacts. Approved relocation plans should precede any construction activity.

10.1.2 General Benefits

- improved water quality
- improved habitat conditions

10.1.3 General Drawbacks

- variable construction-related impacts associated with relocation
- public sentiment for preferred recreation sites may be high
- relocation of facilities does not necessarily guarantee relocation of former users

10.2 IMPLEMENT RECREATIONAL PERMIT SYSTEM

10.2.1 Overview of Technique

Where concentrated recreational pressure is having a negative impact on fisheries and fish habitat, the problem may be alleviated by implementation of a recreational permit system. The permit system would limit the intensity of resource impacts by controlling the number and frequency of users into an area of degraded habitat.

10.2.2 General Benefits

- recreational opportunities remain within an area
- impacted areas may recover naturally and/or faster once recreational use is at or below some "carrying capacity"

10.2.3 General Drawbacks

- public sentiment for preferred recreation sites may be high
- administration and enforcement costs

10.3 IMPROVE CAMPGROUND DESIGN

10.3.1 Overview of Technique

Design criteria for new and existing campgrounds, parks, and other recreational facilities may be improved as needs and opportunities are identified. Opportunities may include, for example, dispersal of user sites (campsites), (re-)location of campsites within a campground, improvedtoilet and sanitation facilities, and control-of-flow structures such as gates; fences, and trails.

10.3.2 General Benefits

- recreational opportunities remain within an area
- reduced fish habitat impacts

10.3.3 General Drawbacks

- none for new facilities
- variable reconstruction-related impacts for existing facilities

10.4 OUTDOORS EDUCATION PROGRAMS

10.4.1 Overview of Technique

Many negative impacts on fisheries and fish habitat can be overcome through effective educational outreaches to recreationists active within a watershed. Many impacts vill be prevented if users are made aware of the causes and effects. Some users will work to mitigate impacts and/or restore degraded sites if informed of the opportunities.

Education programs can cover a range of detail from unstaffed interpretive trails to support of local outdoors and scout groups to funding for interpreters in parks and campgrounds.

10.4.2 General Benefits

- preventive and proactive in nature
- improved habitat conditions
- restoration needs and opportunities publicized
- generally long term in its effect if sustained

10.4.3 General Drawbacks

- may be slow in creating positive effects
- difficult to sustain due to turnover of personnel

10.5 FENCE SENSITIVE AREAS FROM RECREATIONISTS

10.5.1 Overview of Technique

Because concentrations of people can cause resource damage in ways similar to concentrations of livestock (e.g., trampling of streambanks), exclusion of recreationists from sensitive areas by fences and barricades may be an effective enhancement technique.

10.5.2 General Benefits

- reduced physical damage to habitat-influencing structures and processes
- reduced water quality degradation
- improved habitat conditions

10.5.3 General Drawbacks

- exclusion by design does not necessarily guarantee exclusion of all recreationists
- potential negative impacts on wildlife movements
- unsightly

10.6 IMPLEMENT PACK IN/PACK OUT POLICY

10.6.1 Overview of Technique

Where recreational facilities are remote, or where resources to fund sanitation serves are inadequate, implement and enforce a Pack In/Pack Out policy. Inducements for implementation may include providing suitable litter or waste bags, providing a minimum of collection points, and/or levying severe fines on violators.

10.6.2 General Benefits

- reduction in water pollution due to litter reduction

10.6.3 General Drawbacks

- already a "standard" of ethical outdoor conduct
- difficult to enforce

10.7 SANITATION SERVICES

10.7.1 Overview of Technique

Sanitation services include the removal or treatment of both garbage and human wastes in recreational areas. The courses of action available for both these pollution problems varies based on location and available funding.

Garbage may be collected in receptacles on-site and collected on a regular or intermittent basis. It may also be requested that users pack garbage to either home or a nearby receptacle. The spatial coverage of garbage pickup can be limited to heavy-use areas, or expanded, for example, to include infrequently used roadside rest stops.

Facilities for treatment of human wastes range from no facilities whatsoever to flush systems connected to wastewater treatment plants. Intermediate options may include pit toilets; advanced, contained toilet designs; incinerating toilets; and septic systems.

10.7.2 General Benefits

- reduction in litter with increase in services
- reduction in fecal coliform, nitrate, etc. loading with increase in services
- improved water quality

10.7.3 General Drawbacks

- cost of implementation
- cost and difficulty of maintenance and operations

10.8 INSTALL PUMP OR SELF-COMPOSTING TOILETS

10.8.1 Overview of Technique

Pit toilet designs are replaced with contained toilet systems in which waste is easily pumped to removal trucks or treatment facilities. Another design includes a contained, self-composting toilet which minimizes the need for cleaning and maintenance. These contained designs minimize the risk of water quality degradation through contact with shallow ground water.

10.8.2 General Benefits

- reduced risk of water quality degradation
- reduced maintenance requirements

10.8.3 General Drawbacks

- construction impacts
- cost to implement

10.9 CLOSE STREAM TO FISHING TO PROTECT SENSITIVE FISH SPECIES

10.9.1 Overview of Technique

Recreational fishing in some streams may lead to the harassment and/or incidental catch of non-target fish. To reduce the risk of incidental losses or incidental stressing of protected fisheries, certain streams may be closed to all fishing.

10.9.2 General Benefits

- target stocks are clearly protected
- potential impacts on habitat features through increased recreational pressure are reduced

10.9.3 General Drawbacks

- may be unpopular with some fishermen
- may concentrate fishermen in other sensitive streams/reaches resulting in worse habitat degradation

10.10 SEASONAL SPORT FISHERY CLOSURES

10.10.1 Overview of Technique

Recreational fishing in some streams may lead to the harassment, overfishing, and/or incidental catch of non-target fish or of target fish during sensitive life stages. Certain streams may be seasonally closed to prevent impacts to fish resources.

All closures of streams to fishing are subject to state and federal resource agencies.

10.10.2 General Benefits

- target stocks are clearly protected
- potential impacts on habitat features through increased recreational pressure are reduced
- perhaps more acceptable to fisherman than complete closure

10.10.3 General Drawbacks

- may be unpopular with some fishermen
- may concentrate fishermen in other sensitive streams/reaches resulting in worse habitat degradation

10.11 PROVIDE ALTERNATIVE SPORT FISHING LOCATIONS

10.11.1 Overview of Technique

Other sport fishing locations may be promoted as alternatives to popular stream reaches. Closure of the more popular stream reaches may or may not be necessary.

10.11.2 General Benefits

- relieves and/or distributes pressure on both fish and fish habitat
- may expand fishing opportunities

10.11.3 General Drawbacks

- may spread disturbances to otherwise protected areas

10.12 CONSTRUCT WELL TO PROVIDE WATER TO RECREATIONISTS

10.12.1 Overview of Technique

In heavy recreational use areas where some users may frequent stream banks, lakes, or wetlands to collect water for drinking or other uses, alternative water sources may need to be provided. These include well construction, water lines, or spring development (if appropriate) away from the sensitive areas.

10.12.2 General Benefits

- reduction in structural damage of habitat features
- improved water quality due to decrease in human influences on sensitive areas
- safer water supply for recreationists

10.12.3 General Drawbacks

- assumes primary draw to surface water sources is potable or auxiliary water; other attributes may sustain pressure despite alternative water supplies

10.13 MANAGEMENT OF OFF ROAD VEHICLE (ORV) USE

10.13.1 Overview of Technique

Corrective measures may be required where ORV use is causing unacceptable soil erosion and adverse effects on water quality or fish and fish habitat. Corrective measures on disturbed areas may include development of a travel plan, signing or barriers to redistribute use, partial closure during wet weather or to certain vehicle types, total closure, and structural solutions such as culverts and bridges.

10.13.2 General Benefits

- reduction in soil erosion
- water quality and habitat improvement

10.13.3 General Drawbacks

- potential economic loss to recreation-based employment where closures are enforced
- potential pressure on other areas from redistribution

11 MINING AND MINE RECLAMATION TECHNIQUES

Many of the techniques in this section are directed at the inventory and cleanup of abandoned acid-generating mine waste disposal areas in order to prevent further loss of aquatic habitat to Acid Mine Drainage. Under the Watershed Management Program, they are necessarily not intended as operating guidelines for active mines (though many techniques may be applicable). Two techniques speak directly to in-channel dredging operations.

Acid Mine Drainage is produced when sulphide-bearing minerals in rock are exposed to air and water, changing the sulphide sulphur to sulfuric acid. This acid then dissolves heavy metals, such as lead, zinc, copper, and arsenic, which are leached into ground and surface water. Acid Mine Drainage and heavy metals poison drinking water supplies, and can destroy aquatic life and habitat. Acid Mine Drainage can develop in association with underground mines, open pit mines, waste rock dumps, tailings deposits, and ore stockpiles (collectively called mine waste materials in the discussions which follow). Once begun, Acid Mine Drainage can persist for decades, centuries, or longer.

11.1 CONTROL OF RAINFALL LEACHING

11.1.1 Overview of Technique

This technique implements measures to prevent excessive precipitation from entering spent cyanide-leaching heaps and mining spoil areas. The most common approach generally includes the capping of waste piles with low permeability clay liners or other impermeable synthetic or geotextile fabric.

11.1.2 General Benefits

- reduced water supply reduces Acid Mine Drainage
- reduced toxicity and improved water quality
- decreased mortality of fish and aquatic organisms

11.1.3 General Drawbacks

- none

11.2 SURFACE WATER CONTROL

11.2.1 Overview of Technique

Control surface water to prevent contact of water with mined material. Divert streams around the area. Slope surrounding terrain away from storage areas and centers of mine activity. Placing small streams in culverts made of resistant materials can decrease risk of leachate entering surface water supplies. Contour ditches minimize surface runoff and can discharge affected waters into treatment ponds.

