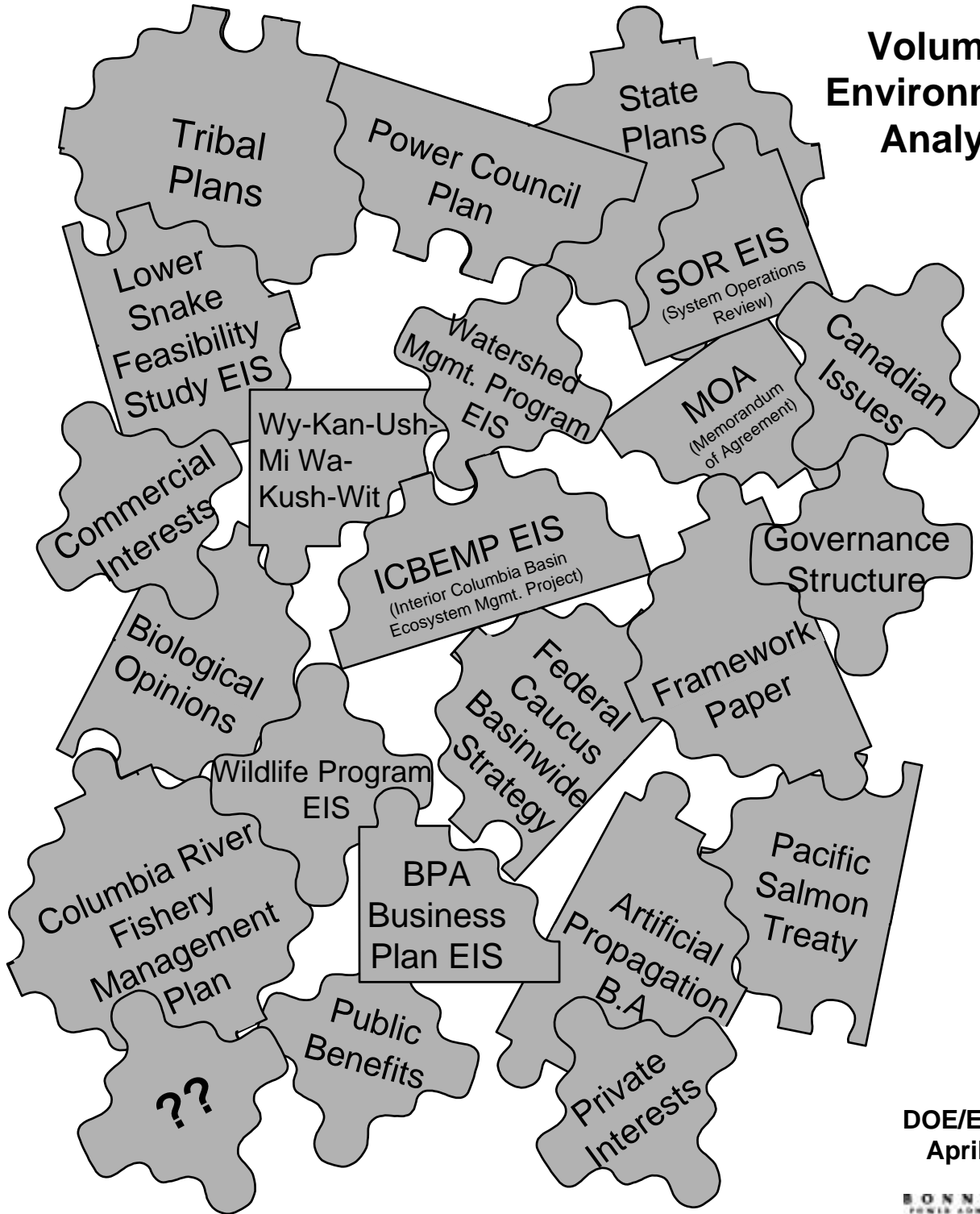


Bonneville Power Administration Fish & Wildlife Implementation Plan Final EIS

"Piecing The Puzzle Together"

**Volume 1:
Environmental
Analyses**



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Fish and Wildlife Implementation Plan Final Environmental Impact Statement (DOE/EIS-0312)

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

Title of Proposed Action: Fish and Wildlife Implementation Plan

States and Provinces Involved: Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, and British Columbia

Abstract: Despite the efforts of BPA and other regional entities in the Pacific Northwest, some populations of fish and wildlife continue to decline. Reasons for the lack of success include the following: different groups have different values and priorities; there is no clear and agreed-upon scientific answer; and there are conflicting directives and jurisdictions. The absence of a comprehensive and coordinated planning approach has caused inefficiencies in both implementing and funding mitigation and recovery efforts. With respect to the Federal Columbia River Power System, BPA funds a large share of the regional efforts. BPA needs a comprehensive and consistent policy to guide the implementation and funding of its fish and wildlife mitigation and recovery efforts.

BPA reviewed the many ongoing processes, identified key issues, and developed alternative policy directions based on alternatives developed by multiple existing initiatives in the Region. BPA examined five basic but distinctively different Policy Directions (Natural Focus, Weak Stock Focus, Sustainable Use Focus, Strong Stock Focus, and Commerce Focus) that offer a wide range of possible unified regional planning approaches. These alternatives are compared against continuing the Status Quo, a baseline or "no action," approach. In this final environmental impact statement (FEIS), with the benefit of public comment and participation, BPA has developed and proposes a Preferred Alternative (PA 2002) that substantially combines elements of the Weak Stock and Sustainable Use alternatives and that falls within the established range of potential Policy Direction alternatives. This FEIS evaluates the environmental consequences of BPA's implementation and funding of sample actions that could emerge from any of the Policy Directions.

BPA is working hard, through its implementation of the National Marine Fisheries Service's and U.S. Fish and Wildlife Service's Biological Opinions, and the Pacific Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, to complete a unified fish and wildlife mitigation and recovery policy. However, the timing and ultimate success of that effort is uncertain. In any event, BPA is obligated to fund and implement fish and wildlife mitigation and recovery actions before, during, and after these policy-level deliberations. BPA also has a statutory obligation to understand the environmental consequences of its actions and to provide an opportunity for the public to participate in agency decisionmaking. This FEIS is designed to meet the immediate and future needs of agency decisionmakers and the public for information regarding the impacts of mitigation and recovery actions proposed for implementation by BPA. BPA does not intend to unilaterally select a Policy Direction for the Region. However, if the Region fails to agree upon a Policy Direction, BPA must still implement and fund a fish and wildlife mitigation and recovery strategy. The BPA Administrator's initial decision, as well as future tiered decisions, will rely on this FEIS environmental analysis and its comparison of the alternatives against the purposes for action. The decisions will consider BPA's fish and wildlife responsibilities, as well as the agency's business responsibilities as a Federal Power Marketing Agency and its responsibility to provide public benefits to the Region.

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For information on DOE National Environmental Policy Act (NEPA) activities contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, EH-42, US Department of Energy, 1000 Independence Ave. SW, Washington DC, 20585. Phone: 1-800-472-2756, or visit the DOE NEPA Web at www.eh.doe.gov/nepa.

FOREWORD

The Bonneville Power Administration (BPA) is required to make certain funding and implementation decisions associated with the ongoing Region-wide fish and wildlife mitigation and recovery efforts. This Fish and Wildlife Implementation Plan (FWIP) final environmental impact statement (EIS):

- summarizes and inter-relates the many regional proposals and sets of actions intended to facilitate fish and wildlife mitigation and recovery;
- provides the BPA Administrator and the public with a broad-based analysis of the possible environmental consequences of funding and implementing decisions now, and into the future, with respect to the natural, social, and economic environments; and
- allows the Administrator an opportunity to use a comprehensive, consistent, and unified planning approach to review and make decisions over time to guide BPA's role in the regional fish and wildlife mitigation and recovery efforts.

It has taken considerable effort to prepare a thorough policy-level analysis, ensuring both opportunity for public review and a thoughtful process for BPA to make an initial decision on the most appropriate Policy Direction to follow. The information in this EIS provides an understanding of the history of fish and wildlife policies in the Region and illustrates the policies, choices, and impacts inherent in BPA's ongoing mitigation and recovery work. Because no EIS with this scope could anticipate the specifics of future events such as court decisions, national policy directives, or critical habitat designations, this document instead shows how to apply its analysis to analogous qualitative changes of the different Policy Directions and their potential constituent actions. These relationships between the alternatives and their impacts will change slowly, if at all, and allow decisionmakers to rely on this EIS for many years.

BPA recognizes that not all interested parties in the Region may be satisfied with the decision(s) that it makes now or in the future regarding fish and wildlife funding and implementation. While BPA will make a decision now based on current policy positions in the Region, it will review, on a periodic basis, the status of the mitigation and recovery efforts. BPA will revisit its Policy Direction decision to determine if changes and modifications are required.

When, for any reason, a chosen Policy Direction is changed or modified, this EIS is designed to help fully inform the BPA Administrator, or any other decisionmaker using this EIS, of the potential environmental consequences of such course-correction decisions. This EIS is not meant to replace, revisit, or prejudice any of the other major fish and wildlife recovery processes in the Pacific Northwest. Instead, it is intended to integrate and complement all these efforts, which have undergone or are undergoing substantial public scrutiny through other Federal, state, or tribal plans or program reviews.

Finally, the EIS establishes a procedural "roadmap" for BPA funding and implementation of future site-specific actions within the scope of the broader policy decisions. By using a tiered public process on more site-specific actions, BPA will be able to make decisions in a more consistent, focused, and timely manner, while ensuring full compliance with the National Environmental Policy Act (NEPA). The intended result is a BPA decisionmaking process that better aligns implementing actions with the broad policy direction.

BPA hopes that this EIS, through its public participation and follow-on processes, will also help other public officials better understand the environmental consequences of the Region's widespread fish and wildlife mitigation and recovery decisions and ultimately promote actions that protect and enhance the human environment and mitigate for past, present, and ongoing effects upon it.

BONNEVILLE POWER ADMINISTRATION
FISH AND WILDLIFE IMPLEMENTATION PLAN
FINAL ENVIRONMENTAL IMPACT STATEMENT

SUMMARY

Bonneville Power Administration (BPA) needs a comprehensive and consistent policy to guide its implementation and funding of fish and wildlife mitigation and recovery efforts.

S.1 INTRODUCTION

S.1.1 The Region

The Pacific Northwest has long prided itself on its bountiful and diverse natural resources—its forests and grasslands, minerals and rivers, fish and wildlife. The Region has also relied on these natural resources to serve multiple, and sometimes conflicting, uses. The independent demands of the whole spectrum of human uses (such as irrigation, municipal water supplies, grazing, fishing and hunting, electric power production, recreation, timber harvest, and transportation) have placed increasing stress on the natural resources of the Columbia River Basin. One consequence is that, over the last decade, the number of fish and wildlife species listed as endangered or threatened under the Endangered Species Act (ESA) has dramatically increased.

The Region has sought to stem and even reverse the species decline. Unfortunately, after a decade of good intentions, there has been less progress than is necessary to reverse this trend. Here are the most important reasons:

- (1) Different groups have different value judgments about priorities, leading to different (and often conflicting) ideas about what recovery and mitigation efforts should be.**
- (2) There is no clear and agreed-upon scientific answer to the problem.**
- (3) Conflicting directives and jurisdictions of regional authorities have meant that funds dedicated to fish and wildlife mitigation and recovery efforts have often been used less efficiently and effectively than they otherwise could have been.**

Recently, regional entities have taken steps to work together to develop a comprehensive and coordinated planning approach for species recovery and mitigation. For example, over the past several years the Council's Columbia River Basin Fish and Wildlife Program, the Recommendations for the Protection and Restoration of Fish In The Columbia River Basin by the Governors of the four Northwestern States, and the Federal

Caucus' Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy (Basinwide Strategy; formerly referred to as the "All H paper") have all emphasized the importance of coordinated planning. Although science cannot yet point out a clear and agreed-upon path, the Region is working toward a unified planning approach to mitigation and recovery of fish and wildlife populations. BPA recognizes it must be prepared to fund the implementation of the ratepayers' share of the regional fish and wildlife mitigation and recovery efforts.

There are two basic ways to define a regional policy for fish and wildlife mitigation and recovery:

- Define the Policy first—develop with a policy and define the actions to carry it out.
- Define the Actions first—develop a set plan of actions, then sum up the actions to arrive at a policy.

BPA must be prepared to respond effectively and efficiently whether a policy-first or an actions-first policy emerges.

S.1.2 Bonneville Power Administration

BPA, a power marketing agency of the United States Department of Energy (DOE), supplies roughly half of the electricity used in the Pacific Northwest. The power BPA markets comes primarily from 31 Federal hydroelectric projects (known collectively as the Federal Columbia River Power System, or FCRPS), and one non-federal nuclear plant. BPA is a co-manager of the Federal hydroelectric projects, but it does not own or operate them. Such responsibilities belong to the U.S. Army Corps of Engineers (Corps) and the U.S. Bureau of Reclamation (Bureau). BPA does own and operate about three-quarters of the Region's high-voltage electric transmission grid. BPA also promotes conservation and purchases power from several privately-owned renewable energy projects.

BPA's fish and wildlife responsibilities are derived from several sources, including, but not limited to, the following:

- The Pacific Northwest Electric Power Planning and Conservation Act of 1980 ("Regional Act");
- BPA's share of the trust responsibility derived from the historical relationship between the Federal government and the tribes, as expressed in treaties, statutes, Executive Orders, and Federal Indian case law; and
- BPA's 1996 Tribal Policy¹.

This EIS uses the phrase "mitigation and recovery" as shorthand for BPA's obligations to fish and wildlife under these and other laws.

¹ USDOE/BPA 1996b.

Since the passage of the Regional Act, BPA has incurred costs over \$6 billion for its fish and wildlife obligations. In addition, hydrosystem operation requirements for salmon recovery efforts have reduced the agency's effective power generation capability in the Region by about 1,000 megawatts since 1995, impacting BPA's revenues and replacement power costs.² As the agency that, on behalf of the FCRPS, currently funds a large share of the fish and wildlife mitigation and recovery efforts, BPA believes that a comprehensive and consistent policy would foster greater coordination and efficiency in fish and wildlife activities in the Region.

S.2 THE FISH AND WILDLIFE IMPLEMENTATION PLAN FINAL ENVIRONMENTAL IMPACT STATEMENT

BPA has prepared this EIS to examine the potential environmental consequences of following different Policy Direction alternatives to implement and fund fish and wildlife mitigation and recovery efforts in the Pacific Northwest. As discussed in BPA's Business Plan Final EIS, there are three broad dimensions of fish and wildlife administration that need to be considered in defining and illustrating BPA's potential directions:

- 1) the relationship between BPA's responsibility to implement its mandated fish and wildlife responsibilities, and its accountability for results;
- 2) the ability to predict and stabilize its fish and wildlife costs; and
- 3) the administrative mechanisms for distributing the fish and wildlife dollars.³

All three of these issues have given rise to BPA's need to move forward with a clear Policy Direction for its implementation and funding of fish and wildlife mitigation and recovery. BPA is preparing this EIS now because (1) many species of fish and wildlife are already declining (further delay must be minimized), and (2) BPA wants to be ready to respond promptly when the regional Policy Direction(s) require change.

Policy Direction: *the overarching theme that guides and shapes the decisions made by governments, agencies, or other public bodies regarding fish and wildlife mitigation and recovery efforts, applied through a series of actions that form an implementing plan.*

Note *that as BPA selects a Policy Direction, any such Policy Direction will be shaped by existing laws, regional processes, and other mandates that BPA must follow. These laws and mandates may change at any time in the future, as public opinion and priorities change, which could lead to corresponding modifications to any Policy Direction BPA may have chosen.*

² See Section 2.3.2.3, Managing the Money Resource, in Chapter 2 for details.

³ USDOE/BPA 1995a, Section 2.4.5.

More specifically, this EIS is designed to:

- (1) **evaluate the range of reasonable Policy Directions** and the potential implementing and funding actions associated with such Policy Directions that the Region could decide to take for fish and wildlife mitigation and recovery;
- (2) **determine the environmental consequences** of BPA's implementation and funding of the actions that could emerge from the Policy Directions;
- (3) **show how the specific Policy Direction is identified** at any given time by using a unified planning approach. The Region's governing bodies together may identify a Policy Direction, or a default policy may be identified by taking guidance from the independent actions planned and taken by the many involved parties attempting to recover fish and wildlife populations in the Region; and
- (4) **facilitate short- and long-term decisionmaking** by the BPA Administrator or other parties who may use the information contained in the EIS.