11.2.2 General Benefits

- reduced water supply reduces Acid Mine Drainage
- reduced toxicity and improved water quality
- decreased mortality of fish and aquatic organisms
- reduction in sediment delivered from streams

11.2.3 General Drawbacks

- annual maintenance may be required

11.3 FISH AND WILDLIFE PROTECTION

11.3.1 Overview of Technique

Prevent access of fish and wildlife to cyanide solution ponds and treatnent or detention ponds in mined areas. This may be accomplished through removal of mined materials stream diversions, and/or fencing of ponds to exclude wildlife. All discharges from treatment areas to surface waters should be safe for fish and people.

11.3.2 General Benefits

- decreased toxicity of surface waters
- prevent fish and wildlife mortality

11.3.3 General Drawbacks

- none

11.4 TREATMENT OF MINE WASTE

11.4.1 Overview of Technique

Location of waste disposal sites should maximize the distance to surfa:e waters, minimize transport to ground water (consider water table depth, soil type), and minimize risk to beneficial uses (aquifers, fisheries, high quality waters). Where feasible, relocate waste disposa sites to identified low-risk locations. Mill tailings should be returned underground if the risk of ground watr contamination is low. Stabilize waste material to prevent physical movement toward surface waters.

Many heavy metals are leached from waste rock and ore under acid conditions. For these metals, treat mined waste material with lime or caustic soda to neutralize the wastestream and prevent leaching into surface or ground waters. A detailed chemical composition of the wase material should be determined prior to treatment since some metals, such as molybdenum, are releasel into solution in basic environments.

11.4.2 General Benefits

- "neutral" environment decreases Acid Mine Drainage producton
- improved quality (decreased toxicity) of surface and ground water
- decreased mortality of fish and aquatic life

11.4.3 General Drawbacks

- none

11.5 TREATMENT OF MINE WASTE RUNOFF

11.5.1 Overview of Technique

An internal drainage system and detention ponds should be constructed to collect runoff and leachate from stockpiled waste material. Ponds should be constructed using synthetic or impermeable clay liners to prevent leaching to ground water. Treat this effluent as required in NPDES and other permits. This effluent may be treated with lime to reduce acidity. Use decanting systems, as appropriate, to remove water from the ponds after solids separation. Secondary treatment and dilution of this water may be necessary to reduce toxicity to levels safe for fish and people. Slowly discharge treated effluent to receiving streams to reduce deposition of suspended matter and to avoid depressing dissolved oxygen. Mine water may be directly used in mill boilers where it may be recycled to reduce contamination of surface waters.

11.5.2 General Benefits

- increased quality of effluent
- improved surface and ground water quality
- decreased mortality of fish and aquatic life

11.5.3 General Drawbacks

- none

11.6 REVEGETATION OF WASTE DISPOSAL SITES

11.6.1 Overview of Technique

Mined waste material should be limed and capped as discussed in techniques above. Additional reclamation should include the addition of some topsoil, recontouring to provide proper surface drainage, revegetation with native grasses, shrubs, and trees, and the implementation of erosion control structures.

Where stockpiles are located on floodplains or adjacent to streams, they should be relocated to areas with less risk of contaminating surface and ground waters. All such disposal sites should be monitored to assure surface and ground water quality is maintained or improved.

11.6.2 General Benefits

- reduced risk of leachate movement into surface and ground water
- vegetation accelerates site recovery
- well-implemented "closure" reduces long-term maintenance costs

11.6.3 General Drawbacks

- regular, long-term maintenance, especially where repeated revegetation attempts are necessary

11.7 MONITORING MINE WASTE DISPOSAL SITES

11.7.1 Overview of Technique

A plan for the long-term monitoring and evaluation of surface and ground water quality should be developed and implemented. Parameters will vary based on the characteristics of the mined waste material, but should include pH, electrical conductivity, and heavy metals and organic compounds, as appropriate. Macroinvertebrate collection and analysis and/or live bioassays should also be considered for biological monitoring. Threshold of concern criteria, potential corrective actions, responsible authorities, and agency contacts should be identified before monitoring commences.

11.7.2 General Benefits

- reduced risk of long-term surface and ground water contamination

11.7.3 General Drawbacks

- none

11.8 LEACHING FOR REMEDIATION

11.8.1 Overview of Technique

Leaching has potential for clean up of Acid Mine Drainage in soils beneath mined waste material stockpiles. The capacity and quality of the aquifer, the depth to a water table, the presence of confining layers in the formation, and the uses of the aquifer below these sites should be considered. There should be no lateral dispersal of the contaminants to adjacent areas. A well should be sited in the region of highest concentration of the contaminant. The well is pumped to a treatment tank at the surface. Once treated, the leachate is pumped back into the ground through injection wells located around the center of highest concentration. Other injection wells around the outermost periphery of the site pump clean water into the ground to create higher pressure and prevent flow of the contaminant laterally out of the site.

11.8.2 General Benefits

- dilution and confinement of contaminant plume beneath the ground surface
- some metals and contaminants removed during treatment at surface

11.8.3 General Drawbacks

- treats the effects of Acid Mine Drainage, not the source
- difficulty in extracting and treating adequate quantities of concentrated contaminants may make it hard to justify the expense

11.9 GRAVEL MINING WINDOW

11.9.1 Overview of Technique

Limit gravel mining in streams to window prescribed by fish and wildlife agency.

11.9.2 General Benefits

- gravel extraction limited to known period when eggs are not in stream gravels
- rearing fish have opportunity to escape disturbance

11.9.3 General Drawbacks

- turbid water created by dredging can cause mortality by clogging gills
- some rearing fish will be physically injured

11.10 REGULATE STREAM DREDGING

11.10.1 Overview of Technique

Gravel mining in streams is not permitted. Some limited extraction from previously disturbed floodplains and terraces may be permitted given habitat protection guidelines are employed (Saskatchewan Environment and Resource Management 1995a).

11.10.2 General Benefits

- complete protection for all fish of all lifestages

11.10.3 General Drawbacks

- economic impact on gravel extraction businesses

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APPENDIX B

CONTRACTOR DISCLOSURE STATEMENT

ORGANIZATIONAL CONFLICT OF INTEREST REPRESENTATION STATEMENT

This representation is for Task Order 96AT96027, Contract No. 94AM10240, Watershed Management 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, organizationanl, 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.

Grant T. Bailey
Signature

Name: Grant Bailey

Title: Principal

Firm: Jones & Stokes Associates, Inc.

Date of Execution: December 20, 1996

ORGANIZATIONAL CONFLICT OF INTEREST REPRESENTATION STATEMENT

This representation is for Task Order 96AT96027, Contract No. 94AM10240, Watershed Management Program EIS. As a representative of Judith H. Montgomery/Communications, 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, organizationanl, 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.

Judith H Montgomery

Signature

Name: Judith H. Montgomery

Title: Principal

Firm: Judith H. Montgomery/Communications

Date of Execution: 12/20/96

APPENDIX C

COMMENT LETTERS RECEIVED

Letters received commenting on the Watershed Management Program Draft EIS:

Log Number	Name	Affiliation
WMP-03-001	*Found not to be on this project*	
WMP-03-002	Mark Tipperman	
WMP-03-003	Roberta Bates	
WMP-03-004	Mike Keppler	
WMP-03-005	Sidney N. Clouston, Jr.	Clouston Energy Research
WMP-03-006	Steve Wegner	
WMP-03-007	John and Donna Skovlin	
WMP-03-008	Joseph R. Maroney	Kalispel Tribe of Indians
WMP-03-009	Herbert A. Pollard II	Idaho Fish & Game, Clearwater Region
WMP-03-010	Gordon Stewart	Flathead Wildlife, Inc.
WMP-03-011	Steve Kelly and Mike Bader	Friends of the Wild Swan, Inc./Alliance for the Wild Rockies
WMP-03-012	John Etchart	Northwest Power Planning Council
WMP-03-013	Steve Martin	Washington Department of Fish and Wildlife
WMP-03-014	Robert Ament	American Wildlands
WMP-03-015	Candace Thomas	U.S. Army Corps of Engineers
WMP-03-016	Barabara J. Ritchie Cyreis Schmitt Patty Lynch	Washington State Department of Ecology Washington State Department of Fish and Wildlife Washington State Department of Transportation
WMP-03-017	Preston A. Sleeger	U.S. Department of Interior
WMP-03-018	Elizabeth Holmes Garr	National Marine Fisheries Service
WMP-03-019	Richard B. Parkin	U.S. Environmental Protection Agency

Mark Tipperman
59161 McIntyre Road
La Grande OR 97850

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WMP-03-002
RECEIPT DATE:
FEB 20 1997

February 15, 1996

BPA Public Involvment Office - ACS
PO Box 12999
Portland OR 97212

Re: Watershed Management Program Draft EIS

To Whom It May Concern:

After reviewing the proposed alternatives and the "preferred alternative" 6, it is apparent that no alternative except 3 will fulfill BPA's obligation to mitigate the adverse impacts of the Northwest Hydroelectric System.

The watersheds' overriding concern must be restoration of the riparian areas and wetlands destroyed and damaged by the hydroelectric system. Concerns about local economies, costs, culture and the like must take a back seat. Alternative 6 will jeopardize efforts to save riparian species by giving other interests which are not in jeopardy the same level of consideration.

Very truly yours,

Mark Tipperman

403 "M" Avenue
La Grande, OR 97850
February 12, 1997

Bonneville Power Administration
Public Involvement Manager
P.O. Box 12999
Portland, OR 97212

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WMP-03-003
RECEIPT DATE:
FEB 24 1997

Re: Watershed Management Plan,
Draft Environmental Impact Statement

Dear Council:

You have released the draft proposal for the development of set standards for approving projects designed to reverse the loss of resident and anadromous fish habitat.

We have studied the six alternatives in the draft and believe that Alternative 6, if implemented, will provide the best protection for the fish and related environmental conditions.

There are four requisites in this alternative that are especially important:

2. Involve Stakeholders - "Develop an effective public involvement program that includes a variety of ways to solicit public input." (This is a major consideration when spending public monies for projects involving resources essential for public welfare. There has been very little public input outside the immediate circle of the Grande Ronde Model Watershed and those connected with it.)

3. Develop a Statement of the Desired Future Condition - "Identify a desired future condition that is self-sustaining (low Maintenance), including the development of a sense of responsibility and 'ownership' in the general public for watershed conditions."

4. "Establish baseline information for watershed against which change can be measured".

5. "Include as project goals: protection and improvement of a variety of fish habitats, including spawning beds, overwintering and rearing areas, resting pools, protective cover" - - and, "development of riparian habitat that can benefit water quality, fish and wildlife." (Surely these requirements all should be incorporated in every project that boundarys the water.)

"A future condition that is self-sustaining after initial improvements have been completed" - should be an accepted dictate in granting money for any kind of a project. Periodic checking should be an expected provision.

Under 2.1.7, paragraph 3b, the phrase, "-and to avoid adverse impacts on land use, local economies related to the environment" - should be eliminated or more precisely explained. It is too broad and could be a loophole for unwanted but necessary restructuring.

Even though Alternative 6 would be an effective guideline for approval and acceptance of projects at a local level, it seems to me that the present practice of promoting small projects uncoordinated with adjacent conditions is an inefficient restoration strategy. I think the mode of approving projects which will be diminished by contiguous substandard land and water environments is a reversal of what the process should be.

It seems logical that the first step should be to analyze the whole stream, identify all the problems in the entire length, determine specific solutions needed for deficiencies throughout the span, then set priorities for problems most urgently needing reconstruction. That could be done regardless of ownership or location. Then each project would augment the general plan.

For instance, if there is a loss of pools, then the locations should be mapped and possible solutions be deliberated. Projects could then be planned and solutions for implementation be developed. If there is great need for temperature reduction, then all effective ways to make the water cooler should be espoused and mapped for the entire length of the stream even though achievement seems doubtful. In short, the total length of each river or stream should be analyzed, solutions for rejuvenation charted, and logical procedures for accomplishing the total recovery undertaken. Best to set a priority river and work on the entire body than to squander money on isolated small projects that do not have an appreciable effect on the overall incapacity. My recommendation would be a coordinated program to work on all the problems of all the stream at the same time.

I sincerely believe that if a total, correlated plan were developed and presented to the public, there would be a good response even from private land holders. It would, of course, dictate large sums of money but would be more productive in the long term and save the expenditure of money on useless unrelated projects.

Catherine Creek would be a good place to experiment. There should be a synchronized restoration of all the deficiencies in a defined stretch of the stream.

We cannot understand how it is possible to estimate the effectiveness of a project without a plan against which to evaluate how successful the project will be toward accomplishing the goal of mitigating the loss of resident and anadromous fish habitat. For instance, if a project is proposed to fence off a mile section of Spring Creek to restore streamside vegetation, how and much will that contribute to the health of fish in the Grande Ronde River? What are the overall conditions of Spring Creek and what are the plans for the entire system? Will the project compliment the overall plan or will it be liquidated by depleted climates above and below the project location?

Regardless of the "success" of a myriad of projects on feeder streams, if the Grande Ronde River is polluted, overheated, devoid of shading vegetation and otherwise too degraded for a flourishing fish habitat, the money spent on those projects will be wasted.

We are convinced that the standards must require some evidence that there will be a lasting improvement in the total watershed system not just on small tracts that have little influence beyond the site.

It is conceivable that the millions of grant money could be spent on numerous ineffective projects and there will be little recuperation of habitat or increase in fish count. We suspect that fact would not be of grave concern to farmers and other commodity users of the stream waters for whom the efforts to protect and preserve the fish are a nuisance at best. The total demise of all fish would have little impact on their lives. Exhausting all the funds and grants by trifling projects would line their pockets and take care of the annoying fish problem at the same time. Leaving the approval of projects in the hands local water resource users could insure that occurrence.

We request that you always keep in mind the goal of fish protection and total habitat enhancement against which to evaluate the best results possible for the money spent. Will these projects truly accomplish benefits for fish?? (We ask: "At the present rate of project implementation and restoration, how long, how much time will it take, for the waterways to be restored to a flourishing condition where fish and wildlife are thriving, healthy and productive.

We do not think that is possible without a comprehensive plan for the Grande Ronde River Watershed.

Yours truly,

Roberta Bates

Roberta Bates

Copy to: Eric N. Powers, BPA
P.O. Box 3621-ECN
Portland, OR 97208-3621

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: OWATR-03-004
RECEIPT DATE: MAR 11 1997

BONNEVILLE POWER ADMINISTRATION

"I'd Like to Tell You..."

1. The best alternatives are (and tell why): #3 To Design a Construct unobstructed Natural-feeling (looking) water flows around all man-made structures that deter fish from migrating up or down old Natural water routes to spawning areas. instead of spilling over a or thru dams and other obstructions. Concerned with only doing whats required by law is not enough.

2. The alternatives I least prefer are (and tell why): #2 & 4 Not Enough is being done and policies in effect such as draw downs are more adverse than affective as far as wildlife and Aquatic Habitat is concerned. #6 Has too many Action Alternatives and by time all are adressed - Nothing or little will be done because of Adverse impacts on land, economics, recreation, etc.

3. Other management techniques you should consider: 3 The more restoration of habitat the better - it can only inhance the quality of life of all Creatures including man.

4. Other environmental resources you should consider: farming, logging, Camping and/or recreational use. Comercial Ocean fishing! They all have benefited so they all should help restore: Not what will happen to them but what they have done to life [illegible]. Turn the table when they start to wyne about something.

5. I think the environmental analysis would be better if you: #5 Stop being concerned with impacts to Man and Commercial Use and look at strictly Natures need for free flowing unmanipulated use of the water ways and adjacent lands.

6. I also have these comments: For fifty years or probably more private and Government Agencies have spent millions and millions on studys and impact statements. Lets start implamenting some real projects that will have a true and everlasting affect for the better of all. Thanks for your time and Efforts.

(Need more space? Please use the back side of this sheet.)

☒ Please put me on your project mailing list. (You are already on the mail list if you received the Watershed Management Program Draft EIS information in the mail.)

Name Mike L Keppler Phone 466-0804
Address N. 10510 Overview Dr. Spokane Wa. 99207

Please mail your comments by March 25, 1997 to:

Bonneville Power Administration
Public Involvement Office - ACS
P.O. Box 12999
Portland, OR 97212

BONNEVILLE POWER ADMINISTRATION

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER-03-005
RECEIPT DATE: MAR 13 1997

CLOUSTON ENERGY RESEARCH

7846 SW 171st Place
Beaverton, OR 97007

Telephone (503) 642-1886

Bonneville Power Administration
Public Involvement Manager
P.O. Box 12999
Portland, OR 97212

March 7, 1997

RE: Watershed Management Program Standards and Guidelines.

Dear Public Involvement Manager:

Thank you for this opportunity to comment on the Bonneville Power Administration's (BPA) Watershed Management Program Draft Environmental Impact Statement (EIS)

As is stated in chapter one of this EIS, a framework may be established where the BPA manager's prescriptions may serve as a guidance to specific projects within a plan. The requirement exists for BPA to consummate mitigation actions for the loss of fish and wildlife habitat caused by the reservoirs and dams.

Without exception the alternatives have common elements which are stated in chapter two, section 2.1.1, one through eight. In step eight which is titled, "Adapt Management According to New Information"....."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." It is this area of new information and technology which deserves adequate attention as well as action and will be the focus of my comments presently.

Because of new information a status quo process should not be selected. Therefore the first alternative,"No Action" ought not be selected. New is not always better, but it is often better when experience and other feedback sheds more light.

Alternative two contains elements that are shared with the remaining alternatives. It also provides a standardize base for them. However, "Many Best Management Practices (BMPs)" which are not required by law are not addressed. It would cause a loss of many good opportunities of productive collaborations, benefiting many groups and programs. For an example, Tom McKinney could write prescriptions for the preferential treatment of at risk youth and/or first time offender populations in training and employment actions in projects. Comments to BPA's Wildlife Mitigation Program EIS were submitted by me that discuss this approach and opportunity for BMPs application.

As in most cases, a balanced approach is best. It is the preferred alternative of BPA, and embraces most of the good elements of each alternative. Nevertheless, the need of specific projects that improves habitat exists. The entire watershed of the Columbia/ Snake rivers are not involved. It cannot be involved with alternative four, Cost and Administrative Efficiency Emphasis. Part of the Snake River is effectively eliminated as spawning habitat due to dams without fish ladders. It would be cost prohibitive to try to open up the areas above those dams. It would be cost effective to improve available habitat and enhance other areas. The greenbelting of water ways are dual purpose projects that are cost effective because it will benefit wildlife as well as fish. Spawning habitat and migration supporting improvements (i.e. food production) are necessary all along the streams and rivers to the ocean. A balanced approach with BMPs will bring about the best actions in project implementation and where management according to new information would not be constrained in adaptation within the preferred approach.