It is important to understand what BPA is *not* doing in this EIS:

- **BPA is not unilaterally creating new Policy Direction alternatives.** The alternative Policy Directions described and evaluated in this EIS are based on alternatives developed within the existing and ongoing policy initiatives within the Region.
- **BPA is not unilaterally selecting a Policy Direction for the Region.** Although BPA is working, through other means, to create a unified fish and wildlife mitigation and recovery policy—the Policy Direction that BPA adopts in its Record of Decision (ROD) for this EIS will be the *BPA* Policy Direction. It will guide BPA in its current and future fish and wildlife decisions. Although this EIS is intended for BPA decisionmaking, the analysis may also be valuable for other regional entities that may adopt it as part of their own decisionmaking process.

S.2.1 Purpose and Need

BPA needs a comprehensive and consistent policy to guide the implementation and funding of its fish and wildlife mitigation and recovery efforts.

BPA has an initial obligation in this EIS to fulfill its NEPA requirements for understanding the environmental consequences of its actions (funding and implementing any Policy Direction) before decisions are made and actions are taken. NEPA compliance will allow BPA to:

- avoid delays in taking effective action, and
- provide an opportunity for public involvement for interested parties.

There are also some specific purposes BPA must consider:

- **facilitating** implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve coordination, efficiency, and consistency;

- **fulfilling** statutory, legal obligations under the Regional Act; especially BPA's obligations to protect, mitigate, and enhance fish and wildlife; provide equitable treatment for fish and wildlife as with the other purposes of the FCRPS; and provide a reliable, adequate, efficient, and economical power supply;
- **fulfilling** the Administration's Fish and Wildlife Funding Principles such that BPA meets all of its fish and wildlife obligations, once established; take into account the full range of potential fish and wildlife costs; demonstrate a high probability of Treasury repayment;⁴ minimize rate effects on power and transmission customers; adopt rates and contracts that are easy to implement; and adopt a flexible fish and wildlife strategy;
- **fulfilling** other obligations under other applicable laws, including Federal treaty and trust responsibilities with regional tribes, the Endangered Species Act (ESA), the Clean Water Act (CWA), and the National Historic Preservation Act (NHPA); and
- **promoting** predictable and stable fish and wildlife costs and competitive rates, enhancing BPA's ability to provide funding for public benefits and remain competitive in the electric utility marketplace.

BPA will use these purposes listed as "yardsticks" to compare how well the alternative Policy Directions meet the agency's need.

S.2.2 Scope of this EIS

To improve the health of fish and wildlife and to find a way to use limited funds most efficiently, many participants throughout the Region have undertaken several related and wide-ranging processes with differing scopes (e.g., policy directions, geographic areas, and particular species). Some of these processes are narrowly focused such as hatchery propagation of fish, habitat restoration and improvement, manipulation of the flow in the rivers (hydro), management of Federal lands, or harvest controls. Others are more broadly focused. For example, the Federal Caucus' Final Basinwide Salmon Recovery Strategy,⁵ a product of nine Federal agencies known as the Federal Caucus, focuses on four areas affecting the life cycle of anadromous fish: hatcheries, harvest, habitat, and the hydrosystem to recover Columbia River Basin ESA-listed fish. Other broadly scoped processes include the Council's 2000 Columbia River Basin Fish and Wildlife Program⁶ which addresses fish and wildlife mitigation and recovery basinwide, and the Multi-Species Framework Report,⁷ a comprehensive approach to fish and wildlife mitigation for multiple species (not just mitigation and recovery of ESA-listed species).

⁴ Treasury repayment is a payment BPA makes annually to repay (1) monies BPA has borrowed from the U.S. Treasury and (2) appropriations to the Corps and Bureau for the share of capital construction allocated to the power purpose of the hydrosystem.

⁵ Federal Caucus 1999b and 2000b. These two documents were formerly known as the "All-H Plan"; they are the draft and final versions of the same study.

⁶ Council 2000d.

⁷ Marcot, B.G., et al. 2002.

Figure S-1, below, compares the scope of many of these different processes. The Figure illustrates how this EIS is scoped very broadly. It covers the full breadth of the numerous other regional processes, encompassing the overall policy-level issues for mitigation and recovery efforts throughout the Region and BPA's service territory.

The Region has a rich history of public policy related to fish and wildlife resources and the social and economic well-being of the Region. This history has lead BPA, and the Region, to a point of once again reflecting back on that public policy which has guided fish and wildlife resources use.

S.3 REGIONAL FISH AND WILDLIFE PUBLIC POLICY

To understand the issues and to make sound decisions on a future Policy Direction for the mitigation and recovery efforts regarding fish and wildlife populations in the Region, decisionmakers must understand three things:

- where we have been,
- where we are now, and
- what policy options are available for the future.

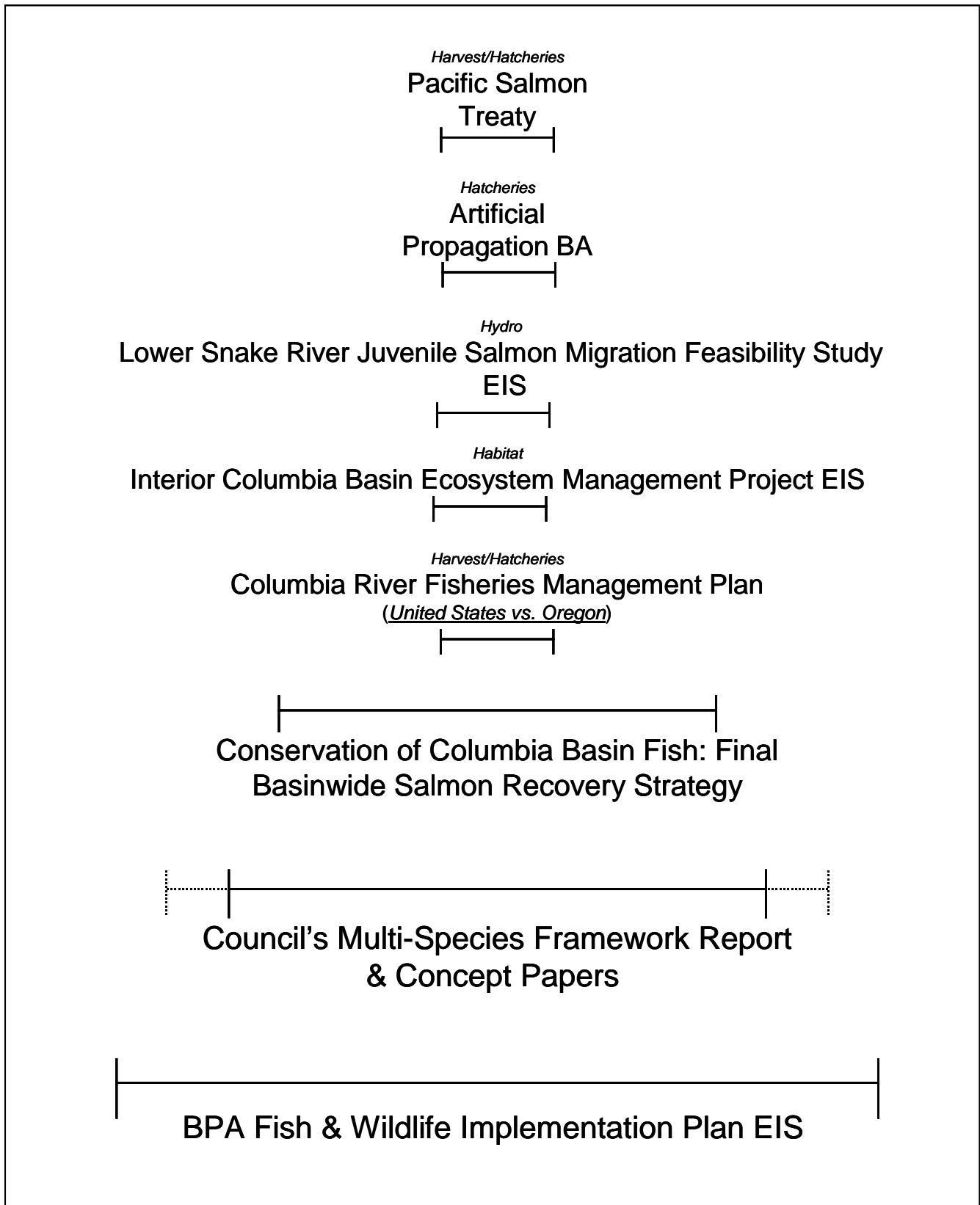
Analyzing history always presents the problem of which events to include and which ones to exclude, because there are a myriad of details to consider. In this EIS we kept focused on what has been done and what happened to the environment as a result. The history of public policy for fish and wildlife was reviewed so BPA, and the Region, could better understand and learn from past events and make the best choices for future policy.

S.3.1 Historical Perspective

Over the past two hundred years, the human environment of the Pacific Northwest has changed dramatically. Some normal variations (such as weather or ocean conditions) and natural disaster events are, of course, beyond human control. However, the vast majority of the changes, at least in number, have resulted from expressed or implied public policies. Consequently, the state of the Pacific Northwest's human environment today is largely a direct or indirect consequence of policies followed over the last two hundred years.

The evolution of fish and wildlife policy has progressed through several stages from early basic subsistence, to the emergence of commercial uses, onto a substantial period of environmental regulation, and settling into a more recent equitable treatment phase for fish and wildlife resources. The policy stages became shorter in duration and the trade-offs became more difficult to comprehensively assess. The trend is continuing as the Region faces further changes in public policy for fish and wildlife resources. As previously stated, BPA and the Region need a unified approach if they are to spend their financial resources efficiently and wisely.

Figure S-1: Examples of Breadth of Scope



S.3.2 Major Participants

There are many participants in the development of a Pacific Northwest fish and wildlife policy. It is important to understand the many interests:

- **the Executive Branch (President and Executive Offices) and Legislative Branch (Congress)** (because a given Policy Direction might require change in national funding resources and legislation),
- **regional tribes** (with express legal status and cultural, spiritual, and economic interests),
- **BPA and other Federal agencies** (which have direct or indirect responsibilities for fish and wildlife recovery and mitigation, as defined by various Federal statutes and regulations),
- **the Northwest Power Planning Council** (whose members from the four Northwest States develop and recommend fish and wildlife measures for BPA to fund as mitigation for the effects of the FCRPS),
- **individual states and local governments** (which in addition to their presence on the Council above, have responsibilities to enforce laws such as the CWA, in accordance with Environmental Protection Agency (EPA) guidelines. Local governments have responsibilities to manage municipal water and waste and are involved in community-based projects such as watershed councils),
- **regional commerce** (which includes people, businesses, and organizations representing such diverse interests as recreation, commercial fisheries, industrial/manufacturing facilities, transportation, agriculture/forestry, energy/transmission facilities, and residential/commercial development, that depend on the resources of the Columbia Basin for their livelihood), and
- **regional interests** (which include the many citizens and groups with other direct or indirect interests in the impacts, costs, strategies, and specific projects that may be involved in any plan to recover fish and wildlife populations).

S.3.3 Key Issues

Over the last decade, Federal agencies in the Region have developed and continue to develop a number of plans on specific fish and wildlife mitigation and recovery actions. They have also issued a series of EISs designed to evaluate those plans to support the implementation of the selected actions. These documents include the Lower Snake River Juvenile Salmon Migration Final Feasibility Report/Environmental Impact Statement (U.S. Army Corps of Engineers, February 2002), the Interior Columbia Basin Supplemental Final Environmental Impact Statement (U.S. Forest Service and Bureau of Land Management, December 2000), and the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (U.S. Forest Service and Bureau of Land Management, February 1994). These and other resource-related

documents have been used as resources in the preparation of this EIS, and are incorporated here by reference.⁸

The FWIP EIS has expanded on the issues addressed in existing environmental documentation by incorporating information from numerous recent regional processes. BPA has also worked with the public and the agencies to identify those "key issues" that are necessary to address for any comprehensive fish and wildlife mitigation and recovery plan to be successful. The key issues are listed in Table S.3-1 below.

Table S.3-1: Key Regional Issues

Key Regional Issues		
1 Habitat	4 Hydro	7 Transportation
1-1 Anadromous Fish	4-1 Dam Modifications and Facilities	7-1 Navigation and Barging
1-2 Resident Fish	4-2 Hydro Operations	7-2 Trucking, Railroads and Infrastructure
1-3 Introduced Species	4-3 Spill	8 Agriculture
1-4 Wildlife	4-4 Flow	8-1 Irrigation
1-5 Predators of Anadromous Fish	4-5 Reservoir Levels	8-2 Pesticides and Agricultural Practices
1-6 Watersheds	4-6 Water Quality	8-3 Grazing
1-7 Tributaries	4-7 Juvenile Fish Passage and Transportation	8-4 Forestry
1-8 Mainstem Columbia	4-8 Adult Fish Passage	9 Commercial Harvest
1-9 Reservoirs	4-9 Flood Control	10 Residential and Commercial Development
1-10 Estuaries and Ocean	5 Power	11 Recreation
1-11 Water Quality	5-1 Existing Generation	12 Tribes
2 Harvest	5-2 New Energy Resources	12-1 Tribal Harvest
2-1 Anadromous Fish	5-3 Transmission Reliability	12-2 Tradition, Culture, Spirituality
2-2 Resident Fish	6 Industry	
2-3 Wildlife	6-1 Industrial Development	
3 Hatcheries	6-2 Aluminum and Chemical	
3-1 Anadromous Fish	6-3 Mining	
3-2 Resident Fish	6-4 Pulp and Paper	

The key issues provide a means for sorting the hundreds of actions throughout the Region proposed by individuals, groups, organizations, and agencies to help guide the fish and

⁸ For a complete listing, see Chapter 1 of this EIS.

wildlife mitigation and recovery effort.⁹ These sample actions supply definition to a set of alternatives derived from regional discussions over fish and wildlife policy direction.

S.4 PROPOSED ACTION AND ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

This EIS examines the Status Quo ("no action" baseline), a range of five basic alternative Policy Directions, and a Preferred Alternative (PA 2002). Each Policy Direction represents a shift toward a particular focus or theme. The proposed actions that were sorted by key issue are further sorted by consistency with one of the five basic alternative Policy Direction themes. The exact actions taken under each Policy Direction, and the intensity of the actions, are not established at the policy level but are used to help the reader to better understand the Policy Directions. Specific actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate (see the Decisionmaking section below).

The Policy Directions are based completely on ideas set forth in recent regional processes on fish and wildlife recovery efforts, and they encompass the range of possible actions assessed within regional processes over the last 10 years. All regional concepts have been considered, even where some may prove infeasible under current law or impractical for other reasons, or may appear to be less effective.

The range of alternatives is covered by the five basic Policy Directions as follows:

- **Natural Focus**
- **Weak Stock Focus**
- **Sustainable Use Focus**
- **Strong Stock Focus**
- **Commerce Focus**

There is also a baseline—Status Quo—against which to compare Policy Directions and any identified preferred alternative Policy Direction from within the range of the basic alternative Policy Directions.

To date, BPA has found that a comprehensive policy has not yet been developed through a regionally unified planning approach. However, an alternative policy is emerging through separately developed and implemented agency actions. This alternative Policy Direction, with consideration of how the policy is likely to evolve in the foreseeable future, is described within this EIS as PA 2002.

⁹ See Volume 3, Sample Implementation Actions, Research Monitoring and Evaluation, and Policy and Planning.

After completing several important steps—seeking out and considering public comment on the issues and alternatives, considering completed and ongoing regional fish and wildlife recovery processes, comparing the five Policy Direction alternatives, considering the Status Quo alternative, evaluating the likely environmental consequences, and reviewing the EIS purposes—BPA has identified the PA 2002. This policy path defines much of the Region's recent past and present situation. Using the events of 2002 to assimilate a Policy Direction, BPA has derived this PA 2002. It is mainly made up of components of two of the five basic alternative Policy Directions alternatives (Weak Stock Focus and Sustainable Use Focus alternatives) defined in this EIS, and falls within that defined continuum of potential alternatives.

There are some important assumptions about future conditions that are held in common with all Policy Directions. They are as follows:

- Internal and external pressures for population growth and urbanization will continue unless specifically changed by an alternative.
- BPA's roles in marketing Federal hydropower and funding and implementing fish and wildlife programs will continue unless changed or affected by an alternative.
- All Policy Directions seek to attain their goals at the least cost practical. This statement should not be taken to mean that the goals themselves are necessarily economical or cost-efficient.

The Status Quo, five basic alternative Policy Directions, and PA 2002 are summarized below. All are based upon concepts for fish and wildlife policy developed or proposed by some persons in the Region.

Status Quo (no change from the approach present when the EIS was drafted)

The Status Quo Alternative represents the "no action" alternative—not changing the lack of clarity for policy direction and ad-hoc approach to fish and wildlife mitigation and recovery that the Region appeared to be following before 2002. Status Quo is defined relative to existing environmental conditions. For this EIS, the Status Quo serves as the baseline against which to compare alternative Policy Directions.