Lastly, I would like to mention that in the Columbia River Basin Fish and Wildlife Program is the obscure section that pertains to the technology aspect of new information and technology for adaptive management. It is found in Section 13 where 13.1F "Promising New Ideas for Improving Salmon Survival" states: "This measure is intended to provide an expedited process to encourage innovative approaches to improving salmon survival." Adaptive management ought to set aside some small percentage for research, development and demonstrations (RD&D). This is important when wetlands, riparian zones or greenbelt areas are created. Managers must be mindful of wild and scenic river guidelines and opportunities that BMPs can be applied to. New methods and new technology in the balanced approach should not be excluded because of its newness, but at least pilot demonstrations be developed and applied where appropriate.

Best regards.

Sidney N. Clouston Jr

Sidney N. Clouston, Jr.

cc: Northwest Power Planning Council
Fish and Wildlife Division
851 S.W. Sixth Avenue
Suite 1100
Portland, OR 97204-1348

Comment rec'd 3/11/97

BONNEVILLE POWER ADMINISTRATION

"I'd Like to Tell You"

1. The best alternatives are (and tell why): Alternative 3 and 1
These alternatives best support your Purpose and Need statement of "mitigating for anadromous and resident fish habitat lost during development of the FCRPS".

2. The alternatives I least prefer are (and tell why): 4, 5 and 2. They take to many other factors into account. The main emphasis of the EIS is to "repair" lost habitat due to the dams, Alts 4, 5 and 2 do this to a much less extent than Alts 3 and 1 and 6.

3. Other management techniques you should consider: you need to make sure that the actions you fund do not result in added damage. We in the USFS have been using the "ROSGEN" techniques to analyze and plan stream restoration projects. He suggests various restoration techniques that →

4. Other environmental resources you should consider: Because your purpose and need is to mitigate lost or damaged fish habitat your considerations need to start with in-channel work but also include floodplain concerns and upslope activities, especially on private lands

5. I think the environmental analysis would be better if you: I think this effort would be much better if you had a base document but then had sections of more site specific information on the river reaches such as river basins like the Kootenai, Clark fork, Snake, etc.

6. I also have these comments: I am a district Hydrologist for the USFS in Libby, MT. We (the USFS) would be interested in using some of these funds to implement restoration projects.

(Need more space? Please use the back side of this sheet.)

☒ Please put me on your project mailing list. (You are already on the mail list if you received the Watershed Management Program Draft EIS information in the mail.)

Name Steve Wegner
Address 5621 Bobtail Rd.
Libby, MT. 59923

Please mail your comments by **March 25, 1997** to:

Bonneville Power Administration
Public Involvement Office - ACS
P.O. Box 12999
Portland, OR 97212

I 3 cont.

can include rootwad revetments, resculpting of flood plains vortex-rock weirs, and various other types of in-channel structures.

RECEIVED MAR 14 1997 ENVIRONMENT FISH & WILD LIFE

P.O. Box 121
Cove, OR 97824
March 12, 1997

RECEIVED BY BPA PUBLIC INVOLVEMENT
LOG#: WATER-03-007
RECEIPT DATE: MAR 24 1997

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208-3621

Dear Sirs:

This letter is in response to your invitation to review and comment on BPA's Draft Environmental Impact Statement for the Watershed Management Program.

We would prefer Alternative 5, General Environmental Protection. The protection of our environmental resources must take top priority. By protecting these resources, we will receive the most benefits to all interests in the long term.

Very truly yours,

Jon M. Skovlin

Donna Skovlin

Kalispel Tribe of Indians

March 25, 1997

Bonneville Power Administration
Public Involvement Manager
P.O. Box 12999
Portland, OR 97212

Dear Public Involvement Manager:

Below are comments provided by the Kalispel Tribe of Indians on Watershed Management Program Draft Environmental Impact Statement. Of the alternatives provided, Alternative 6 (BPA's preferred alternative) is the most agreeable.

Chapter 1/3	"The goal of these projects is to assist recovery efforts for anadromous fish in the CRB." Comment: This statement needs to reflect that the goal of these projects is to assist recovery of anadromous fish, resident fish and wildlife within the CRB. Within the Council's Program it states that "Good habitat is important for resident fish, just as it is for anadromous fish. The degraded condition of resident fish habitat in the Columbia River Basin often rivals that of anadromous fish. The Council believes comprehensive, cooperative watershed management is essential to making good investments in protecting, mitigating and enhancing resident fish in the basin."
Chapter 3/51	Kalispel Tribe ~~of Idaho~~
Chapter 8/135	Kalispel Tribe ~~of Idaho~~
Glossary/i	Comment: Resident fish can be either resident, fluvial or adfluvial. Adfluvial and fluvial fish spawn in tributaries. Once fluvial fish become adults, they migrate to larger streams or rivers and then migrate back to tributaries to spawn. Once adfluvial fish become adults, they migrate to either lakes or reservoirs and then migrate to tributaries to spawn.

I look forward to commenting on the Final Environmental Impact Statement. Thank you for your consideration in reviewing this document.

Sincerely,

Joseph R. Maroney
Fisheries Program Manager

P.O. Box 39 • Usk, WA 99180 • (509) 445-1147 • Fax (509) 445-1705

IDAHO FISH & GAME
CLEARWATER REGION
1540 Warner Avenue
Lewiston, Idaho 83501-5699

March 19, 1997

Philip E. Batt/Governor
Stephen P. Mealey/Director

Eric Powers
Environmental Project Leader
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER 03 - 009
RECEIPT DATE: MAR 28 1997

Dear Eric,

We have reviewed the summary of the watershed management program DEIS. We offer the following comments on the DEIS

We agree that there is a need for a programmatic approach to BPA's watershed program Many potential BPA-funded mitigation, conservation, and rehabilitation projects can be implemented by existing agencies including the Natural Resources Conservation Service, the Idaho Department of Fish and Game, the U.S. Forest Service, private timber companies, the Nez Perce Tribe, and Department of Environmental Quality. However, to achieve aquatic habitat objectives while being cost and administratively efficient and in compliance with laws and regulations, we suggest the alternatives and EIS attempt to achieve these objectives by defining using an interagency approach to project prioritization, implementation, and monitoring. We suggest this because the projects and agencies funded under BPA watershed program usually do not have the expertise or resources to achieve the 8 steps identified in the DEIS summary. Additionally, as has been proven in the past, a NEPA-type effort to solicit comments or consultation with affected stakeholders is not as effective as participation, involvement, and responsibility for projects. Therefore, our suggestion is that decisions on alternative emphasis not be decided on a programmatic level by BPA's watershed management program but by interagency process defined by this EIS. This would provide a better tie to project priorities, desired future condition, and site-specific project and monitoring needs within each watershed. Therefore, these would not be prescribed by BPA's programmatic EIS decision, but on the social, economic, and biological limits and conditions as decided by the interagency effort.

We hope you will consider these suggestions. Please keep us informed and involved in the process Thank you for the opportunity to comment.

Sincerely,

Herbert A. Pollard II
Regional Supervisor

HP/GS

cc: NRPB, NRCS, Lewiston; USFS, Orofino and Grangeville; DEQ, Lewiston; NPT, Lapwai; Potlatch Corp.; Plum Timber Company

FLATHEAD WILDLIFE, Inc.
P.O. BOX 4
KALISPELL, MONTANA 59903

March 17, 1997

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER-03-010
RECEIPT DATE:
MAR 28 1997

Department of Energy
Bonneville Power Administration
P. O. Box 3621
Portland, OR
97208-3621

Dear Sirs:

Flathead Wildlife Inc. wishes to thank the Bonneville Power Administration for the opportunity to review and comment on the Draft Environmental Impact Statement for the Watershed Management Program. Flathead Wildlife is a sportsmen's group situated in Kalispell, Montana. We have some 100+ members and are concerned with the management and protection of the environment for the welfare of our fish and wildlife.

Of the six alternatives presented, FWI agrees with BPA that the Balanced Action alternative is preferred over the other five. Here, on the upper Flathead River, we have two power dams that affect fish habitat and welfare. Nearby, on the Kootenai River, is another. In these affected environments we have three threatened or endangered species and, at least, one more that is critical. Yes, we are concerned.

A problem, as we see it, is the amount of time that it takes to implement a plan. Often, opportunities are lost before a plan can work its way through the red tape. We would like to have someone investigate the possibility of some agency being able to step in and secure these opportunities until such time as the bureaucracies can get in motion.

Again, thanks for the opportunity to comment on this EIS.

Sincerely,

Gordon Stewart

Gordon Stewart,
President

montana wildlife federation

The Wealth Of Our Nation Is In Its Natural Resources
Preserve It By Conservation, Not Conversation

MONTANA

FRIENDS OF THE WILD SWAN
P.O. BOX 5103
SWAN LAKE, MONTANA 59911
(406) 885-2011

Eric N. Powers, Environmental Project Leader
Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208-3621

March 24, 1997

re: Watershed Management Program DEIS comments

Dear Mr. Powers:

Please accept the following comments on behalf of the Friends of the Wild Swan, Inc. and Alliance for the Wild Rockies, Inc. relating to the BPA's DEIS to establish standards and guidelines for funding the planning and implementation of watershed conservation and rehabilitation projects in streams tributary to the main stem Columbia and Snake Rivers.