Description: Uses human intervention to address the perceived problems facing fish and wildlife populations and their recovery, with no unified or single regional plan. Independent strategies, multiple plans, different and sometimes conflicting goals, multiple governmental actions, and unclear expectations tend to result in a complicated and confusing mixture of many policy themes.¹⁰

The Status Quo focuses on modifying *hydro* system operations and increasing *hatchery* production to recover ESA-listed stocks of anadromous fish for increased harvest. The

¹⁰ See Appendix I for a visual representation of Status Quo across the five basic Policy Direction alternatives.

BPA mitigation and recovery funding efforts over the past decade have had substantially greater funding allocated to anadromous fish compared to that for resident fish and wildlife. Status Quo recognizes the past trade-offs between fish and wildlife and human activity and economic benefits.

Natural Focus

*"Wilderness is not for us at all. We should allow it to exist out of respect for the intrinsic values of the rest of nature and particularly for the life forms dependant on wild habitats."*¹¹

Under a unified regional planning approach, this alternative emphasizes *removing the past major human "interventions"* in the ecosystem and allowing the existing fish and wildlife to return to a natural balance without further major human intervention (*let nature heal itself*). The focus is on protecting *habitat* and controlling *hydro* operations to reestablish ecological processes. The preservation of habitat quality would be put ahead of economic activity.

As part of this alternative, the first priority is to protect areas considered pristine, especially those areas untouched by previous human development (e.g., value of "wildness," not directed at any species in particular). Second, for those ecosystems already altered by human activities, efforts would focus on minimizing further degradation and restoration would emphasize regeneration via natural processes. Third, in exceptional cases, humans might intervene to rebuild the most essential elements needed for natural functioning e.g., breaching dams).

Weak Stock Focus

*"Extinction is not an option."*¹²

Under a unified regional planning approach, this alternative emphasizes *human intervention to promote recovery* of weak species of fish and wildlife that are listed or proposed for listing under the Endangered Species Act or other legal protections. The focus is on actively protecting and enhancing *habitat* and controlling *hydro* operations to enhance survival of ESA-listed fish stocks and wildlife species at all lifecycle stages. Restoring quality habitat for weak stocks would be done over economic activity.

This alternative emphasizes an intensive approach to prevent the extinction of legally protected fish and wildlife populations. The priority would be on saving the weakest populations first. The ultimate goal is to "recover" species so they no longer need protection under the ESA. The ESA is the primary driver behind this Policy Direction and more emphasis would be on continued regulation.¹³

¹¹ Nash, Roderick 2001, p. 388.

¹² State of Washington 1999.

¹³ USDOJ/USFWS 1998a.

Sustainable Use Focus

*"Conservation is a state of harmony between men and land."*¹⁴

*"Conservation holds that it is about as important to see that the people in general get the benefit of our natural resources as to see that there shall be natural resources left."*¹⁵

Under a unified regional planning approach, this alternative emphasizes *human intervention as part of the goal to rebuild and maintain* sustainable fish and wildlife populations to promote expanded harvest and recreation opportunities. (*Sustainable* is defined as the continued use of a resource at a stable rate over the long term.) The focus is on increasing *hatchery* production, modifying *hydro* operations, and enhancing and managing *habitat* to increase harvest opportunities. Available resources are used to maintain and expand harvest opportunities.

This Policy Direction emphasizes the expansion of opportunities to harvest fish and wildlife resources. Humans have rights to use natural resources to meet sustenance, spiritual, and economic needs, but they also have an obligation to ensure that those resources are self-sustaining (e.g., intervene at all stages in the life cycles of fish and wildlife to help those populations rebuild and maintain themselves in perpetuity).¹⁶

Strong Stock Focus

*"It is time to apply 'triage' techniques, i.e., face up to what are likely irreversible declines in some runs in order to direct resources to those runs where the odds for long-term survival are better with adequate help."*¹⁷

Under a unified regional planning approach, this alternative emphasizes *human intervention to avoid declines* of strong fish stocks and strong wildlife populations preventing weakened populations that require legal protection. The focus is on maintaining *habitat* to sustain strong fish stocks and strong wildlife populations. Maintaining habitat and restricting further degradation would be put over economic activity and new development.

The focus here is on maintaining healthy fish stocks and wildlife populations within a stable ecosystem. Priorities would be based on the effectiveness of stock/population maintenance (as opposed to recovery) and costly efforts to recover populations that are so depleted that they likely will not be recovered would be abandoned (e.g., limited resources would go to the fish and wildlife that have the best chance of maintenance and recovery).¹⁸

¹⁴ Leopold, Aldo 1949, p. 207.

¹⁵ Pinchot, Gifford 1910, p. 81.

¹⁶ CRITFC 1996.

¹⁷ Thomas, Jack Ward, Dr. 2000, p. 5.

¹⁸ Thomas, Jack Ward, Dr. 2000, p. 4. See generally Michael, John H. 1999.

Commerce Focus

*"Endangered species has divided the country on an issue that seemingly pits growth (and jobs) vs. the environment. This does not have to be the case. Protecting endangered species can be integrated with economic growth, turning a win-lose or lose-lose situation into one where everyone benefits. This can be accomplished by using economic incentives to promote conservation.... Although the costs incurred by these incentives may be high in some cases, they will be highly cost-effective. The current 'at any cost' strategy is only marginally effective, and can actually harm species in some circumstances."*¹⁹

Under a unified regional planning approach, this alternative emphasizes *human intervention to enhance the economic value* of river uses and allocates a portion of the revenues to fund fish and wildlife mitigation. The focus is on increasing *hatchery* production and improving *hydro* operations to support the commercial values of the river. Increased revenues would be put toward funding fish and wildlife mitigation programs that do not directly affect economic efficiency.

This Policy Direction emphasizes economic efficiency in choosing a recovery strategy. Money is a scarce resource and a major component in any recovery plan, and should be spent only when costs are justified by benefits. This Direction decreases government regulation and emphasizes voluntary actions, financial incentives, and market mechanisms to bring about desired results that can best meet the goals of fish and wildlife conservation, while still fulfilling their economic needs (e.g., we have to be left standing if we are going to support a unified plan).^{20,21}

BPA Preferred Alternative (PA 2002)

"Our goal is to arrive at a "unified plan"—a set of common understandings and actions that enjoy a wide base of regional support and commitment. The Action Agencies believe that there is much common ground between the 2002-2006 5-Year Plan and the various regional recommendations and programs for salmon recovery,

"Recovery must provide for immediate, emergency needs of the fish, but also commitment for the long-term. Recovery must operate across multiple jurisdictions—five states, two nations, and numerous Indian tribes. Recovery must meld the needs of the anadromous and resident fish, listed and non-listed fish, and hatchery and wild fish. Through all of these challenges, recovery must deal with human actions, yet strive to restore some semblance of the natural conditions and functions that support wild fish." (Federal Action Agencies, 2001)²²

"It is the federal government's role to administer the Endangered Species Act and to uphold tribal trust responsibilities. But the states also have an important role and responsibilities, as do other regional entities. Agreement on a regional approach,

¹⁹ Schaerer, Brett 1996, p.1.

²⁰ Smith, Craig 1998.

²¹ PNWA 1996; Schaerer, Brett 1996; PNWA 2000.

²² USDOJ/Bureau, Corps, and BPA 2001a, p.3.

consisting of specific federal, state and regional plans that protect both salmon and our communities, should be reached and accepted by federal and state officials in consultation with tribal leaders...." (Governors Recommendations, July 2000)²³

"Under the Northwest Power Act, the Council's fish and wildlife program is not intended to address all fish and wildlife problems in the basin from all sources. But the Council adopted the vision, objectives, strategies and scientific foundation with the belief that they will complement and help support other fish and wildlife recovery actions in the region." (Council's Fish and Wildlife Program, 2000)²⁴

"There are gaps and unavoidable uncertainties associated with the science. Therefore, the Strategy calls for a comprehensive research monitoring and evaluation program to reduce those uncertainties that are critical to future decisions regarding salmon and steelhead recovery, while providing information for needed adjustments to future strategies." (Federal Caucus, 2001)²⁵

"The Tribal vision for the future of the Columbia river Basin is one in which people return to a more balanced and harmonious relationship with the environment." (CRITFC, 1999)²⁶

The focus of the PA 2002 is to use a unified planning approach to protect weak stocks of fish and achieve biological performance standards, as set forth in the BiOps, while sustaining overall populations of fish and wildlife for their economic and cultural value. PA 2002 is essentially a blend of the *Weak Stock Focus* and *Sustainable Use Focus* Alternative Policy Directions.²⁷ As under both Alternatives, the unified regional planning approach will be implemented to the greatest degree possible.

The principal guidance for this Policy Direction comes from the Federal Caucus' Basinwide Strategy, the 5-year implementation planning and progress reporting efforts of the three Federal Action Agencies (Corps, Bureau, and BPA) for the FCRPS, the Council's 2000 Fish and Wildlife Program, the Governors' Recommendations, the Tribal Vision, and the Corps' 2002 Record of Decision on the Lower Snake River Feasibility Study. Where Key Issues were not specifically addressed in the above referenced documents, BPA was guided by the pertinent parts of the overall themes of the Weak Stock Focus and Sustainable Use Focus Policy Directions, other regional fish and wildlife processes, and public input to determine the remaining aspects of the PA 2002.

The PA 2002 focuses on enhancing fish and wildlife *habitat*, modifying *hydro* operation and structures, and reforming *hatcheries* to both increase listed stock populations, and provide harvest opportunities in the long-term. It gives priority to improving water quality and habitat for ESA-listed stocks of fish over economic activity, stopping short of breaching dams. It emphasizes human management, in a least-cost manner, to recover

²³ Governors, Pacific Northwest States 2000, p. 17

²⁴ Council 2000d, Introduction section, p. 10.

²⁵ Federal Caucus 2000b, p. 2.

²⁶ CRITFC 1999, p. 2.

²⁷ The dam breaching aspects under the Weak Stock Focus alternative are not part of the PA 2002. See Corps 2002c.

listed species and build sustainable populations of fish and wildlife, while recognizing that ultimately the fate of the listed species may now be determined by weather and ocean conditions rather than human action.

S.5 COMPARING THE POLICY DIRECTIONS

The BPA Administrator must make fully informed decisions about BPA’s funding and implementation of its fish and wildlife obligations to support the Region’s mitigation and recovery efforts. Understanding the environmental consequences of implementing the Policy Direction that best reflects the Region’s position is paramount. An important objective of this EIS is to provide that information. BPA has evaluated each of the five basic Policy Direction alternatives against the Status Quo. The PA 2002, which is a blend of the Weak Stock Focus and Sustainable Use Focus alternatives, has also been compared against the Status Quo. By using this methodology, the BPA Administrator, as well as others in the Region, can evaluate the environmental consequences of current Policy Direction proposals and future proposals.²⁸ The structure of the analysis provides for an assessment of the cumulative effects of implementing a Policy Direction.

Table S.5-1, provides a summary of **Natural Environment** and **Social and Economic Environment**²⁹ consequences of the Policy Directions, and PA 2002, based on the analysis in Chapter 5. The table illustrates the anticipated long-term environmental effects of the alternative Policy Directions compared to Status Quo. This summary highlights the areas where the effects are clearly different, but also shows where they may be similar, offering the opportunity to quickly see the possible “trade-offs.” Effects are shown by shading to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo.³⁰ By assembling and condensing the information in this manner, decisionmakers can more readily compare the likely environmental consequences. The effects shown for each Policy Direction are without mitigation. Chapter 5 discusses potential mitigation measures.

No judgment is made about whether the Status Quo, or any other Policy Direction, is *good* or *bad*. This EIS is not intended to define the Region’s values. Some may believe that economic prosperity should be the overriding value; others may believe that maintaining a natural environment should be the appropriate value. Still others may believe that some form of balance between economic prosperity and preservation of the natural environment should be the “correct” value for the Region. These disparate viewpoints are represented within the range of alternatives.

²⁸ See Chapters 3 and 5, and Appendix I for information on how to create and evaluate different Policy Direction alternatives.

²⁹ For information about the existing environmental conditions in these effect areas, please see Chapter 2. For a listing of those actions that are proposed for each Policy Direction, as well as the current implementation actions now underway, please see Section 3A. For a more detailed discussion of environmental consequences, including the analysis behind Table S.5-1, please see Chapter 5.

³⁰ Effect categories are condensed from the expanded list of categories described in Section 5.3 of this EIS. Condensing allows the reader to more easily see the major trends in effects. Where categories are condensed, the summaries represent the central tendency of the more detailed results.

Table S.5-1: Comparison of the Alternatives Including the Preferred Alternative (PA 2002)*

Effect Area	Status Quo*	Natural Focus	Weak Stocks	PA 2002	Sustain-able Use	Strong Stocks	Com. Focus
NATURAL ENVIRONMENT							
Air Quality							
Land Habitat							
Upland							
Riparian/Wetland							
Water Habitat							
Nitrogen Supersaturation							
Non-Thermal Pollution							
Sedimentation**							
Temperature/Dissolved Oxygen							
Instream Water Quantity							
Amount Stream/River Habitat							
Reservoir Habitat							
Fish and Wildlife							
Naturally-spawning Native Anadromous Fish							
Hatchery-produced Native Anadromous Fish							
Native Resident Fish							
Native Wildlife							
Non-Native Species***							
SOCIAL AND ECONOMIC ENVIRONMENTS							
Commerce							
Recreation							
Economic Development							
Funding Costs							
Tribes							
Fish Harvest							
Health, Spirituality, and Tradition							
Cultural/Historic Resources							
Aesthetics							

* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 5.1.

** The sedimentation evaluation is based on long-term effects. It should be noted that the short-term effects under Natural Focus and Weak Stock from dam breaching would be much worse than those conditions under Status Quo.

*** Under this analysis fewer non-native species is considered "better". For a complete discussion, see Chapter 5.



Another important objective of this EIS is to show how a Policy Direction will affect BPA's ability to fulfill the stated purposes. The Administrator must consider these environmental consequences together with the purposes in this EIS and other relevant factors (including public input) to make an informed decision on a comprehensive and consistent policy to guide BPA's implementation and funding of fish and wildlife mitigation and recovery actions.

The many ethical, political, legal, and scientific implications surrounding fish and wildlife management issues make them difficult to discuss without becoming mired in the pro and con of various policy choices. While science can help evaluate the consequences of different policy options, resource management issues are ultimately issues of public choice. This frames the dilemma that now faces decisionmakers, including BPA, that are involved with fish and wildlife policy—the trade-offs have to be considered.

S.6 DECISIONMAKING

There is no one "best" Policy Direction. "Best" is a value judgment, ultimately a matter of personal preference. However, one may evaluate whether certain actions are more or less likely to bring about certain results. In making a decision, BPA must consider:

- What fish and wildlife Policy Direction the Region appears to be following.
- How to fund and mitigate the environmental consequences, if necessary, of the likely actions under that Direction.
- How best to implement the Direction being followed and meet BPA Purposes.

In this EIS, a wide range of the environmental consequences of alternative Policy Directions were evaluated. The evaluation included trade-offs among resources, as well as ways to mitigate effects. The public and decisionmakers were offered an opportunity to assess, participate in, and influence the selection of a regional Policy Direction alternative(s) for fish and wildlife mitigation and recovery efforts. Because BPA's EIS is undertaken as a complement to other regional processes, it will also provide a springboard for BPA to implement specific actions consistent with the selected Policy Direction with minimal or no further delay and without the need to constantly revisit past decisions.

After publication of this Final EIS, BPA will prepare a Record of Decision (ROD) that documents and explains the basis for the selected Policy Direction. The ROD will also identify the alternative Policy Directions considered to be environmentally preferable. BPA may then "tier" decisions about the implementation of actions consistent with the same Policy Direction.³¹

³¹ See Chapter 1.

As part of this decision process, this EIS will support actions that BPA determines are necessary to comply with its responsibilities, including the following:

- funding and implementing fish and wildlife mitigation and recovery efforts that support the selected Alternative Policy Direction;
- integrating those efforts into a unified plan;
- short- or long-term FCRPS recommendations in the NMFS and USFWS BiOps;
- funding of the Council's Fish and Wildlife Program,
- capital improvements at FCRPS projects; and
- funding of cultural resource mitigation.

S.7 FUTURE CHANGES IN POLICY DIRECTION

Once the BPA Administrator, or any other decisionmaker, chooses a Policy Direction, it will need to be implemented. Individuals, groups, or agencies will take appropriate implementing actions, such as those provided as Sample Implementation Actions in this EIS.³² Many natural, economic, and social factors will strongly influence the ultimate success of these actions. If we have chosen well, fish and wildlife mitigation and recovery will improve at an acceptable social pace and economic cost.

Even if we have chosen as well as we can, we may find, in monitoring results, that we need to change our specific actions, or the overall Policy Direction itself. Successful mitigation and recovery may mean that the Region needs to modify its management of the resources differently. On the other hand, mitigation and recovery may not be as successful or as speedy as we wish, or the consequences for other resources may prove unacceptable. Research and development may result in new types of actions, or science may determine that other types of actions might better foster fish and wildlife mitigation and recovery. Federal or state officials and the actions they advocate may change, or the preferences of society may change. Regardless of the reason, eventually, the chosen Policy Direction will likely need to be modified. This EIS is designed to accommodate such need.

This is a forward-looking policy-level EIS. As such, BPA has taken into account the possibilities of factors outside human control such as weather, ocean conditions, species-specific disease, and social or economic crises that can change the predicted effect of a particular course of action. New decisionmakers, and the decisionmaking process itself, may also affect implementation.³³ If any of these potential events or circumstances occur, it is particularly important to understand how the interaction of public process, political intervention, and judicial review may affect implementation of the fish and wildlife mitigation and recovery plans.

³² See Volume 3.

³³ See Chapter 4.

We know that change will occur-in the natural, social and economic environments, as well as in public policy. This EIS is designed to facilitate BPA's ability to quickly accommodate such changes. These tools help make it possible to modify, extend, or create a Policy Direction:

- Response strategies – After a decision on a particular Policy Direction, it is likely that economic, political, or environmental changes will require corrective measures to maintain the selected course. Response strategies allow immediate corrections or improvements *without changing the overall Policy Direction* in effect. They represent management options within the agency's jurisdiction that have been contemplated, implicitly or explicitly, and evaluated in advance, allowing for immediate implementation. Response strategies are grouped into three categories: Management and Operating Agency, BPA Funding, and Regional.
- Reserve options – Fish and wildlife policy in the Columbia River Basin has changed over time, and is expected to continue to evolve. The specific actions being considered today are different from those that were considered 10 or 20 years ago. Developments in science and technology, past successes and failures, different people and priorities, and changes in focus from salmon to multi-species are just a few examples. Future developments may necessitate changes beyond the specific actions currently considered “reasonable” under the Policy Directions. We have identified "Reserve Options" to ensure that those future decisionmakers have the needed flexibility to make those changes. Public process would be conducted before such options were decided and implemented.
- Mix and match approach – Decisionmakers could revisit a chosen Policy Direction after it has been implemented and make changes. If a particular action or set of actions proved to be very successful, decisionmakers may want the flexibility to implement such actions on a broader scale. Conversely, if a particular action or set of actions were not producing the desired result, decisionmakers could substitute a more aggressive action or opt for a different strategy. This EIS is designed to be broad enough to encompass any potential Policy Directions under consideration throughout the Region. By mixing and matching components of the different Policy Directions, decisionmakers could create a new Policy Direction. Because the mix-and-match approach is used to *create a new Policy Direction*, regional discussion and public process would likely be necessary.

All three of these tools are designed to provide full disclosure of related information and to further the public's understanding of the decisionmaking process, now and in the future.

READER'S GUIDE

Welcome to the Fish and Wildlife Implementation Plan Final Environmental Impact Statement (FWIP EIS). Below are a few tips to help you make best use of the document.

WHAT THIS DOCUMENT DOES

- Bonneville Power Administration (BPA) is obligated to fund and implement fish and wildlife mitigation and recovery actions. BPA also has a statutory obligation to understand the environmental consequences of its actions and to provide an opportunity for the public to participate in agency decisionmaking. Accordingly, the FWIP EIS process has been designed to meet the needs of both agency decisionmakers and the public as we work together under current and developing Pacific Northwest (PNW) mitigation and recovery Policy Direction(s). In years to come, as new direction(s) emerge, BPA expects that this EIS—designed to cover a wide range of possible actions—will continue to provide the necessary environmental coverage to allow mitigation and recovery actions to proceed expeditiously and in full compliance with NEPA.
- This EIS is designed to (1) evaluate the range of potential Policy Directions and possible related implementing actions that the Region and BPA could decide to take for fish and wildlife mitigation and recovery, (2) show how to identify the direction at any given time that best reflects the PNW's policy for fish and wildlife populations in the Region, and (3) determine the environmental consequences of BPA's present and future decisions to implement and fund actions that could emerge from that policy.

WHAT TO EXPECT IN THE FWIP EIS

- Many EISs are written for specific actions, e.g. building a fish hatchery or developing wildlife habitat. This EIS, however, is about *policy*: what kind of priorities to set for fish and wildlife and how to integrate those priorities with other needs for the use of the river and land.
- This means that the discussions and analyses in this EIS are different from those in typical site-specific EISs. You won't see many calculations, but you *will* see how different actions will cause more or less impact on a natural, social, or economic resource. You will see the same topics covered that the Council on Environmental Quality specifies for EISs: Need, Background, Alternatives (including No Action or Status Quo—continuing to follow the same path), and Environmental Consequences.
- This EIS has condensed tens of thousands of pages of technical information produced in other regional processes and considered hundreds of public comments in evaluating key topics connected with fish and wildlife policy. The many proposed fish and wildlife actions have been sorted into five basic Policy Direction alternatives, representing a wide range of themes. These Policy Directions provide a basis for organizing the many fish and wildlife processes and ideas. (See Figure RG-1.)
- After considering the entire EIS record, BPA has now identified an initial Preferred Alternative Policy Direction (PA 2002). This PA 2002 best reflects the Agency's consideration of guidance from the PNW. See Chapter 3 for details.

HOW THE EIS IS STRUCTURED

- To focus on the problems and compare possible solutions, please read Chapters 1 and 3. For an understanding of the existing environment and a detailed analysis of the effects on the human environment of implementing the Policy Directions, read Chapter 5. To understand the difficulties of implementing a Policy Direction, and what provisions have been made for change, read Chapter 4. Chapter 2 summarizes key points in the history of fish and wildlife policy in the Region. Chapter 6 focuses on how a selected policy might be managed. (See Figure RG-2.) Chapter 7 addresses pertinent Federal statutes, regulations, and Executive Orders related to the Policy Directions. Chapter 8 presents a brief summary of the results of public meetings and workshops.

Figure RG-1: Sorting Policy Alternatives

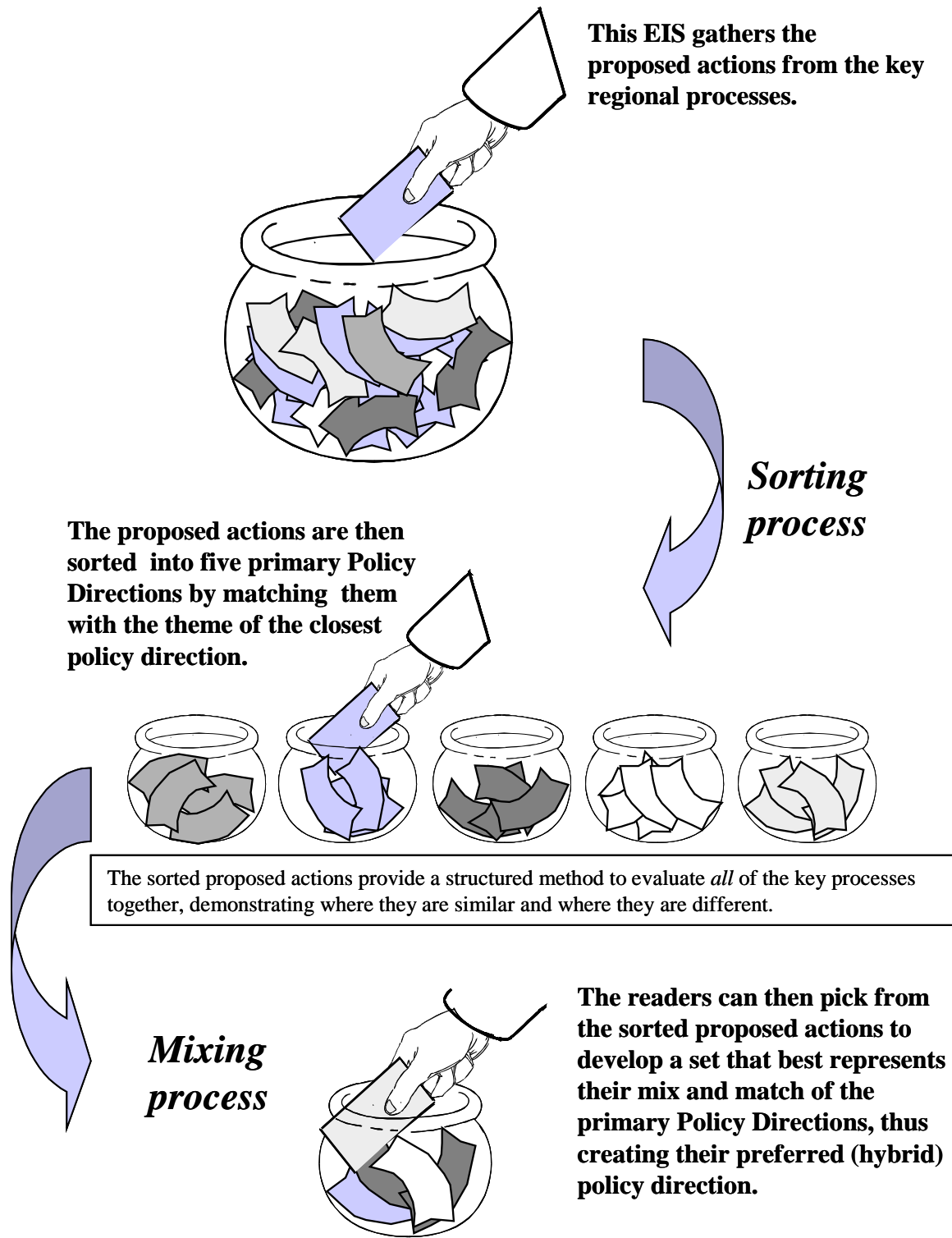
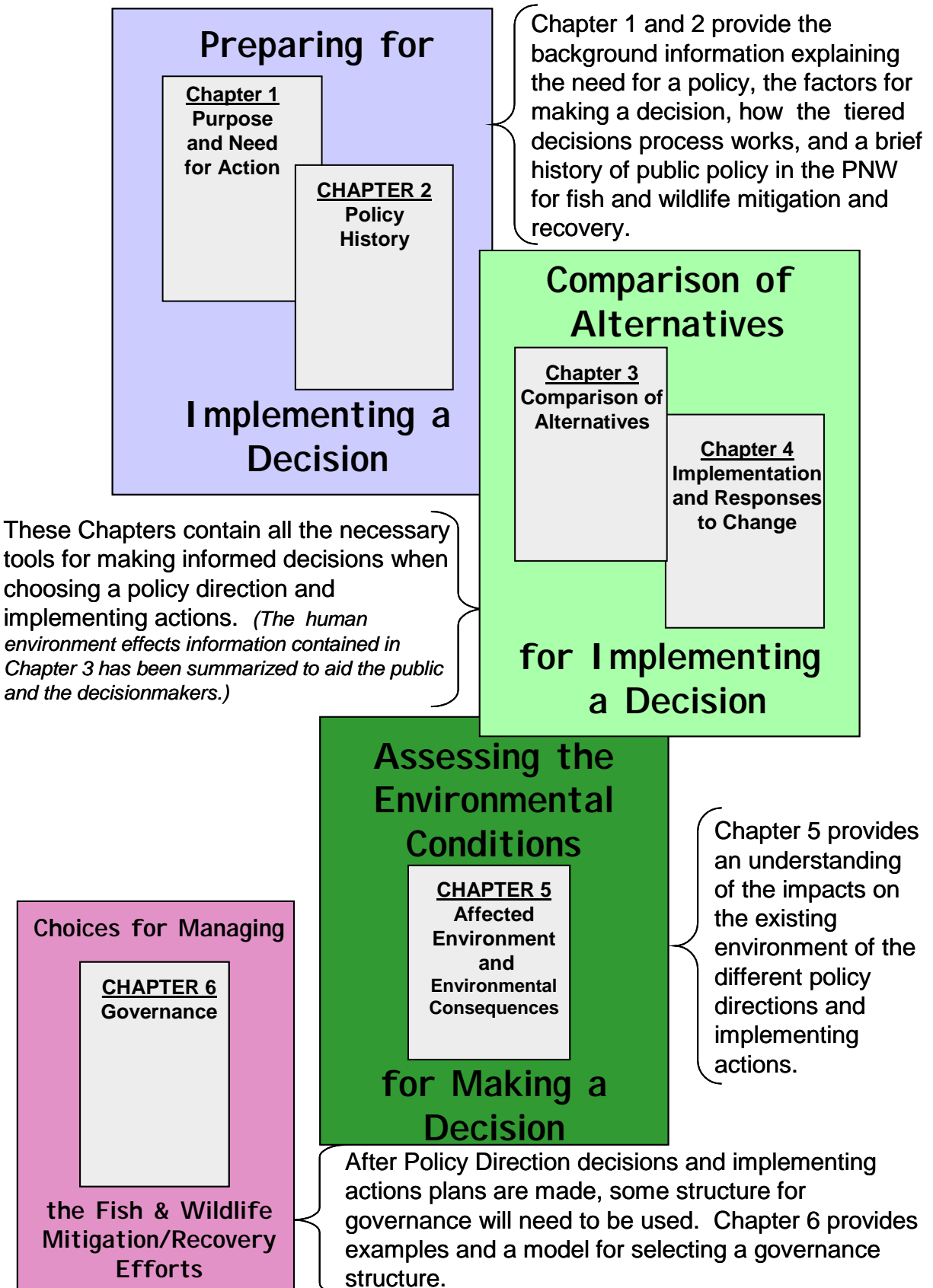


Figure RG-2: Structure of the Chapters



“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.” Albert Einstein

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CHAPTER 1

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Introduction

- Statement of the problem with the regional fish and wildlife mitigation and recovery effort
- BPA's role in this effort

Background

- Description of:
 - the major participants,
 - the scope of this EIS, and
 - the related processes.

BPA's Need for a comprehensive and consistent fish and wildlife mitigation and recovery policy

BPA's Purposes for funding and implementing actions

Decisionmaking Process

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

- **Describes the problem for which this final environmental impact statement (EIS) examines alternative solutions.**
 - **Outlines Bonneville Power Administration's (BPA) role, the scope of its involvement, and factors to consider in its decision.**
 - **Introduces the major participants and processes involved in addressing the problem.**
 - **Identifies the decisions to be supported by this Final EIS.**
-

1.1 INTRODUCTION

BPA has prepared this Fish and Wildlife Implementation Plan (FWIP) EIS to examine the possible environmental consequences of its decision to implement and fund a Policy Direction for fish and wildlife mitigation and recovery efforts in the Pacific Northwest. A broad range of Policy Directions is reflected within the alternatives considered in the FWIP EIS. This range of Policy Directions serves as a foundation from which to build an understanding of the overall environmental consequences for making a decision on a Policy Direction, or combination of Policy Directions, to follow now and in the future. This EIS also incorporates several key ongoing regional fish and wildlife processes. These combined processes, as described in Section 1.3.2, will shape and establish a regional fish and wildlife Policy Direction that BPA will use to guide its current and future mitigation and recovery efforts, including its funding of those efforts. BPA is preparing this EIS now because (1) many species of fish and wildlife are already considered to be at risk (further delay must be minimized), (2) BPA wants to be fully informed and ready to respond promptly when a regional Policy Direction(s) is being selected or changed, and (3) if the Region is unable to reach agreement on a Policy Direction, BPA needs to be able to move forward with a Policy Direction that best reflects the regional view.

Policy Direction: *The overarching theme that guides and shapes the decisions made by governments, agencies, or other public bodies regarding fish and wildlife mitigation and recovery efforts, applied through a series of actions that form an implementation plan.*

Note that BPA will select a Policy Direction that reflects the different policies and actions currently being developed within the Region. Any chosen Policy Direction will be shaped by existing laws, regional processes, and other mandates that BPA must follow. These laws and mandates may change at any time in the future, as public opinion and priorities change. These changes could lead to corresponding modifications to any Policy Direction BPA may have chosen.

More specifically, this EIS is designed:

- (1) to evaluate the range of reasonable Policy Directions** and the potential implementing and funding actions associated with such Policy Directions that the Region could decide to take for fish and wildlife mitigation and recovery efforts;
- (2) to determine the environmental consequences** of BPA's implementation and funding of the actions that could emerge from the Policy Directions;
- (3) to show how the specific Policy Direction is identified** at any given time by using a unified planning approach. The Region's governing bodies together may identify a Policy Direction, or a default policy may be identified by taking guidance from the independent actions planned and taken by the many involved parties attempting to recover fish and wildlife populations in the Region; and
- (4) to facilitate short- and long-term decisionmaking** by the BPA Administrator or other parties who may use the information contained in the EIS.

An environmental impact statement is a document that presents an analysis of the potential environmental effects of a major Federal action and its reasonable alternatives. It is required by the National Environmental Policy Act (NEPA) when the consequences of that action may be significant. After incorporation of public review and comment, the EIS is used by agency decisionmakers to select the best alternative for action to meet a defined need.