First, let's start with things we hope BPA won't support, including, but not limited to:

1) State and/or federal hatcheries and stocking programs to "restore" bull trout and other native fishes.
2) Poisoning streams to control exotic species like brook trout, pike or other introduced non-native species.
3) Overly aggressive electroshocking to verify 'viable populations" of native fishes in areas coveted for logging, grazing mining and other pollution-causing activities.
4) Projects that fragment or reduce the size and habitat quality of roadless refugia.
5) Projects that are linked to extractive, consumptive use projects (i.e. Forest Service timber sales that rely on KV fundsand unkept promises to accomplish road restoration).

Prevention - Please fund projects that prioritize preventative measures. In many cases preventing additional aquatic habitat damage is more important than mitigating for past actions. Roadless areas are currently maintaining the most successful bull trout and westslope cutthroat trout populations in the Snake and Columbia River system. Many of these roadless area are not protected. Preventing the destruction of roadless areas and upland headwaters regions is cost effective and provides long-term benefits to many aquatic lifeforms.

Dam Deconstruction - Please also fund contingency plans for dam deconstruction after their useful half-life is spent. For example, the Hungry Horse Dam near Glacier National Park should have its own deconstruction plan which activates upon final shut-down of the Columbia Falls Aluminum Plant. An artful use of the Army Corps of Engineers' talents could turn the dam into a triumphal archway for the river to run through. Once the South Fork of the Flathead River is reestablished, one of the two roads leading into the Bob Marshall Wilderness could be eliminated. The entire Swan Range could be restored to its original wild state. Wildland restoration projects like this should be a long-term goal of dam mitigation projects, especially those dams built primarily to subsidize industrial users. Deconstruction is the ultimate form of mitigation.

Fish Passage - The Milltown Dam in Bonner, Montana is a good candidate for some type of fish passage structure to reconnect migratory bull trout populations in the Clark Fork River with bull trout now isolated in the Blackfoot River. The dam at Bigfork on the Swan River is another possible location for fish passage if there is a way to sort out (and eat) the lake trout. The dam on Rattlesnake Creek in Missoula is another barrier to bull trout migratory patterns. There are many dams without fish passages that deserve to be studied and fitted with fish passage structures. Adfluvial and fluvial forms of bull trout would benefit greatly. Throughout its range. BPA should fund fish passage projects to reconnect the former migratory range of bull trout.

Multiple Species Strategies - Please require multi-species approaches to mitigation projects. This means integrating the habitat needs of terrrestrial and aquatic liveforms into one comprehensive restoration/mitigation strategy. A suite of "umbrella" or "indicator" species can be protected, restored and monitored to determine if BPA mitigation measures are as effective as projected.

All too often single species approaches are reactive and not always beneficial to the overall health and welfare of aquatic ecosystems. The great salmon hatchery (add barging) debacle is a good example of how an intensive single-species recovery campaign to save anadramous salmon further disrupted the ecological balance for all native fishes, including the target species, wild salmon. BPA funded projects should ensure that projects designed to benefit one targeted species does not succeed at the expense of other species living in the same ecosystem.

Habitat - Alternative 3 prescribes the kind of habitat-based prioritization that will produce long-lasting benefits at the most reasonable cost. Upland areas, roadless areas and mainstem riparian areas need to be protected and maintained as impaired habitats, only partially supporting biological diversity, are restored. It makes no sense to destroy aquatic refugia that includes strongholds of high quality habitat. Moratoriums — holding the line— on land-disturbing activities in core watersheds with high quality habitat is the best way to ensure self-sustaining viable populations of sensitive and rare species. A system of core areas, buffers and connecting corridors using the principles of Conservation Biology is a sensible "best available science" approach to prioritizing BPA projects.

Alternative 3, however, has its downside. Its reliance on words like "flexibility" for project managers, "adaptive management" and other weasel words cannot be left undefined. Forest Service, BLM, state school trust lands managers consistently abuse these words to delay action. These terms must be defined in full detail to prevent abuses of management discretion and unreasonable delay. Better yet, don't use any language that could be used to subvert the goals and objectives of Alternative 3 of BPA's Watershed Management Program. If Alternative 3 is redesigned to get results it could begin to make significant improvements over the status quo. If legal loopholes are not sealed tightly, improvements to aquatic ecosystems will be hard to come by.

Thank you for the opportunity to comment.

Sincerely,

Steve Kelly

SK for M. Bader

Steve Kelly
P.O. Box 4641
Bozeman, Montana 59772
(406) 586-0180

Mike Bader
P.O. Box 8731
Missoula Montana 59807
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John Brogoitti
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Joyce Cohen
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Ken Casavant
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Mike Kreidler
Washington

March 28, 1997

Randall Hardy, Administrator
Bonneville Power Administration
P. O. Box 3621 - Routing A
Portland, Oregon 97208

Dear Randy:

The Council has reviewed Bonneville's recently released Watershed Management Program Draft Environmental Impact Statement with great interest. The draft EIS addresses a portion of the program that is very important to the Council. Improvement of fish and wildlife habitat using an ecological approach is vital to rebuilding these populations. We believe that implementation of projects by local subbasin interests is one of the most effective ways to meet this need. The draft EIS should add efficiency and effectiveness to this program by fully addressing the requirements of the National Environmental Policy Act in a simpler more coordinated method. Our review of the draft EIS found it to be well done, generally. Our comments are meant to clarify what we believe to be the intent of the EIS.

As stated in the draft EIS, the recommended alternative (alternative 6) provides the most balanced approach to meeting aquatic habitat objectives of watershed management projects, achievement of cost and administrative efficiency, and protection and improvement of other environmental resources when those actions would support watershed management. Further, it states that this alternative would implement watershed management programs or projects more efficiently and with greater consistency than under the current case-by-case basis. The Council agrees with these statements. We agree with Bonneville that the other alternatives are not adequate to fully meet the needs of the watershed program. For this reason the Council supports alternative 6.

The Council requests that the EIS contain language that clarifies the importance that the EIS is fully consistent with the existing program as well as future versions of the program. It is in the region's and Bonneville's interest not to close doors on what might be done in watersheds in the future. This comment is not meant as a criticism of the EIS, instead it is meant to ensure that good opportunities are not foreclosed.

As you are aware, recent reports authored by three independent scientific panels -- the Independent Scientific Group, the National Research Council, and the National Marine Fisheries Service Salmon Recovery Team -- have called for ecologically-oriented approaches to restoration of

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
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Main Office Location Natural Resources Building, 1111 Washington Street SE, Olympia, WA

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER - 03 - 013
RECEIPT DATE:
APR 07 1997

DATE: April 04, 1997

TO: BPA Public Involvement Manager

FROM: Steve Martin, WDFW Area Habitat Biologist in southeast Washington

SUBJECT: **Comments on the Watershed Management Program draft EIS (DOE/EIS-0265)**

The Washington Department of Fish and Wildlife (WDFW) supports the concept of the Model Watershed Program. The WDFW has been involved with several Bonneville Power Administration (BPA) model watershed projects funded in the past few years. We encourage the BPA to adopt a set of policies and procedures that address the following deficiencies in the model watershed program to ensure that public monies are used effectively to enhance fish resources in the northwest.

The first comment on the DEIS is that BPA has funded small demonstration projects under the Model Watershed Program. One of the model watersheds is the Tucannon River watershed. In this watershed the Council approved a number of "Early Action" projects for implementation in 1996, with funds earmarked for Endangered Species mitigation In the Tucannon Watershed Program, critical habitat areas for spring chinook salmon were identified, but numerous 1996 projects were completed in areas outside of the critical habitat. This may have been done because landowners outside the critical habitat areas were willing to cost share on projects that provided them bank protection. Stable banks are an essential element to habitat improvement, however, if such projects are completed outside the critical habitat areas, benefits to the critical stocks are negligible. Perhaps instream habitat improvement projects in the critical habitat areas should be funded at 100% in 1997 so that land owners do not have to cost share for such projects. Funding should be based on priorities for improving fish habitat in the critical habitat areas

It has been identified that large pools with woody debris is limited each watershed. Rock and log weirs, accompanied with root wads provide such habitat. Project managers should focus on large pool habitat improvements in this river. A second analysis of the river indicated that water temperatures exceed the preferred range for salmonids. To decrease water temperatures, tree planting and riparian protection has been prioritized Although the project plans include dormant stock plantings at each site, project sponsors should be encouraged to develop techniques to plant rooted-stock at the time of

project construction, as dormant stock plantings are difficult to establish in rip rap or river cobbles; it is much easier, both monetarily and logistically to excavate a hole while the equipment is on site than to try and get dormant poles established with hand tools. Beaver, and other rodents are also problematic in the basin and tend to prefer the young dormant plantings in the spring and summer. Rooted stock should be planted at the time of construction and the trees be protected from beavers This requirement should be included in the Watershed Management Program and project managers must implement such a planting strategy in their proposal for funding from BPA.
Environmental impacts are much greater if revegetation is not successful at a site that has been disturbed by construction activities

Project proponents (managers) need to establish some quantitative metric to gauge success or failure This issue should be resolved in the Watershed Management Program and each proponent (manager) should be held responsible for establishing a goal in which some statistical measure of change can be compared to see if the goal is met. The measure should include an element of time and measure of change Watershed projects must be efficient because all fish and wildlife projects compete for funding under the BPA's Fish and Wildlife Program funding cap. Therefore, the measurable benefits of these projects for salmonids should be closely monitored and evaluated by BPA and others Ecological monitoring is difficult and requires many years to detect a change, considering the amount of natural variation in most metrics assessed.