Resource Demands. The Pacific Northwest has long prided itself on its bountiful and diverse natural resources—its forests and grasslands, minerals and rivers, fish and wildlife. The Region has also relied on these natural resources to serve multiple, and sometimes conflicting, uses. Human uses can compromise and severely deplete these resources, even eliminate them. The independent demands of the whole spectrum of human uses (such as irrigation, municipal water supplies, grazing, fishing and hunting, electric power production, recreation, timber harvest, development, and transportation) have placed increasing stress on the natural resources of the Columbia River Basin and the Region. One consequence is that, over the last decade, the number of fish and wildlife species listed as endangered or threatened under the Endangered Species Act (ESA) has increased dramatically.

Endangered: A species in danger of extinction throughout all or a significant portion of its range.

Threatened: A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Recognizing this trend, the public and private interests of the Pacific Northwest have tried to mitigate these stresses—to improve the status of fish and wildlife and their habitats, especially those that are considered threatened or endangered. Mitigation, as defined by NEPA, can take several forms:

- avoiding actions that might have a negative impact;
- minimizing impacts by limiting human actions;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- working to preserve and maintain a resource; and
- compensating for the impact by replacing or providing substitute resources or environments.¹

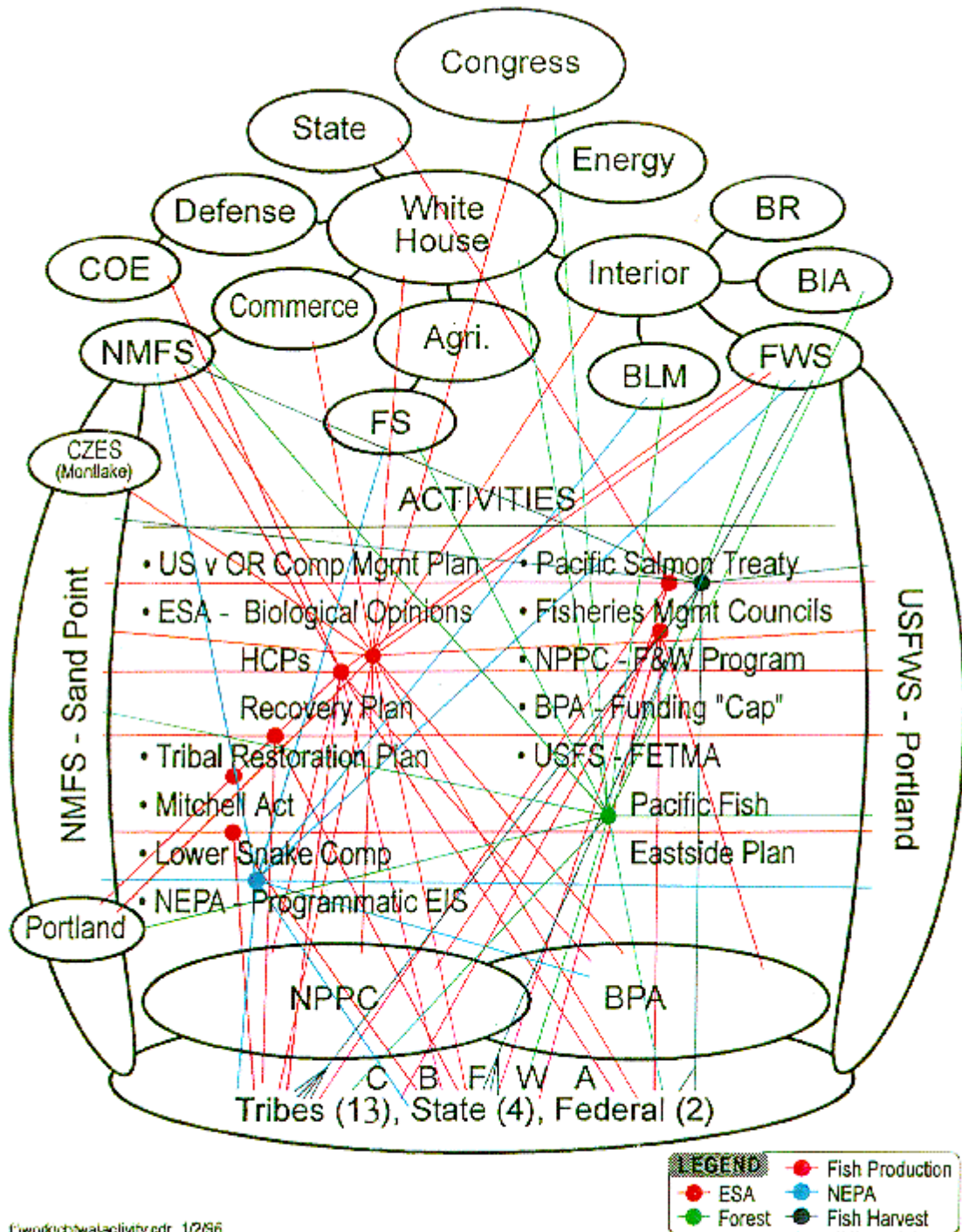
Lack of Management Coordination. For several decades, a variety of Federal, state, and tribal entities within the Pacific Northwest have been managing fish and wildlife resources. Each entity has its own legal constraints, policy directives, and constituent interests. There is no formally recognized "umbrella" organization or overall Policy Direction to help coordinate or reconcile the entities' respective actions. This situation has played an important role in keeping the Region from reaching common goals to support healthy, self-sustaining fish and wildlife resources. The Fish and Wildlife Activity Map (Figure 1-1) shows an example of the number and overlapping tangle of authorities.²

Past Attempts to Address the Problem. Over the last 10 years, the Region has sought to stem and even reverse species decline. Regional governmental entities, interest groups, and citizens have intensified their efforts to determine how best to mitigate effects (impacts) on fish and wildlife populations.

¹ CEQ (Council on Environmental Quality) 1987, Section 1508.20.

² The figure is reproduced exactly as it was transcribed at a meeting to identify issues and interested parties. BR = Bureau of Reclamation; BIA = Bureau of Indian Affairs; Agri. = Department of Agriculture; FS/USFS = U.S. Forest Service; BLM = Bureau of Land Management; FWS = U.S. Fish & Wildlife Service; NMFS = National Marine Fisheries Service; CZES = Coastal Zone Estuary Study; COE = U.S. Army Corps of Engineers; NPPC = Northwest Power Planning Council; CBFWA = Columbia Basin Fish and Wildlife Authority; ESA = Endangered Species Act; HCP = Habitat Conservation Plan; FETMA = Forest Ecological Timber Management Assessment.

Figure 1-1: Fish and Wildlife Activity Map



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NOTE: This diagram was an actual attempt in 1996 to capture the connections between the numerous complexities of the regional fish and wildlife activities.

Lack of Progress. Unfortunately, after more than a decade of good intentions, there has been less progress than necessary to reverse species decline. Some important reasons are:

- (1) **Different groups have different values and priorities, leading to different (and often conflicting) ideas about what recovery and mitigation efforts should be.** For example, some groups want to maximize fish production, while others want to preserve biological diversity. Such conflicting ideologies have made reaching a consensus extremely difficult.
- (2) **There is no clear and agreed-upon scientific answer to the problem.** Many factors affect the decline and recovery of fish and wildlife populations. Substantial scientific disagreement exists even today as to the best means to rebuild ecosystems and recover populations.
- (3) **Conflicting directives and jurisdictions of regional authorities have meant that funds dedicated to fish and wildlife mitigation and recovery efforts have often been used less efficiently and effectively than they otherwise could have been.** The Region has not been able to launch a fully coordinated mitigation and recovery plan. There have been delayed, inconsistent, piecemeal, and contradictory actions. Attempts to correct problems for one species have, in some cases, caused problems for other species. The Region has been unable to agree on how to gather or review information to determine whether certain actions are working, so that the actions can be expanded, amended, or stopped. This means that more money is spent than is necessary, and that more benefits could be obtained for the same amount of money.

Unified Planning Approach. Recently, however, regional entities have taken more steps to work together to develop a **comprehensive and coordinated planning approach for mitigation and recovery efforts**. Any such approach must involve, for example, coordinating policies and programs under the ESA, the Pacific Northwest Electric Power Planning and Conservation Act (Regional Act), the Clean Water Act (CWA), and trust and treaty obligations with the tribes, along with other obligations. A unified planning approach is based upon the premise that all fish and wildlife resources are interrelated parts of a single ecosystem, and that humans are integral components of the ecosystem through their many and diverse activities. Therefore, the needs of humans, fish, and wildlife must be addressed together and simultaneously. BPA supports this move toward a more unified planning approach, and is one of the many participants involved (see Section 1.3.1).

BPA has certain roles and responsibilities in the fish and wildlife mitigation and recovery effort and in the unified planning approach:

- BPA must responsibly use ratepayer money to fund and implement certain fish and wildlife mitigation and recovery actions in accordance with its obligations under statutes and regulations (e.g., under the ESA and Regional Act; see Section 1.2.1).
- BPA recognizes it must take action in response to fish and wildlife policy, whether a unified planning approach is successfully developed and adopted

(active policy selection) or whether the Region just continues as it has in the recent past (default policy selection—status quo).

The FWIP EIS. Because environmental analysis and public process will be necessary to fully inform BPA and the public of the consequences of funding and implementing various actions, BPA has prepared this EIS. BPA has analyzed a range of alternative Policy Directions to determine their environmental consequences, as well as their potential effects on BPA's implementation and funding responsibilities now and in the future.

It is important to understand what BPA is *not* doing:

- **BPA is not unilaterally creating new Policy Direction alternatives.** The Policy Direction alternatives described and evaluated in this EIS are based on *alternatives developed within the existing and ongoing policy initiatives within the Region.* We closely studied the proposals submitted by all the major participants in the many processes underway, followed the development of key issues, and sorted and grouped the ideas together by overall theme. We synthesized five Policy Direction action alternatives (plus a baseline alternative, Status Quo—no change from the approach present when the EIS was being drafted), from a range of options and presented them in the Draft EIS (June 2001). Volume 3 of this Final EIS lists hundreds of Sample Implementation Actions drawn from these proposals, and used to further define the Policy Direction through potential actions.
- **BPA is not unilaterally selecting a Policy Direction for the Region.** BPA is working hard, through its implementation of the National Marine Fisheries Service (NMFS)³ and U.S. Fish and Wildlife Service (USFWS) Biological Opinions (BiOps), and the Northwest Power Planning Council's (Council) Columbia River Basin Fish and Wildlife Program, to complete a unified fish and wildlife mitigation and recovery policy. However, the timing and ultimate success of that effort is uncertain. In any event, BPA is obligated to fund and implement fish and wildlife mitigation and recovery actions before, during, and after these policy-level deliberations. BPA also has a statutory obligation to understand the environmental consequences of its actions and provide an opportunity for the public to participate in agency decisionmaking.

The FWIP EIS is designed to meet the immediate and future needs of agency decisionmakers and the public for information regarding the impacts of mitigation and recovery actions proposed for implementation. However, if the Region fails to agree upon a Policy Direction, BPA must still implement and fund a fish and wildlife mitigation and recovery effort strategy. Therefore, after considering the comments received on the Draft EIS and guidance from recent regional fish and wildlife recovery efforts, we have developed a Preferred Alternative (PA 2002). The PA 2002 is composed

³ In 2002, NMFS changed its name and is now known as NOAA Fisheries.

primarily of elements from two of the five base alternatives examined in this EIS (see Chapter 3).

Section 1.2 below focuses on BPA's role and its purpose and need in undertaking this environmental study. Section 1.3 lays out the background essential to understanding the process itself, covering the major participants involved in the unified planning effort, the studies and environmental documents that support the current work, and the different processes that form the background and impetus for this EIS.

BPA is an agency of the U.S. Department of Energy. It wholesales electric power produced at 31 Federal projects located in the Columbia-Snake River Basin in the northwestern United States, as well as the power from one non-Federal nuclear plant and renewable resources. BPA is a co-manager of the Federal hydroelectric projects, but it does not own or operate them. BPA also promotes conservation and renewable resources. BPA is one of four Federal power marketing agencies (PMAs) within the Department of Energy.

Today, BPA sells about 46% of the electric power consumed in its service territory, which includes the states of Oregon, Washington, Idaho, and the portion of Montana west of the Continental Divide. BPA also directly serves small portions of California, Nevada, Utah, and Wyoming. In addition, it markets surplus power to California and the Southwest, as well as British Columbia, Canada. BPA's service territory covers approximately 775,000 square kilometers (300,000 square miles). To deliver power, BPA owns and operates one of the largest high-voltage electrical transmission systems in the world, with over 24,140 kilometers (15,000 miles) of transmission lines.

1.2 BPA'S PURPOSES AND NEED

1.2.1 Need

BPA needs a comprehensive and consistent policy to guide the implementation and funding of its fish and wildlife mitigation and recovery efforts.

BPA's fish and wildlife responsibilities originate from several sources:

- The Regional Act extended BPA's responsibilities to include development of energy conservation resources and enhancement of Northwest fish and wildlife that have been affected by construction and operation of the Federal Columbia

River Power System (FCRPS).⁴ Under the Regional Act, BPA has specific duties:

- (1) to protect, mitigate, and enhance fish and wildlife adversely affected by the construction and operation of the FCRPS;
 - (2) to do so in a manner that provides equitable treatment for such fish and wildlife with the other purposes of the FCRPS; and
 - (3) to assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply.
- BPA also has specific duties under the ESA:
 - (1) BPA must avoid jeopardizing listed species.
 - (2) BPA must comply with incidental take statements (see discussion of "jeopardy" and "take" in the description of the ESA in Section 2.3.2.1).
 - (3) BPA must use its authorities to conserve listed species.
 - BPA also recognizes that a trust responsibility derives from the historical relationship between the Federal government and the tribes, as expressed in treaties, statutes, Executive Orders, and Federal Indian case law. BPA is bound to uphold its share of the Indian trust and treaty responsibilities of the United States. The government's policy on trust and treaty responsibility to Columbia Basin tribes holds that the recovery of salmonid populations must achieve two goals:
 - (1) the recovery and delisting of salmonids listed under the ESA, and
 - (2) restoration of salmonid populations over time to a level that provides a sustainable harvest sufficient to allow for the meaningful exercise of tribal fishing rights.
 - BPA's own Tribal Policy, adopted in 1996, provides that BPA will consult with tribal governments to assure that tribal rights and concerns are considered before BPA takes actions or makes decisions that may affect tribal resources. Objectives of these consultations include the following:
 - (1) protecting tribal lifestyles, culture, religion, and economy; and
 - (2) striving toward mutually agreeable decisions reflecting a consensus.⁵

The EIS uses the phrase "mitigation and recovery" as shorthand for BPA's obligations to fish and wildlife under these and other laws.

⁴ The FCRPS includes 31 Federal hydro projects, on the combined Columbia and Snake Rivers, which are operated in part to provide hydroelectric power BPA transmits throughout the Pacific Northwest and, when there is surplus power, to other nearby areas. The projects are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation (not by BPA).

⁵ U.S. Department of Energy (USDOE)/BPA 1996b.

The Regional Act created the Council with responsibilities to develop a Columbia River Basin Fish and Wildlife Program. BPA must decide whether and to what extent it will provide the actual *funding of the Program*, through its ratepayer revenues. To date, BPA ratepayers have contributed over \$6 billion to the fish and wildlife mitigation and recovery effort. From 2002-2006, ratepayers are currently projected to be spending millions of dollars annually for direct program, reimbursable, and capital investment costs as part of the fish and wildlife effort. In addition, hydrosystem operation requirements for salmon recovery efforts have reduced hydropower generation in the Region by about 1,000 megawatts since March of 1995. This reduction has increased costs from replacement power and lost revenues.⁶

Although the responsibilities under the Regional Act and ESA are perhaps most often mentioned in discussions involving BPA's fish and wildlife mitigation and recovery obligations, other statutes, regulations, and treaties also bear upon BPA's fish and wildlife mitigation and recovery efforts. Many of these are discussed in Chapter 2 of this EIS. Additionally, BPA is not the only Pacific Northwest entity with interests in, and activities affecting, fish and wildlife (see Section 1.3). Many other entities manage fish and wildlife resources, each with its own legal constraints, policy directives, and constituent interests. And there exists no agreed-upon regional plan for coordinating these mitigation and recovery efforts. This lack of coordination has serious consequences. For example, recovery efforts have experienced significant duplication and delay that detract from the Region's ability to achieve a common goal, and ratepayer funds to support these efforts have been used less efficiently than they might be.