Project evaluation needs to occur to determine if fish are utilizing the instream habitat structures and to evaluate which structure is preferred. An array of structures have been constructed in Asotin and Pataha creeks, and in the Grande Rhonde and Tucannon rivers, and each is designed to improve habitat conditions for salmonids Without evaluation, future designs may mirror existing designs, and without a rigorous monitoring and evaluation element to each project we may never know which projects are utilized or preferred by the target species This issue is the fundamental premise for the Program and needs to be a requirement placed upon each proponent prior to funding. An evaluation effort helps ensure that the program provides substantial benefits to fish and is accountable for expenditures of public funds.

Each model watershed project should include public meetings and public outreach efforts at the local community level to educate participants in the watershed program and the general public about the local habitat problems and fish needs. Too often steering committees become isolated from the general public

We reiterate our support of the concept of local involvement in planning and decision making encompassed in the model watershed program. We ask that the Bonneville Power Administration and committees associated with the Fish and Wildlife Program carefully evaluate all model watershed programs to ensure effective use of monies and substantial benefits to salmonids.

Thank you for the opportunity to comment on this draft EIS for the model watershed program

American Wildlands

March 25, 1997

Bonneville Power Administration
Public Involvement Manager
P.O. Box 12999
Portland, OR 97212

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER-03-014
RECEIPT DATE:
APR 14 1997

RE: Watershed Management Program DEIS

Dear BPA:

I would like to submit comments on the BPA's Watershed Management Program Draft Environmental Impact Statement on behalf of American Wildlands. We appreciate BPA's effort to look at the issue of the Power System's future management actions in the Columbia River Basin as a programmatic whole rather than ad hoc piecemeal site-specific projects.

With the recently released reports on the status the Interior Columbia Basin by the interagency effort developing ecosystem management, we feel adequate information exists for BPA to develop a meaningful Watershed Management Program. The reports: "Integrated Scientific Assessment for the Ecosystem Management" and "Status of the Interior Columbia Basin, Scientific Findings" indicate the aquatic condition and many of the dependent species of salmonids, as well as other riparian/aquatic species are in serious decline in the Interior Columbia River Basin.

From AWLs perspective, we are not only concerned with anadromous fisheries, but the often overlooked inland native fish are also in trouble. The bull trout, redband trout and westslope cutthroat trout are in decline leading towards extinction if immediate action is not taken soon. This should be brought out in the FEIS so that the necessary watershed management activities are developed rapidly and more are completed sooner than later.

With all the recent findings on the demise of the Columbia River Basin Ecosystem we feel that the DEIS's alternative 3 should be developed and expanded in the Final EIS. This alternative with an Aquatic Habitat Objectives Emphasis is needed to curtail the many "train wrecks" occurring to the many aquatic dependent species.

We support an emphasis on the whole watershed rather than simply on riparian and in-stream habitat. Recent flooding and

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landslides throughout the region were often a result of management activities further from the watercourses than Alternative 3 contemplates. Thus, Alternative 3 should should be changed in the FEIS to agressively restore a much larger land area under BPA approved management/mitigation activities. This also will ensure a sounder ecosystem approach.

Lastly, "Return to the River: Restoration of Salmonid Fishes in the Columbia River Esosystem" developed by The Independent Scientific Group and funded by BPA developed a conceptual foundation for recovery efforts for salmon and steelhead. This report should be incorporated into the FEIS as completely as possible.

Thank you for considering our comments on the Draft EIS. We would appreciate receiving a copy of the Final EIS.

Sincerely,

Robert Ament, Resource Specialist

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978
March 21, 1997

REPLY TO
ATTENTION OF

Planning Division

Bonneville Power Administration
Public Involvement Manager
P.O. Box 12999
Portland, Oregon 97212

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER-03-015
RECEIPT DATE:
APR 14 1997

To Whom it may Concern:

We have reviewed the Bonneville Power Administration Watershed Management Program Draft Environmental Impact Statement and have the following comments:

1. The document begins with a summary, yet the environmental consequences of the alternatives are not summarized.

2. Section 1.7 contains a "list of issues" identified during the scoping process. The listing is more a categorization of the issues, rather than detailed statements of what the issues are. For example, wetlands resource management is at issue; but what specific aspects of wetlands resource management are at issue is not presented. We are interested in knowing more of the specifics of the issues regarding waters of the US, including wetlands, raised during scoping.

3. Table 2-2 presents a comparison of the environmental consequences of the six alternatives. It is difficult to compare the alternatives because dissimilar language is used. Take for example the Fish/Water Resources and Quality environmental resource category. It is stated that Alternative 1 (No Action) may cause temporary exceedences of state water quality (sediment) standards due to construction disturbance of soils and channels. For Alternative 6 (Preferred Alternative), it is stated that short-term, construction-related impacts are mitigated to the extent practicable. Would not construction-related impacts to water quality be mitigated to the extent practicable under Alternative 1? It is stated that Alternative 1 would benefit fish and water quality as aquatic and riparian habitat is restored and/or protected. For Alternative 6, it is stated that moderate improvements in fish and riparian habitat would result, including immediate and sustained benefits to fish. Would not the benefits to fish under Alternative 1 be moderate, immediate, and sustained?

4. Chapter 4 begins with a statement that the primary objective of the watershed program is to increase and sustain anadromous and resident fish populations by increasing the amount of high quality habitat available to these populations. It is stated in section 4.2.2 that Alternative 1 would benefit fish and water resources/quality overall because of the nature of the mitigation and restoration projects, and that State water regulations would be followed under all alternatives, so no significant impacts are expected. This section does not support the statement made in Table

2-2 discussed above. Are significant beneficial impacts expected? Will high quality habitat become available to anadromous and resident fish populations? It is stated that Alternative 6 would increase fish habitat and water quality at new mitigation sites over the long term as the diversity of in-stream habitats increases and as riparian habitat establishes and expands, and that no significant long-term adverse impacts are expected. Again, this section does not support the statement made in Table 2-2 discussed above. Will high quality habitat become available to anadromous and resident fish populations? Are significant short-term adverse impacts expected?

Thank you for the opportunity to comment.

Sincerely,

Candace Thomas

Candace Thomas
Chief, Environmental Analysis Branch
Planning Division

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

March 21, 1997

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER - 03 - 016
RECEIPT DATE:
APR 14 1997

Bonneville Power Administration
Public Involvement Manager
PO Box 1299
Portland OR 97212

Dear Sir:

Thank you for the opportunity to comment on the draft environmental impact statement (EIS) for the Watershed Management Program (DOE/EIS-0265).

Consistent with the Department of Ecology's responsibilities as Washington State's coordinator for the National Environmental Policy Act, we are forwarding the comments received from the State of Washington, Department of Transportation and Department of Fish and Wildlife.

Washington Department of Fish and Wildlife has expressed that the EIS or Watershed Management Program should give further consideration to addressing limiting factors, outcome monitoring, future watershed land uses, and regionally specific management techniques. They have also expressed concern related to possible impacts to the Wildlife Caucus budget, as well as more specific comments. If you have any questions on the comments made by Washington Department of Fish and Wildlife, please call Ms. Cyreis Schmitt at (360) 902-2416.

Washington Department of Transportation's comments focused on the need and benefits of consultion and coordination with state and local agencies. For questions on the comments from Washington Department of Transportation, please contact Ms. Patty Lynch at (360) 705-7448.

After reviewing the document, Ecology Program staff have the following comments.

(1) Regarding habitat modification projects, monies should be set aside for evaluation of the projects' effectiveness in meeting program objectives.

(2) In Section 4.2.1 (1), the description of Washington State Department of Ecology areas of regulatory authority related to the protection, use, and management of water resources should also include: flood control, dam safety and inspection, water right permitting, and well construction.

(3) Under Section 4.2.4 -- Potential Program-Wide Mitigation Measures, the last bullet should include: obtain water rights for withdrawal of water from the state where the project is being considered.

(4) Section 4.2.4 should also have an additional bullet, stating: Coordinate with state and local water resource and water quality agencies to share data collection efforts in project areas.

If you have any questions on Comment (1), please call Mr. Bill Young with our Shorelands Program at (360) 407-6399. For questions regarding Comments (2) through (4), please contact Mr. Chris Anderson with our Water Resources Program at (360) 407-0272.

Sincerely,

Barbara J. Ritchie

Barbara J. Ritchie
Environmental Review Section

BJR:ri

Attachments (2)

EIS #970720
cc: Chris Anderson, SWRO
Patty Lynch, WDOT
Carol Mortensen, CRO
Cyreis Schmitt, WDFW
Debra Smith, CRO
Abbe White, SWRO
Bill Young, SWRO

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 600
Portland, Oregon 97232-2036

IN REPLY REFER TO

April 15, 1997

ER 97/0084

Bonneville Power Administration
Public Involvement Officer
P.O. Box 12999
Portland, Oregon 97212

RECEIVED BY BPA
PUBLIC INVOLVEMENT
LOG#: WATER-03 017
RECEIPT DATE:
APR 22 1997

Dear Sir:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Bonneville Power Administration (BPA) Watershed Management Program (Watershed Program), States of Idaho, Montana, Nevada, Oregon, Washington, and Wyoming. The following comments are provided for your use and information when preparing the Final Environmental Impact Statement (FEIS).