In its Business Plan EIS, BPA noted that there was great concern within BPA and in the Region about both the lack of progress and the increasing costs of the fish and wildlife mitigation and recovery effort. The agency's Business Plan needed to address how BPA's could fulfill both its mandated fish and wildlife responsibilities and its power marketing responsibilities in a business-like manner. BPA identified three broad dimensions of fish and wildlife administration that help define its potential directions and illustrate potential impacts under its Business Plan:

- 1) the relationship between BPA's responsibility to implement its mandated fish and wildlife responsibilities, and its accountability for results;
- 2) BPA's financial position—its ability to predict and stabilize its fish and wildlife costs; and
- 3) the administrative mechanisms for distributing the fish and wildlife dollars.⁷

All three of these issues underlie BPA's need to move forward with a clear Policy Direction to guide its implementation and funding of fish and wildlife mitigation and recovery. On behalf of the FCRPS, BPA currently funds a large share of the fish and wildlife mitigation and recovery efforts. BPA believes that a comprehensive and consistent policy would foster coordination and efficiency in fish and wildlife activities in

⁶ See Section 2.3.2.3 in Chapter 2 for details.

⁷ USDOE/BPA 1995a, Section 2.4.5.

the Region. Accordingly, BPA has prepared this EIS to examine the effects that may arise from implementing any of a range of fish and wildlife Policy Directions. These Policy Directions reflect and are generated from existing and ongoing regional processes. Those processes will shape and establish a regional fish and wildlife Policy Direction that BPA will use to guide its current and future mitigation and recovery efforts, including its funding. Although this EIS is intended for BPA decisionmaking, the analysis may also be valuable for other regional entities that may adopt it as part of their own decisionmaking.

1.2.2 BPA's Purposes

BPA has an obligation to fulfill its NEPA requirements for understanding the environmental consequences of its actions (funding and implementing any Policy Direction) before decisions are made and actions are taken. NEPA compliance will also allow BPA to:

- avoid delays in taking effective action, and
- provide an opportunity for public involvement for interested parties.

There are also some specific purposes BPA must consider. BPA will use the purposes listed below as "yardsticks" to compare how well the alternative Policy Directions meet the agency's need. These purposes are:

- **facilitate** implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve:
 - coordination,
 - efficiency, and
 - consistency;
- **fulfill** statutory, legal obligations under the Regional Act, especially BPA's obligations to:
 - protect, mitigate, and enhance fish and wildlife;
 - provide equitable treatment for fish and wildlife with the other purposes of the FCRPS; and
 - provide a reliable, adequate, efficient, and economical power supply for the Pacific Northwest;
- **fulfill** the Administration's Fish and Wildlife Funding Principles (see Appendix A) such that BPA:
 - meets all of its fish and wildlife obligations, once established;
 - takes into account the full range of potential fish and wildlife costs;

- demonstrates a high probability of Treasury repayment;⁸
- minimizes rate effects on power and transmission customers;
- adopts rates and contracts that are easy to implement; and
- adopts a flexible fish and wildlife strategy;
- **fulfill** obligations under other applicable laws, including:
 - Federal treaty and trust responsibilities with regional tribes,
 - the ESA,
 - the CWA, and
 - the National Historic Preservation Act (NHPA); and
- **promote** predictable and stable fish and wildlife costs and competitive rates, enhancing BPA's ability to provide funding for public benefits and remain competitive in the electric utility marketplace.

These are purposes that **BPA** must consider before deciding to take action under this EIS. Other entities in the Region may use this document, with different purposes in mind. These entities will need to consider their own purposes before making decisions regarding their fish and wildlife mitigation and recovery efforts.

1.3 BACKGROUND

1.3.1 Major Participants⁹

BPA is just one of many interests in the Region seeking an effective and balanced means to halt species decline and strengthen the overall health of the human environment in the Pacific Northwest. The major participants involved in the ongoing effort to reach an agreement on a unified planning approach are identified in Figure 1-2 and described below:

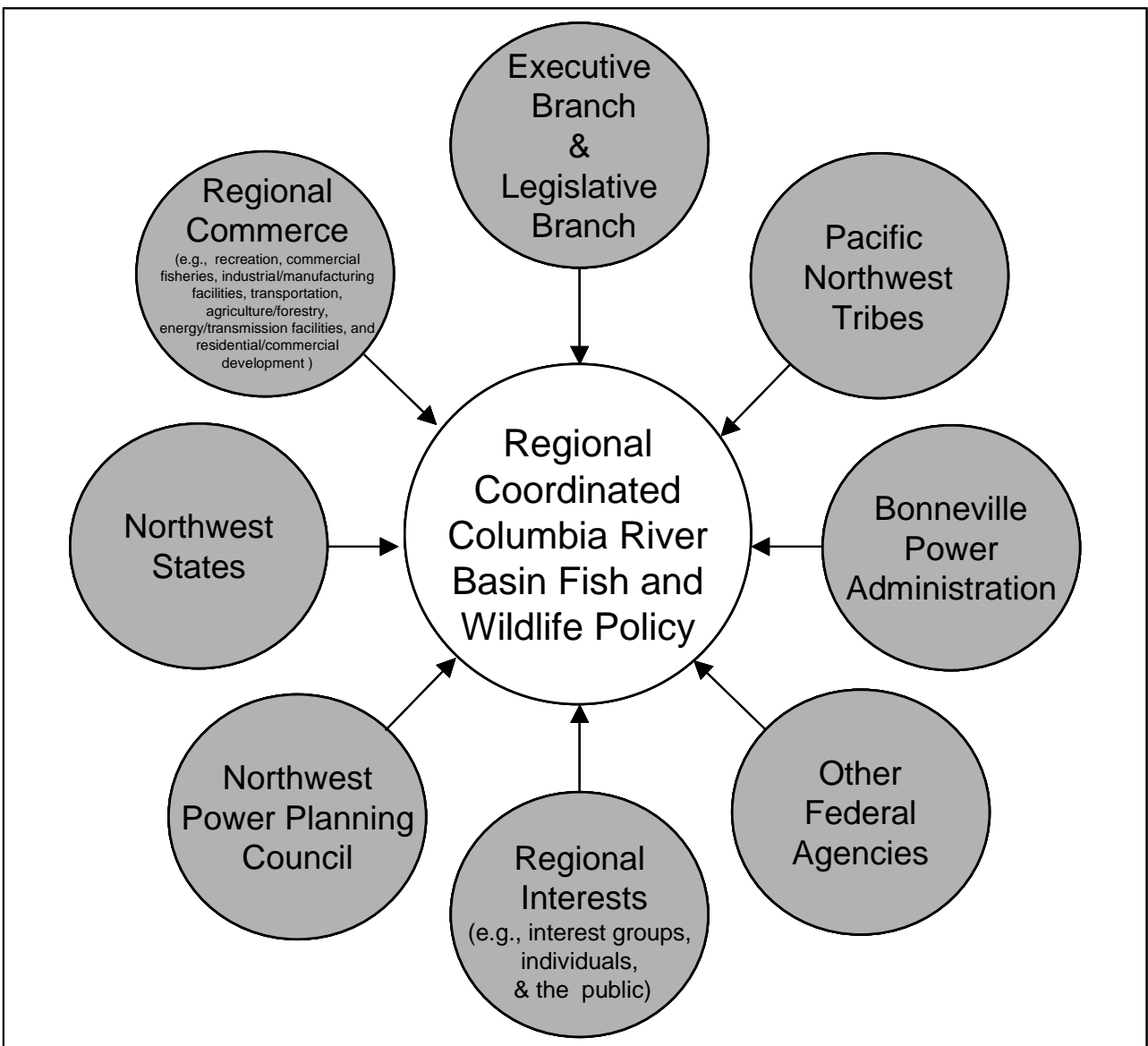
- **The Executive Branch (President and Executive Offices) and Legislative Branch (Congress)** have an interest because there is a potential for change in the natural resources funding and because legislation may be required to implement certain Policy Directions.
- **Regional tribes** have express legal status via treaties and other Federal laws, as well as economic, cultural, and religious interests, in any plan that may bear upon the future of fish and wildlife in the Region.

⁸ Treasury repayment is a payment BPA makes annually to repay 1) with interest, monies BPA has borrowed from the U.S. Treasury and 2) appropriations to the Corps and Bureau for the share of capital construction allocated to the power purpose of the hydrosystem.

⁹ Several groups have come into existence for specific purposes, including to help in the regional decisionmaking process. These groups were then disbanded when their specific work was done or no longer needed. Examples: the Columbia River Basin Forum, the Framework.

- **BPA and other Federal agencies** have direct or indirect responsibilities in fish and wildlife recovery and mitigation efforts as defined by various Federal statutes and regulations (see Appendix B, Mission Statements and Statutory Table).
- **The Council** was created by the Regional Act. It is made up of representatives from the four Northwest states. The Council develops and recommends measures for BPA to fund. These measures are intended to mitigate for the effects of the FCRPS on fish and wildlife.
- **Individual States and Local Governments** are also important participants. The four Northwest states are represented through the Council. In addition, the

Figure 1-2: The Major Participants in Regional Columbia River Political Forum



Governors of Idaho, Montana, Oregon, and Washington have prepared a joint statement outlining their preferred strategy for recovery efforts:

"Recommendations for the Protection and Restoration of Fish in the Columbia River Basin."¹⁰ The states enforce the CWA, in accordance with Environmental Protection Agency (EPA) guidelines. Local governments manage municipal water and waste and are involved in community-based projects such as watershed councils.

- **Regional commerce** includes people, businesses, and organizations (representing recreation, commercial fisheries, industrial/manufacturing facilities, transportation, agriculture/forestry, energy/transmission facilities, and residential/commercial development) that depend on the resources of the Region for their livelihood.
- **Regional interests** include the many citizens and groups with other direct or indirect concerns about the impacts, costs, strategies, or specific projects that may be involved in any plan for mitigation and recovery of fish and wildlife populations.

1.3.2 Scope and Related Processes

To improve the health of fish and wildlife and to find a way to use limited funds most efficiently, the participants listed above (and others throughout the Region) have begun and in some cases completed several related and wide-ranging processes with differing scopes (e.g., policy directions, geographic areas, and particular species).

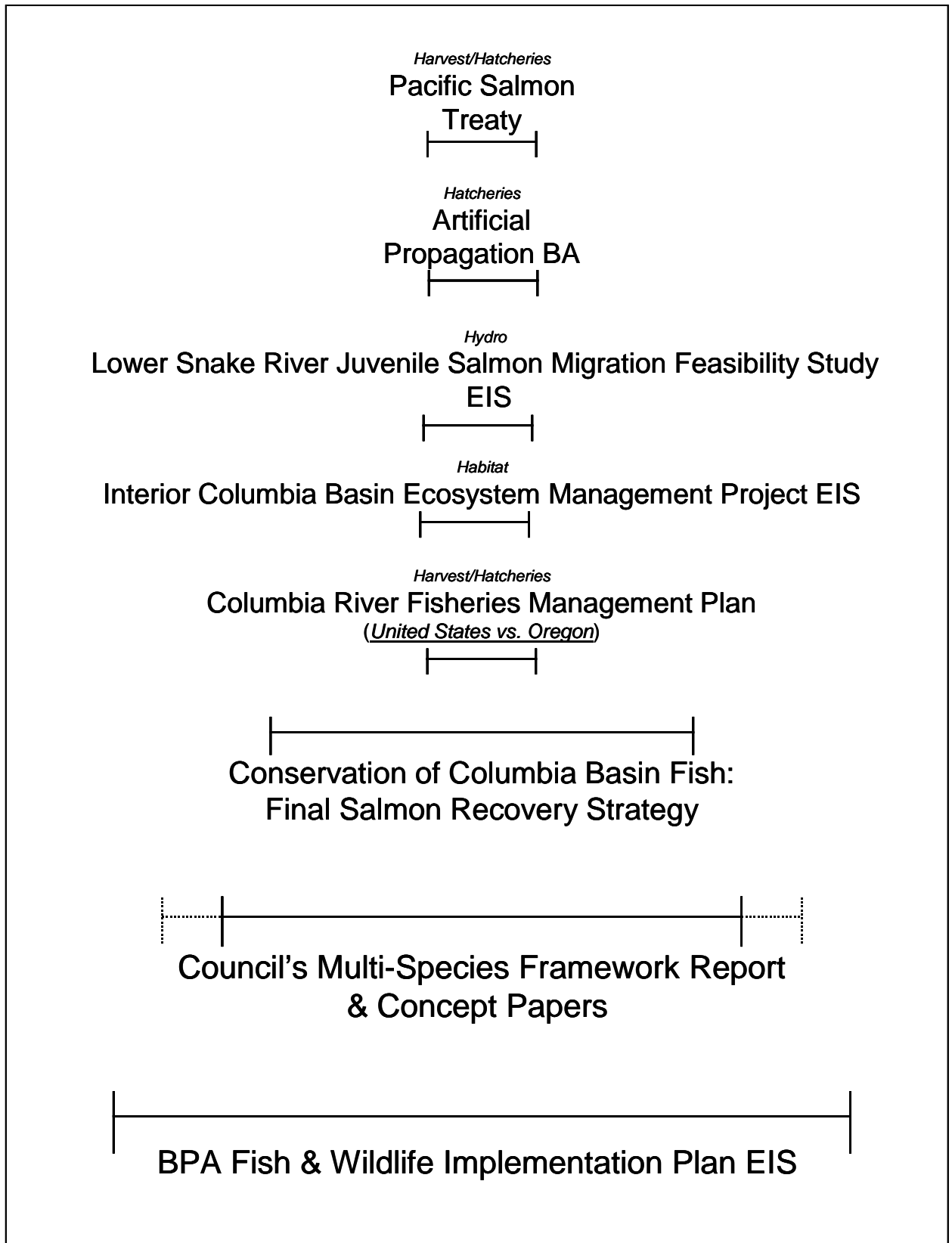
Several of these related processes and the associated documents are listed below. The listing includes a description of the special mandates of each responsible participant; in some cases, the mandates represent current policy regarding human effects on fish and wildlife. Figure 1-3 shows the scope of some of the different processes and documents.

- **Individual Processes:** Figure 1-3 shows examples of several individual processes that were intended to address a variety of fish and wildlife mitigation and recovery issues. Any one of these processes—hatchery propagation of fish, habitat restoration and improvement, manipulation of the flow in the rivers, management of Federal lands, breaching dams, and harvest controls—may help a particular aspect of the overall policy need; however, each falls short of offering a coordinated, comprehensive effort to address all the issues.
- **Federal Caucus and the Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (Conceptual Plan) and Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy (Basinwide Strategy):**¹¹ This process and documentation, a product of nine Federal agencies known as the Federal Caucus, focuses on four areas affecting the life cycle of

¹⁰ Governors, Pacific Northwest States 2000.

¹¹ Federal Caucus 1999b and 2000b. These two documents were formerly known as the "All-H Plan"; they are the draft and final versions of the same study.

Figure 1-3: Examples of Breadth of Scope



anadromous fish: hatcheries, harvest, habitat, and the hydrosystem. The Basinwide Strategy describes the comprehensive changes that are assumed to be needed to recover Columbia River Basin fish. This document outlines the strategies and specific actions that Federal agencies operating within the Columbia River Basin should take to prevent extinction and foster recovery by improving survival across all life stages of ESA-listed anadromous-fish evolutionarily significant units (ESUs). It also functions as a blueprint to guide Federal actions and interactions with state and local governments and tribes as they take steps to comply with the ESA while exercising their authorities. BPA expects that recovery planning for listed anadromous fish will likely proceed along the lines discussed in the Basinwide Strategy Paper.

The Basinwide Strategy is incorporated into NMFS and USFWS recommendations through the BiOps for actions that affect Columbia River Basin ESA-listed anadromous and resident fish.

- **NMFS and USFWS Biological Opinions (BiOps):**¹² These agencies prepare Biological Opinions, as required by the ESA, for species under their respective authorities. BiOps describe the respective Federal agency's determination as to whether proposed actions will jeopardize species listed as threatened or endangered. BiOps prepared for the FCRPS provide operating parameters for the Action Agencies—the U.S. Army Corps of Engineers (Corps), the Bureau of Reclamation (Bureau), and BPA. BiOps are also prepared on other actions affecting Columbia Basin fish and wildlife.
- **Recovery Planning:**¹³ NMFS plans the recovery process for salmon and steelhead. The USFWS has responsibility for freshwater fish and terrestrial species. The recovery planning process includes the following:
 - (1) forming Technical Recovery teams to identify the de-listing criteria and recovery goals for an ESU, and
 - (2) developing Recovery Plans that describe actions needed to achieve the recovery goals and de-listing criteria.

Other Federal agencies, states, tribes, and stakeholders cooperate with NMFS, so that the many interests and ongoing recovery processes at all levels can be recognized. As NMFS moves forward to develop Recovery Plans using the technical information, the agency will rely on those cooperating sources to complete the information. Subbasin plans will be "aggregated" to ensure that the recovery of the entire ESU is provided for.

- **1- and 5-Year Implementation Plans:** The USFWS and NMFS BiOps require the Action Agencies to develop, annually, 1- and 5-year implementation plans to implement specific measures in hydro, habitat, hatcheries, harvest, research, monitoring, and evaluation needed to meet and evaluate the relevant performance standards. The 5-year implementation plans provide the conceptual foundation

¹² NMFS 1995, 1998 a and b, 1999c and d, 2000b; USDOJ/USFWS 1998b and 2000.

¹³ Federal Caucus 2000b.

and the management framework for coordinating actions to further recovery efforts over a 5-year period. One-year implementation plans summarize specific measures and provide detail on the *who, how, what, where, and when*. The Action Agencies issued the first draft 5-Year (2002–2006) Implementation Plan in July 2001¹⁴ and a final 2002 1-Year Implementation Plan in November 2001.

- **The Council's 2000 Columbia River Basin Fish and Wildlife Program:**¹⁵ The Council's Fish and Wildlife Program is the largest effort in the nation to recover, rebuild, and mitigate impacts on fish and wildlife. The 2000 (fifth) revision of the Program expresses goals and objectives for the entire Columbia River Basin, based on a scientific foundation of ecological principles. In the future, the Program will be implemented through both locally developed plans for the 58 subbasins of the Columbia River and a plan for the mainstem. Fish and wildlife projects proposed for BPA funding to implement the Council's Fish and Wildlife Program will originate from these subbasin plans. While those plans are being developed, the Council has provided for ongoing project review and for funding by BPA. The Council is proposing amendments to the mainstem plan for hydro operations that will improve conditions for resident fish and increase power generation.¹⁶
- **The Council's Multi-Species Framework Report:**¹⁷ In November 1998, to develop a framework for its Fish and Wildlife Program, the Council initiated the Multi-Species Framework Project—a more balanced, comprehensive approach to fish and wildlife mitigation. The Framework Project was managed by a state/Federal/tribal committee and administered by the Council. The Framework was tasked with addressing fish and wildlife recovery and mitigation for multiple species (not just ESA-listed species), exploring alternative long-term visions for the river, and preparing a report on the process.

Twenty-eight Concept Papers were submitted by interested parties, and over 100 fish and wildlife actions were proposed. The Council developed seven Framework alternatives, incorporating those alternative long-term visions (See Appendix D). A state-of-the-art analytical system, Ecosystem Diagnosis and Treatment (EDT), was used to address the biological benefits of each alternative; a separate Human Effects Analysis was used to address the economic and social impacts and benefits of the alternatives. This process, which was completed in late 2000, was used to inform the Council's adoption of its 2000 Fish and Wildlife Program. The Framework Report was released in February 2002.

- **Fish and Wildlife Funding Principles:** In September 1998, then-Vice-President Gore announced principles to help shape how BPA sets its power marketing rates, and to ensure that BPA could meet all of its mitigation and recovery effort

¹⁴ U.S. Department of Interior (USDOI), Corps, and BPA 2001a and 2001b.

¹⁵ Council 2000d.

¹⁶ Council 2002a.

¹⁷ Marcot, B. G., et al. 2002.

- responsibilities, while simultaneously meeting its marketing and Treasury repayment responsibilities.¹⁸
- **The Council's 2001 Report on Bonneville Fish and Wildlife Expenditures:**¹⁹ In response to a request from the governors of Oregon, Washington, Idaho, and Montana, the Council has provided an accounting and brief assessment of BPA's fish and wildlife program implementation expenditures. The *Inaugural Annual Report of the Columbia Basin Fish and Wildlife Program, 1978-1999* found that, since 1978, BPA's costs have totaled \$3.48 billion. Of that total, 76% has been spent on anadromous fish. For BPA's efforts, the Region has seen a dramatic increase in in-river juvenile salmonid survival, increases in some resident fish populations, and mitigation for over 38% of the wildlife habitat inundated by the dams and reservoirs.
 - ***U.S. v. Oregon:*** In 1968, the Columbia River treaty tribes and the United States brought this case against the state of Oregon, and later against the states of Washington and Idaho. It continues today, with jurisdiction residing in the Federal District Court of Oregon. In this landmark case, Judge Robert Belloni ruled that state management practices failed to meet the tribes' treaty-secured fishing rights, and that the tribes were entitled to take "a fair and equitable share" of the harvestable portion of the runs. Judge Belloni further ruled that the state can regulate the Indian fisheries only for purposes of conservation, and that those regulations cannot "discriminate against the Indians." Ultimately, the tribes won recognition of their right to an even split of the harvestable fish between treaty and non-treaty fisheries. They also won acceptance as fisheries co-managers. The 1988 Columbia River Fish Management Plan resulted from work under *U.S. v. Oregon*. The plan addressed issues such as the allocation of state and tribal harvests, fishing seasons, hatchery production, hatchery locations, and disposition of surplus returning adult salmonids of hatchery origins. The last plan expired in 1998 and has not yet been renegotiated. Judge Garr King (U.S. District Court of Oregon) now oversees the case and has continuing jurisdiction over it.

These many processes may result in the adoption of any one of many Policy Directions. Further, the selected policy may change, as technical issues are clarified or resolved. Therefore, the scope for BPA's EIS must be broad enough to encompass any potential Policy Directions under consideration.

1.3.3 Incorporation by Reference of Supporting Federal Documents

Throughout the last decade, Federal agencies in the Region have developed and continue to prepare a number of plans and programs addressing fish and wildlife mitigation and recovery actions. They have also issued a series of EISs designed to evaluate alternatives and implement selected actions. The environmental documents described below have

¹⁸ BPA is authorized to borrow money from the U.S. Treasury to build facilities needed to carry out its mission. Because BPA is self-financing, these monies must be repaid. BPA is committed by law to meet its repayment responsibilities as well as its responsibilities to the environment.

¹⁹ Council 2001.

been produced either by the participants listed in Section 1.3.1 or in the processes discussed above. All of these documents have been used as resources in the preparation of this FWIP EIS and are incorporated here by reference.

Resource Programs Final Environmental Impact Statement (DOE/EIS-0162, February 1993). This programmatic EIS evaluates the consequences of alternatives for energy resource development and operation and BPA energy resource acquisition (USDOE/BPA, 1993).

Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (U.S. Forest Service and Bureau of Land Management, February 1994). This EIS evaluates alternative management direction strategies for balancing forest habitat and forest products from forest ecosystems (USDOE/BPA, 1994).

Business Plan Final Environmental Impact Statement (DOE/EIS-0183, June 1995). BPA prepared this EIS in response to the need for a sound policy to guide its business direction (including power marketing, rates, and administration of fish and wildlife activities) under changing market conditions (USDOE/BPA, 1995).

Columbia River System Operation Review Final Environmental Impact Statement (DOE/EIS-0170, November 1995). This EIS evaluates a range of system operating strategies for the multiple uses of the FCRPS (USDOE/BPA, Corps, and BOR, 1995).

Delivery of the Canadian Entitlement Final Environmental Impact Statement (DOE/EIS-0197, January 1996). This EIS was prepared by the United States Entity (designated by the Columbia River Treaty between the United States and Canada as the BPA Administrator and the Corps' Division Engineer, North Pacific Division) for information on downstream power benefits. It is important to note that Executive Order 12114 does not require, but allows examination of impacts outside of the United States.²⁰

Impacts of Artificial Salmon and Steelhead Production Strategies in the Columbia River Basin Draft Programmatic Environmental Impact Statement (Columbia River Basin Fish and Wildlife Authority for Federal Agencies, December 1996). This document was prepared to evaluate alternative artificial production strategies for anadromous fish in the Columbia River Basin and the effects of hatchery-produced fish on natural populations of salmon and steelhead (CBFWA, 1996).

Wildlife Mitigation Program Final Environmental Impact Statement (DOE/EIS-0246, March 1997). This EIS is used to standardize the planning and implementation

²⁰ USDOE/BPA 1996a.

of BPA-funded projects for mitigating loss of wildlife habitat caused by the FCRPS (USDOE/BPA, 1997c).

Watershed Management Program Final Environmental Impact Statement (DOE/EIS-0265, July 1997). The analyses in this EIS were used to standardize the planning and implementation of individual watershed management programs and projects funded by BPA as mitigation for the loss of resident and anadromous fish habitat caused by the FCRPS (USDOE/BPA, 1997b).

Transmission System Vegetation Management Program Environmental Impact Statement (DOE/EIS-0285, May 2000). This BPA EIS assesses the uses and resource effects of different combinations of manual, mechanical, biological, and herbicide methods of managing vegetation on BPA rights-of-way, as well as mitigation measures for those effects (USDOE/BPA, 2000a).

Interior Columbia Basin Ecosystem Management Project Final Environmental Impact Statement (U.S. Forest Service and Bureau of Land Management, December 2000). This stand-alone EIS analyzes three alternatives for the management of public lands in the interior Columbia River Basin. It supplements the two Draft Interior Columbia Basin Ecosystem Management Project EISs and reflects the 83,000 comments received on those documents (USDA/USFS and USDO/BLM, 2000). A Final EIS Proposed Decision, also released in December of 2000, identified the preferred alternative (USDA/USFS and USDO/BLM, 2000). In February 2003, The State Directors and Regional Foresters elected not to prepare a Record of Decision and instead have chosen to complete the Project through use of "The Interior Columbia Basin Strategy."

Lower Snake River Juvenile Salmon Migration Feasibility Study Final Environmental Impact Statement (U.S. Army Corps of Engineers, February 2002). This EIS assesses the effects on juvenile salmon migration of alternative hydro system configurations and operations at the four lower Snake dams (Corps, 2002). A preferred alternative, which does not include dam breaching, was identified in the EIS. In September of 2002, the Corps released its Final Record of Decision supporting the Preferred Alternative.

Upper Columbia Alternative Flood Control and Fish Operations Interim Implementation. Libby and Hungry Horse Dams Final Environmental Assessment. (U.S. Army Corps of Engineers, December 2002). This EA evaluates the impacts of interim implementation of variable discharge (or VARQ, with Q representing engineering shorthand for discharge) flood control (FC) operations at Libby and Hungry Horse Dams and for the flow augmentation in the Kootenai, Flathead, and Columbia Rivers that such alternative flood control would facilitate, prior to the completion of an environmental impact statement (EIS). Appendix G contains a Finding of No Significant Impact.

Voluntary Environmental Assessment, FONSI 02-02. Interim Operation of the VARQ Flood Control Plan at Hungry Horse Dam (USDOI/Bureau of Reclamation, March 2002). As in the previous Corps EA above, this is the Bureau of Reclamation's EA for an alternative flood control strategy, VARQ, at Libby and Hungry Horse Dams. The Bureau also prepared a Finding of No Significant Impact.

Figure 1-4 shows the major elements that have been used from the documents above to help in the environmental analysis in this EIS.

1.3.4 Policy by Unified Planning or by Uncoordinated Agency Action

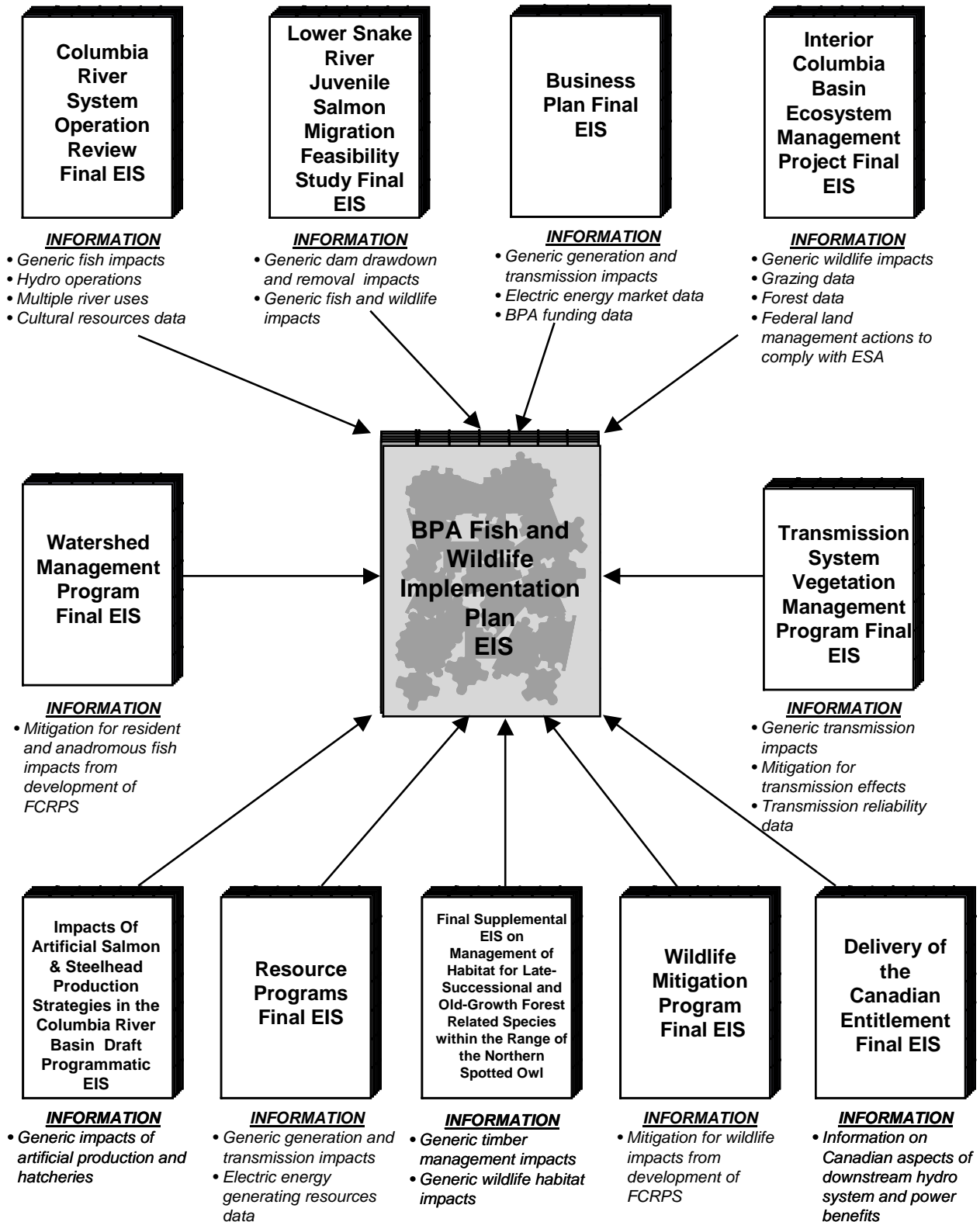
The discussions above have outlined what has been taking place in the way of policy actions that affect (positively or negatively) the fish and wildlife resources of the Pacific Northwest. Regional policy regarding fish and wildlife efforts has developed through both deliberate action and by failure to choose (by default or inaction) (see Figure 1-5):

- Initially, actions to expand the electric power system were taken, and the policies underlying those actions developed, without a comprehensive evaluation of the long-term effects on fish and wildlife. (Default Solution.)
- In 1980, Congress passed the Regional Act in part to give fish and wildlife equitable treatment with power production and other river uses (policy by *active decision*). This legislation was enacted to counter the uncoordinated, and sometimes nonexistent, nature of fish and wildlife mitigation efforts. (Legislation Solution.)
- In 1991, NMFS declared Snake River sockeye an endangered species and, in 1992, ruled that the spring/summer and fall runs of Snake River chinook were threatened. In 1994, NMFS reclassified the Snake River chinook stocks as endangered. These rulings required the Federal operating agencies to consult with NMFS on annual river-operating plans. (Consensus Solution.)
- Recently, a *technical/scientific exercise* has been underway to find "the solution." However, science in this area is not yet sufficiently refined to resolve the many technical differences of *opinion* on reaching recovery status; in fact, it may never be sufficiently precise to meet everyone's satisfaction and to determine the sequence of steps to be taken. (Science Solution.)