GENERAL COMMENTS

The Alternative 6: Balanced Action, BPA's Preferred Alternative, purports to balance cost factors, administrative efficiency, and protection and improvement of environmental resources with aquatic habitat objectives. Also, it would establish a standard planning process and apply a program-wide mitigation measures. The "balance" reached should represent the key factor for determining whether or not effective and measurable habitat improvement would be obtained. Significant changes in some watersheds would be necessary to provide detectable levels of improvement. Efforts to "balance" should not preclude meaningful habitat improvement. However, many aquatic habitat improvement projects would have beneficial environmental components.

The various habitat improvement techniques listed are appropriate although some techniques may be more helpful in promoting effective agriculture, forestry, or urban development strategies rather than being priority fish habitat techniques. More efficient irrigation practices would not benefit fish if they only free more water to irrigate additional land. The FEIS should limit the use of "hard to get" fish money. Programs for agriculture and urban problems usually are adequately financed, and BPA's Water Program should avoid linkages to those types of aid programs. The FEIS needs to emphasize aquatic habitat improvement projects.

Sincerely,

Preston A. Sleeger
Acting Regional Environmental Coordinator

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

March 20, 1997

Eric N. Powers
Project Leader
Bonneville Power Administration
Public Involvement Manager
Post Office Box 12999
Portland, Oregon 97212

Dear Mr. Powers:

Thank you for the opportunity to review the Bonneville Power Administration (BPA) Draft Environmental Impact Statement (DOE/EIS-0265) for BPA's Watershed Management Program. Maintaining and restoring watershed functions necessary to sustain fish and wildlife resources is a daunting task, and we applaud your efforts to standardize a planning and implementation approach for watershed projects funded in whole or in part by BPA.

General Comments:

Of the alternatives presented, the Department of Fish and Wildlife supports Alternative 6. This alternative appears to provide the best all around approach for evaluating, ranking, implementing and monitoring watershed projects. However, we do have several questions and comments which we feel will strengthen the DEIS and implementation of the program.

We note the relationship between BPA's Watershed Management Planning Process for specific watersheds and this program and encourage wherever possible, that BPA keep "the horse before the cart" when considering specific projects. That is, the projects should be evaluated in a watershed context; one which considers watershed processes such as basin hydrology, instream flow, sediment delivery and routing, water quality, riparian area and wetland extent and condition, and fish access and passage. To meet objectives for fish and wildlife, addressing limiting factors is essential for long-term success. Consequently, an analysis of limiting factors (for each life history stage) in a watershed should be conducted and incorporated in the watershed plans before specific projects to meet these objectives are implemented. Monitoring of outcomes, coupled with an adaptive management strategy, are also essential to realize the full potential of the mitigation funds and activities. In addition, many watershed planning and implementation activities are currently underway in the Columbia Basin and we assume that BPA's watershed management program, regardless of which alternative is selected, will be coordinated with and complementary to those efforts. Hopefully, watershed plans developed according to the alternative selected for BPA's watershed managment program wll address all these issues.

Further, projects should not assume static land use (zoning). The DEIS characterizes the affected environment as essentially rural and sparsely populated. While this may be true relative to Seattle or Portland metropolitan areas, it is not necessarily true for most basins in the lower watershed. Conversion of forest and agricultural lands to rural residential or suburban and urban land uses is occurring at a rapid clip in Washington. This puts inordinate pressure on fish and wildlife resources and may limit the long-term success of habitat projects. Low intensity land use has been found to be a fundamentally sound and successful method for protecting fish and wildlife habitat.

We also note the relationship between this program and the Wildlife Mitigation Program. We understand Watershed Management projects will be funded out of the Anadromous Fish budget. It appears under preferred Alternative 6, resident fish and wildlife benefits may be expected. Will BPA be given Habitat Unit credits for wildlife benefits? The relationship between this funding process and wildlife funding is unclear. There have been concerns expressed in the Wildlife Caucus that the wildlife portion of the BPA budget may be expected to provide funding for wildlife benefits and that BPA would receive mitigation credit for watershed projects. Since the Wildlife Caucus has developed a five year budget, goals and objectives, but has not received adequate funding to support all the identified needs, will funding for wildlife benefits under this program affect the Wildlife Caucus budget? How will cost sharing between the Fish Caucus and the Wildlife Caucus be determined? The Northwest Power Planning Council (NPPC) and BPA require some kind of permanence associated with wildlife mitigation projects. Does the Watershed Management Program have a similar requirement? What steps have been taken by the Watershed Management Program to ensure consistency with the NPPC's Wildlife Program?

Regardless of which alternative is implemented there should be some room for adjustment or addition to the available management techniques illustrated in Table 2-1 and described in Appendix 1. While the list is fairly extensive, it could use some region specific techniques and allow room for "other " techniques. For example, under in-channel modifications and habitat improvement techniques, restoration of channelized reaches, dike removal or set backs should be included. Under road management techniques, there should be a hierarchical sequence which includes avoidance of stream crossings first, followed by bridges, then bottomless arch culverts, oversized culverts, temporary culverts. Perhaps early in the implementation phase, this list could be customized to more closely fit our region.

Within all alternatives there should be more discussion of the positive aspects of watershed integrity on human health and safety. For example, land use zoning which restricts development on flood plains generally results in less flood impacts to structures. Watershed treatments that facilitate natural hydrology result in available water for other uses. Land use practices that reduce unnatural sedimentation may avoid the need for expensive treatment of domestic water supplies.

Specific Comments:

Chapter 2/10, 2.1.3 Alternative 2: Base Response, 2. Involve Stakeholders:
Because this EIS focuses on fish and fish habitat, "consultation with affected tribes, and state fish and wildlife agencies" may be interpreted as consultation with the fisheries programs within the affected tribes, and state fish and wildlife agencies. **Change sentence** to read: Consult with affected local governments, adjacent landowners, tribes, and state fish and wildlife agencies regarding fish, wildlife, habitat, or other issues.

Chapter 2/19 first paragraph top of page: The use of the term "non-target wildlife" seems inconsistent with the previous paragraph and the intent of this Alternative. **Delete** "non-target"

Chapter 2/20, paragraph 4, first bullet: The use of "ecological" may be intended to be broad, but may be interpreted narrowly. **Delete**: the word "ecological" and replace it with natural resources.

Chapter 2/21, paragraph 6. What is the difference with the term "side benefit" as it is used here and "coincidental benefits" used in Alternative 3? The use of the term "side benefits" seems inconsistent with the intent of this Alternative. The preceeding paragraph,(paragraph 5.) states under this Alternative, BPA would encourage project managers to include social, economic, cultural and natural resource protection and improvement goals. Protection and improvement goals for natural resources (wildlife) seems to indicate an expectation of more than a "side benefit".

Chapter 2/28-37, Table 2-1: The Northwest Power Planning Council's Wildlife Program is habitat based and consequently so are the Basin's wildlife mitigation projects. The Wildlife Mitigation Program EIS included a table similar to Table 2-1. Since the Wildlife Program uses habitat techniques for riparian, wetland, agriculture, grazing, road management, forest management, and recreation management are the techniques and use frequency consistent with those identified in the Wildlife EIS?

Chapter 3/49, 3.6 Wildlife and preceding map: Wildlife mitigation projects use a well established standard habitat classification scheme (cover typing). To ensure consistency, the same system should be used for Watershed Management projects.

Within the Washington Wildlife Mitigation Projects Environmental Assessment (DOE/EA-1096), habitat types occurring on some or all of the project areas included: shrub-steppe, grassland, riparian, wetland, agricultural, forest, and woodland. Although the final EIS is not yet available for the Wildlife Mitigation EIS, it is likely it will indicate more than three "general vegetation zones".

Chapter 3/50, 3.8 Cultural and Historic Resources: Wildlife mitigation projects are required to have a cultural resource survey completed prior to any ground breaking activity. Does the Watershed Management Program have a similar requirement?

Chapter 4/119, 4.13.6 Cultural Resources: Wildlife mitigation projects are required to have a cultural resource survey completed prior to any ground breaking activity. What Program-wide measures would help to protect cultural resources? If a survey is required it would lessen the probability of inadvertent impacts.

Chapter 6: References: To be consistent with the other EIS documents BPA has prepared, this EIS should identify those EIS documents which use the same types of management techniques.

Appendix A: Are the effects identified consistent with those identified in the Wildlife Mitigation EIS?

Again, thank you for this review opportunity. We look forward to being an active partner in the implementation of this important watershed management program. If you have questions about our comments, please feel free to call me. My number in Olympia is (360) 902-2416.

Sincerely,

Cyreis Schmitt

Cyreis Schmitt
Conservation Services Division Manager
Habitat Management Program

CS:SK:kam

Washington State
Department of Transportation

Memorandum

Date: March 21, 1997

From: Patty Lynch

Phone: (360) 705-7448

Subject: BPA DEIS - Watershed Management Program

To: Rebecca Inmann, Environmental Review Section
Wa State Department of Ecology

Washington State Department of Transportation (WSDOT) has had an opportunity to review the Draft EIS for the Bonneville Power Administration (BPA) Watershed Management Program, and submits the following comments for inclusion in the state response letter.

WSDOT supports development of a management plan to provide guidance for the review of mitigation projects submitted to BPA for funding and for the development of alternatives that would promote consistency in planning and management objectives based on watershed concepts. The development of watershed-based mitigation guidance may enhance opportunities for WSDOT to coordinate transportation mitigation requirements with priorities established by BPA and the Northwest Power Planning Council. WSDOT may be in a position to request funding or matching funds for activities that will promote BPA's goals of improving fish habitat, as well as meet our own needs for environmental mitigation and fish passage restoration. WSDOT is committed to developing cost effective mitigation projects that provide the greatest ecological benefits based on identified needs of the watershed. The objectives described in Alternative 6 of the draft EIS compliment Transportation's interest in moving towards a watershed approach.

One concern is that the DEIS is inconsistent in it's proposed consultations with regulatory agencies. Federal, state and tribal entities are addressed. However, coordination with local jurisdictions with regard to local ordinances is not addressed. For example, Corps permits, NRCS, and compliance with the Clean Water Act are mentioned with regard to wetlands, but wetland rating, buffers, and local permits are not. In another instance, the DEIS states that the USFWS will be consulted regarding all major construction projects, but state wildlife agencies are not mentioned, even though permits require that state fish agencies are to be contacted for all construction in or near waters of the state.

Thank you for the opportunity to comment on the DEIS. Please forward future correspondence to:

DOT 700-008EF
Revised 3/93

Patty Lynch
Washington State Department of Transportation
PO Box 47331
Olympia, WA 98504

(360) 705-7448 phone
(360) 705-6833 fax
e-mail: lynchp@wsdot.wa.gov

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
ENVIRONMENTAL & TECHNICAL SERVICES DIVISION
525 NE Oregon Street
PORTLAND, OREGON 97232-2737

F/NWO3

April 14, 1997

Randall Hardy, Administrator
Bonneville Power Administration
P.O. Box 3621 - Routing A
Portland, OR 97208

Dear Mr. Hardy:

Thank you for agreeing to receive and consider the National Marine Fisheries Service's (NMFS) comments on the Bonneville Power Administration's draft Environmental Impact Statement for the Watershed Management Program. Our findings are as follow.

We note that the program objectives are not clearly stated in the draft EIS. The program objectives stated in *1.2 Purposes* include: achievement of the Fish and Wildlife Program's aquatic habitat objectives for watershed management projects to be implemented by BPA, achievement of cost and administrative efficiency, compliance with all laws and regulations, and environmental protection. The Fish and Wildlife Program's aquatic habitat objectives are not described or referenced, and "environmental protection" is a goal rather than a specific objective. Program objectives should be explicitly stated in the draft EIS.

We agree that the recommended alternative (Alternative 6) provides the most reasonable approach to meeting aquatic habitat objectives of watershed management projects, ensuring cost and administrative efficiency, and protecting and improving other environmental resources. We also agree that this alternative would be more efficient and consistent than the current case-by-case management basis (No Action). However, we note that of the six alternatives provided, four were components of the sixth alternative. To be consistent with the intent of NEPA, an EIS should provide distinct and viable alternatives.

✱ We note that the draft EIS frequently describes in-channel modifications and techniques as conservation and rehabilitation actions. Some of the in-channel modifications and techniques are technological fixes that are inappropriate in critical habitat, unless rehabilitating natural processes or natural features is not possible. Because they are often inappropriate and counterproductive, in-channel structures and modifications should only be used when other techniques fail.[1] Some concerns are:

- Grade structures completely disrupt the natural bedload movement essential for developing normal pool/riffle complexes and allowing lateral channel movement[2],[3];

- woody debris installation typically fails (or has unintended consequences), and is not a substitute for natural debris recruitment[4],[5];

- "other habitat complexity structures" - it is not clear what these would be, but artificial structures should be used only as a last resort;

- structural bank protection disrupts normal channel migration and often inhibits development of vegetative cover; and,

- debris removal should be contemplated with extreme caution as it is rarely an appropriate rehabilitative action.

Restoration actions are appropriate only after the causes of habitat degradation have been identified and remedied, and natural, passive restoration has demonstrably begun. Only within this context will active restoration projects accelerate the underlying trend (and then only if well-designed). Outside of this context, active restoration projects are at best unlikely to be effective,

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[1] Spence B.C. et al., 1996. An ecosystem approach to salmonid conservation, Management Technology, TR-4501-96-6057.

[2] Ritter, D.F. 1986, Process Geomorphology, Dubuque, IA: Wm. C. Brown.

[3] Schumm, S.A. 1977. The fluvial system, New York: Wiley Interscience.

[4] Frissell, C.A., and R.K. Nawa. 1992. Incidence and causes of physical failure of artificial habitat structures in streams of western Oregon and Washington, N. Am. J. Fisheries Management 12:182-197;

[5] Beschta, R.L., W.S. Platts, and J.B. Kauffman. 1991. Field review of fish habitat improvement projects in the Gande Ronde and John Day River basins of eastern Oregon. Bonneville Power Administration Project 91-069 Contract DE-AP79-91BP21493, Portland, OR.

and could sometimes be harmful.

In light of NMFS' concern for aquatic habitat objectives and the sustainability of habitat improvements, the following elements should be included in BPA's preferred alternative *(Alternative 6)*:

- All projects funded by BPA's watershed program should address problems or opportunities that have been identified in a watershed assessment. Without this criterion, it is likely that many projects will be funded which will not address the needs and priorities identified on a watershed or ecosystem level.

- Develop a Statement of the Desired Future Condition: Consider concepts that include sustainable revenue generation (e.g. crop production, timber harvest) to reduce initial or long-term Federal costs, as long as they are consistent with aquatic habitat objectives *(from Alternative 4)*.

- Characterize the Site Conditions and Trends: Identify and map soil conditions, topography, hydrology, vegetation, and other physical and biological systems within the areas proposed for watershed management projects *(from Alternative 3)*.

- Establish Project Goals: add to the statement "protection and improvement of a variety of fish habitats, including spawning beds, overwintering and rearing areas, resting pools, protective cover," to include "especially for high-quality native or other habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species" *(from Alternative 5)*.

- Monitor Conditions and Evaluate Results: The BPA should encourage and support the more rigorous and comprehensive management objective monitoring that is included in *Alternative 3*.

The need for an adaptive management approach was clearly stated in the draft EIS. The draft EIS should also contain language describing how such an approach would be used in a watershed context. In this instance, adaptive management would call for ongoing monitoring and evaluation of project results, project impacts, data gaps, etc. on both the project and watershed levels. The BPA's watershed management program should thus include a clear monitoring and evaluation component.

Finally, the draft EIS should address how it will mesh with other current EISs in the region, such as the USFWS/NMFS/BPA's hatchery EIS and the USFS/BLM's Interior Columbia Basin Ecosystem Management Project EIS. These should be coordinated and reviewed together in order to ensure that integrated ecosystem planning is truly underway in the Columbia Basin.

We appreciate the BPA's efforts to coordinate its watershed management program projects in a consistent and comprehensive manner. We also appreciate the opportunity to comment on the draft EIS, and your agreement to receive and consider our comments after the deadline requested in the draft EIS.

Sincerely,

Elizabeth Holmes Gaar

Elizabeth Holmes Gaar, Director
Habitat Conservation Program

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

April 17, 1997

REPLY TO
ATTN OF: ECO-088

Eric N. Powers
Bonneville Power Administration
P.O. Box 12999
Portland, OR 97212

Re: BPA Watershed Management Program Draft Environmental Impact Statement (DEIS)

Dear Mr. Powers:

The U.S. Environmental Protection Agency (EPA) has received the **BPA Watershed Management Program Draft EIS** for review in accordance with our responsibilities under the National Environmental Policy Act and under Section 309 of the Clean Air Act. Based on a limited review of the document, we do not foresee having environmental objections. However, we do wish to submit the enclosed comments.

If you have any questions or would like to discuss these comments further, please contact Elaine Somers in Seattle at (206) 553-2966.

Sincerely,

Richard B. Parkin, Manager
Geographic Implementation Unit

Enclosure

U.S. Environmental Protection Agency
Region 10

Comments on BPA's Watershed Management Program Draft EIS

- **It is important to use a watershed/landscape assessment as a basis for making project proposals and decisions.** Our understanding is that BPA intends to use a watershed approach to project approvals. As the EIS is written, it is not clear whether the basis for project area identification, development of desired future condition, and characterization of historical and present site conditions and trends is a watershed/landscape assessment or whether the basis is site specific. We recommend that you clarify the intent of and process for your watershed approach in the EIS.

  We advocate a process in which projects identified in collaboration with agencies, tribes, and interested citizens are based on a thorough watershed/landscape assessment. Absent such an analysis, the validity and usefulness of many project proposals would lie in question.

- **Not all projects should be categorically excluded from environmental assessment under NEPA.** As discussed above, in implementing a watershed approach, a watershed assessment should be completed, which identifies priority areas for attention. Participants should reach agreement on certain actions based on the watershed/landscape assessment, thereby making individual NEPA processes unnecessary. However, there are certain types of projects that must go through a permitting process, and that may be large in scale or overall environmental effect such that an environmental assessment is warranted. An example is the Methow irrigation conversion project in which the conveyance system for irrigation water was converted from open canals to a pipeline.

- **Decrease emphasis on use of pesticides and herbicides.** To prevent pollution of soil and water, protect fish, wildlife, and humans, and to foster overall ecosystem health and resilience, we ask you to decrease the emphasis upon use of pesticides and herbicides in your preferred alternative. We suggest that Alternative 6, the Balanced Approach, reflect infrequent use rather than moderate use of pesticides and herbicides (Table 2-1).

- **Eliminate "wildlife harvest" as a management technique.** If forage is lacking, it makes more sense to reduce cattle grazing and restore areas degraded by human alterations of the ecosystem than to eliminate wildlife. Compared to the effects of cattle grazing and other human-induced alterations to the ecosystem, wildlife have little impact and are a natural, integral component of the system.

Bonneville Power Administration

PO Box 3621 Portland, Oregon 97208-3621

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