Although science cannot yet point out a clear path, the Region is still faced with the need to continuously define and redefine a policy for fish and wildlife. BPA, also, needs to plan how to wisely spend ratepayer funds it commits to address fish and wildlife mitigation and recovery efforts, and how to operate effectively and more efficiently under either of two conditions:

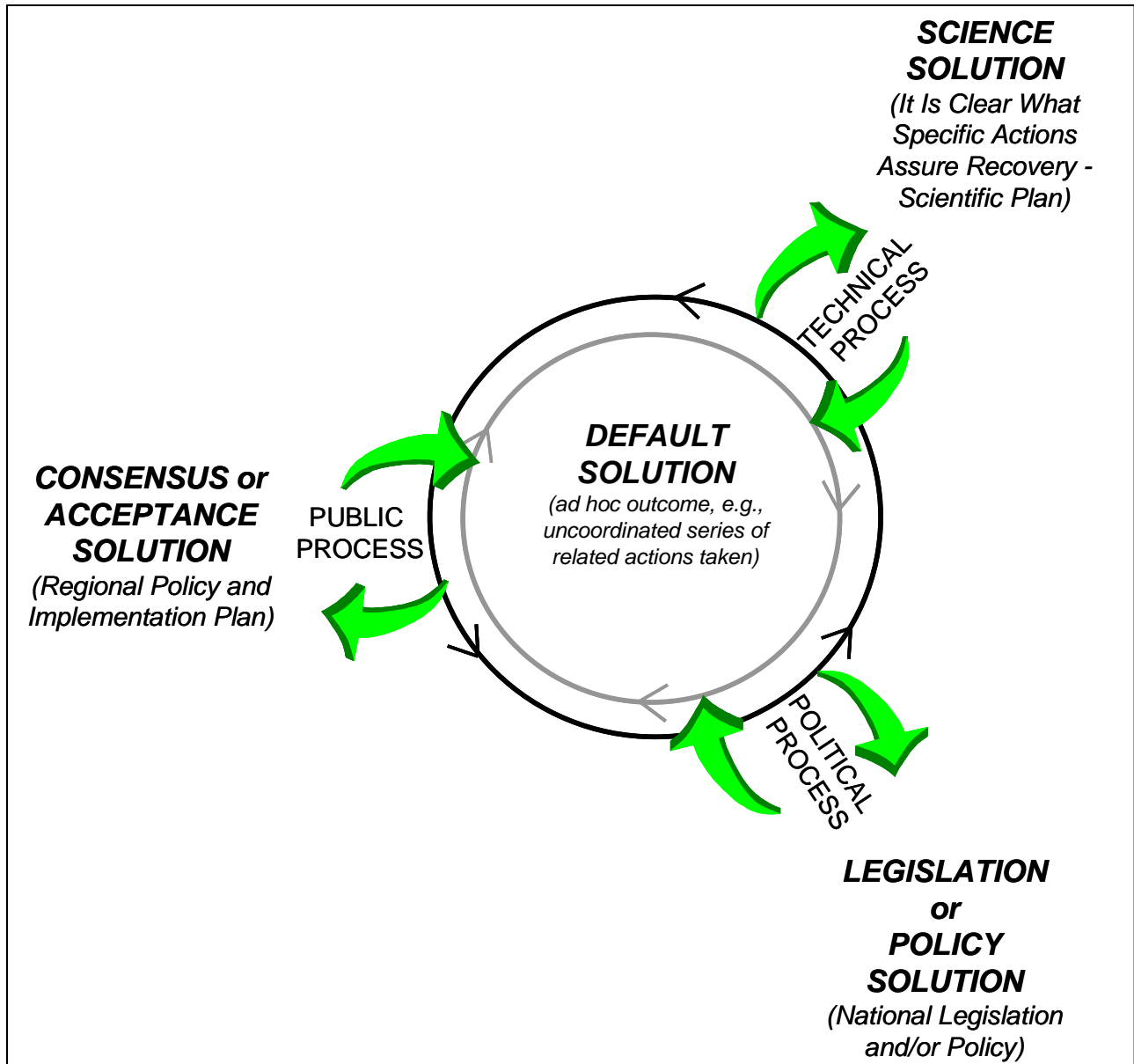
- a policy developed by a regionally unified planning effort (and subject to public input and review), or
- a default policy emerging through separately developed and executed individual agency actions: the policy path that defines much of the Region's past approach.

Figure 1-4: Incorporation by Reference*



* The Corps' Upper Columbia Alternative Flood Control and Fish Operations Interim Implementation EA/FONSI and the Bureau's Voluntary Environmental Assessment, FONSI 02-02 are not listed with the above EISs but information regarding flood control operations was used from these documents in this EIS.

Figure 1-5: Policy Process Cycle



1.4 DECISIONMAKING PROCESS

The analysis provided here, in a formal, policy-level process and environmental document, will offer the public an opportunity to assess, participate in, and influence the selection of a regional Policy Direction alternative for fish and wildlife mitigation and recovery efforts, along with the regional decisionmakers.

1.4.1 Decision and Implementation through Tiering

By undertaking this EIS as a complement to the other processes, BPA completes a comprehensive look at those regionwide processes. This EIS will also provide a springboard for the Administrator, as well as other decisionmakers, to fund and implement actions consistent with the ultimate Policy Direction selected to support the regional fish and wildlife mitigation and recovery effort (whether by unified planning or by default), without further delay. This ability to "tier" decisions is an extremely valuable tool, especially when time is of the essence. Figure 1-6 shows tiered decisionmaking pursuant to NEPA. Below are details on how this "tiering" works.

The Draft and Final EISs. First, the broadly scoped Draft EIS evaluated a wide range of alternative Policy Directions available to decisionmakers. The evaluation included trade-offs among resources and options to modify the basic Policy Direction(s), as well as environmental effects and ways to mitigate for effects. Publication of the Draft EIS signaled the beginning of a public review and comment process. Information from that process was used by BPA in preparing this Final EIS. In this EIS, the BPA Administrator, by using a unified planning approach, identifies a preferred Policy Direction that encompasses policy actions that have already been identified in other regional forums or processes, and by other decisionmakers. In addition, it reflects consideration of the BPA Purposes. See Chapter 3 for discussion of the preferred Policy Direction (PA 2002).

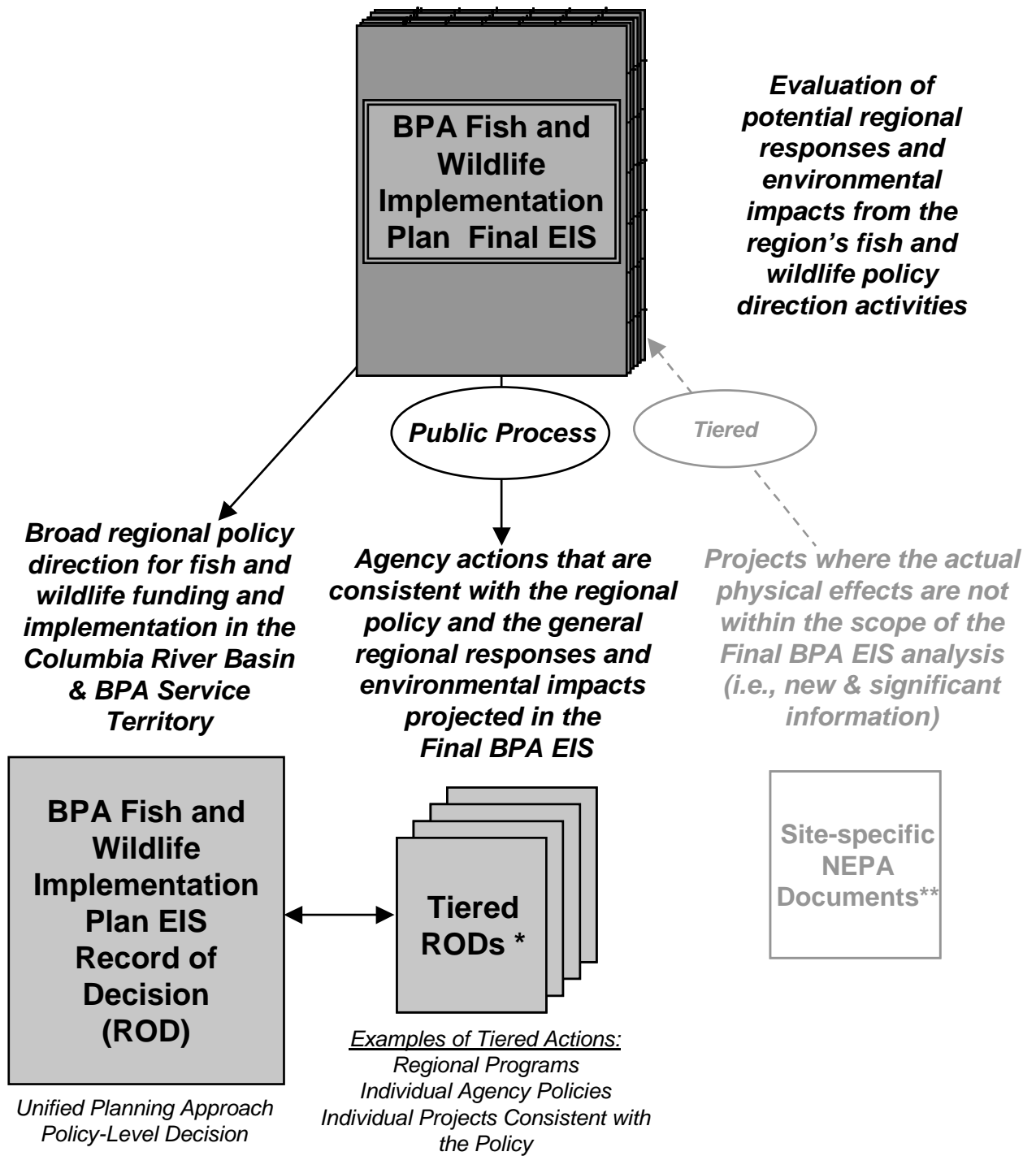
- **The Record of Decision (ROD) on Policy Direction.** BPA will next prepare a ROD that documents and explains the basis for the Administrator's Policy Direction selection. The decision will reflect the potential environmental consequences and mitigation, as well as public and agency comment.
- **Tiered RODs.** The BPA Administrator may then "tier" decisions about the implementation of actions consistent with the selected Policy Direction. BPA will continue to involve the public as it decides on different categories of specific implementation actions. In some cases, BPA may use a Supplement Analysis to determine whether any further NEPA documentation is needed to implement an action (see 10CFR1021, Section 1021.314(c)).

1.4.2 Potential Decisions to be Supported

The FWIP EIS will support actions that BPA determines are necessary to comply with its responsibilities, including the following:

- funding and implementing fish and wildlife mitigation and recovery efforts that support any selected Policy Direction;
- integrating those efforts into a unified plan;
- short- or long-term FCRPS recommendations in the NMFS and USFWS BiOps;
- funding of the Council's Fish and Wildlife Program;
- capital improvements at FCRPS projects;

Figure 1-6: NEPA Decision Process Integration



* If BPA determines that the final EIS adequately evaluates the environmental impacts of its future actions, then the preparation of additional or supplemental EISs would be unnecessary. Instead, BPA would prepare tiered RODs to cover the subsequent actions related to the policy ROD. In some cases, BPA may use a Supplemental Analysis to determine whether any further NEPA documentation is needed to implement an action. If other agencies or entities find the BPA EIS adequate to cover their actions, they could adopt the EIS and prepare RODs explaining their decisions and how the EIS analyzes the related environmental impacts.

** These documents could include categorical exclusions, environmental assessments, or environmental impact statements.

- other fish and wildlife mitigation and recovery efforts:
 - research,
 - monitoring and evaluation,
 - education, and
 - enforcement; and
- funding of cultural resource mitigation.

Other Federal agencies and regional entities may use this EIS to evaluate and support their own decisions regarding fish and wildlife mitigation and recovery efforts. Those agencies and entities may find this EIS useful because it looks at the effects of various fish and wildlife mitigation and recovery efforts throughout BPA's entire service territory, which makes up most of the Pacific Northwest Region and covers areas of concern to many. In addition, this EIS has a broad scope that covers essentially all of the substantive regional fish and wildlife issues.

To support their decisions regarding fish and wildlife recovery efforts, other Federal agencies and those who may need to comply with NEPA requirements could choose to adopt this EIS, consistent with CEQ Regulations For Implementing NEPA. Any such agency or entity wishing to do so would need to evaluate the EIS against its own purposes and needs. Any such agency would also have to determine whether to adopt all or part of this document to meet its own obligations under NEPA or to comply with similar laws and regulations applicable for environmental review.

- **As a frame to understanding the alternative Policy Direction choices, Chapter 2 provides an outline history of active/default policy decisions that have affected Pacific Northwest natural resources over time.**

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Preparing for

CHAPTER 1

Purpose
and Need
for Action

CHAPTER 2

Policy
History

Implementing a Decision

Comparison of Alternatives

CHAPTER 3
Comparison
of
Alternatives

CHAPTER 4
Implementation
and Responses
to Change

for Implementing
a Decision

Assessing the Environmental Conditions

CHAPTER 5
Affected
Environment
and
Environmental
Consequences

for Making a
Decision

Choices for Managing

CHAPTER 6
Governance

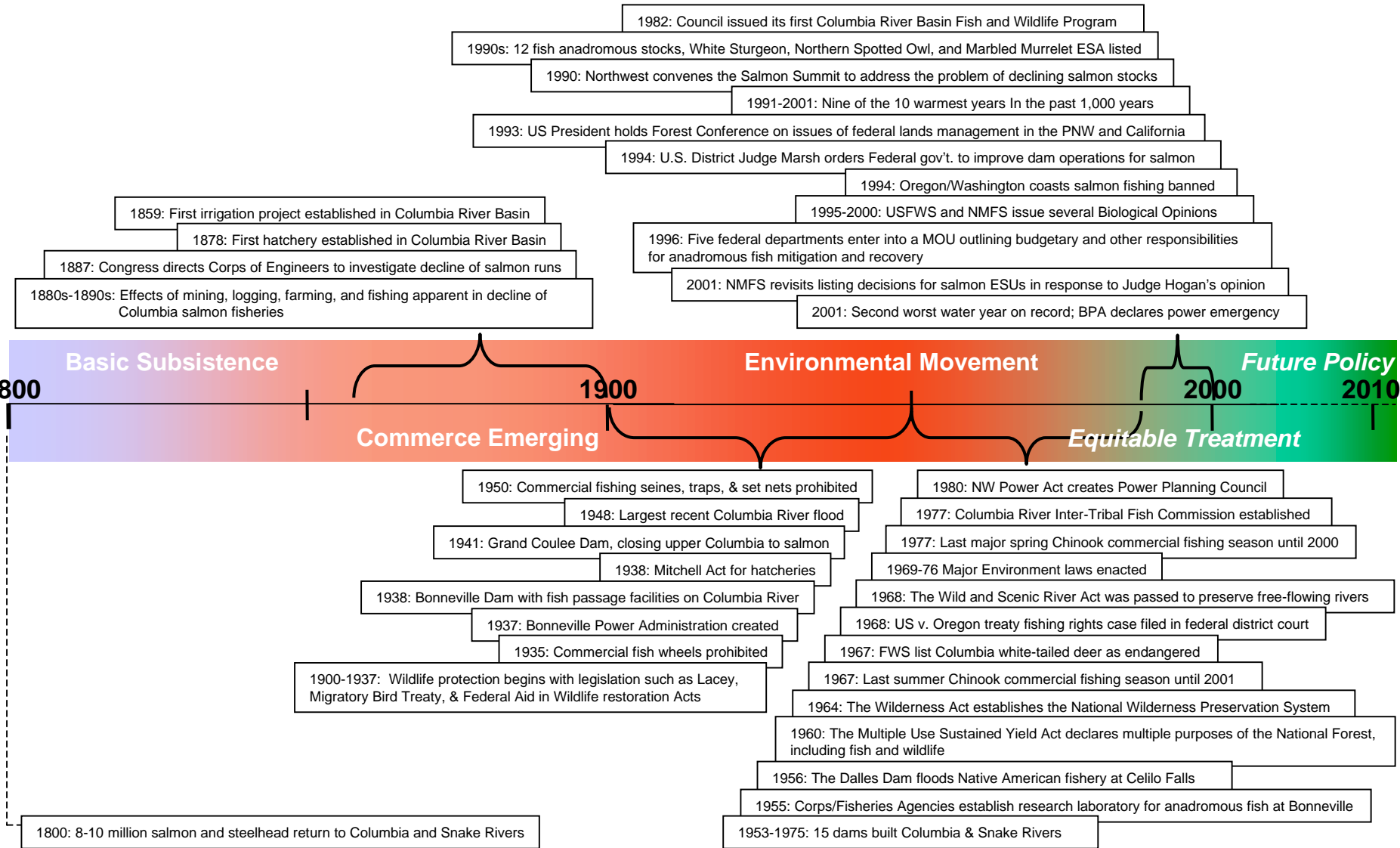
the Fish & Wildlife
Mitigation & Recovery
Efforts

Chapter 2

*BPA Service Territory &
Columbia River Basin*

*Fish and Wildlife
Policy Evolution
in the Pacific Northwest
Region*

Figure 2-1: Shifts in Public Policy Direction and Key Events



CHAPTER 2 – FISH AND WILDLIFE POLICY DEVELOPMENT

- **Describes the evolution of fish and wildlife policy over time**, through
 - Basic Subsistence,
 - Land Claims and Commercial Development,
 - Federal Intervention, and
 - The Period of Statutory "Equitable Treatment."
- **Provides a "snapshot" of recent efforts to:**
 - develop policy(ies) to mitigate and recover fish and wildlife, and
 - establish processes for managing those efforts.

This chapter focuses on describing historical and recent policy-level decisions that have affected fish and wildlife populations throughout the Region (see Figure 2-1).

2.1 INTRODUCTION

We may be accustomed to thinking of public policy as long, formal documents developed by an anonymous group of government officials. However, public policy—principles that guide and shape decisionmaking by a controlling authority—is as old as civilization.

To understand the issues and to make sound decisions on a future **Policy Direction** for the mitigation and recovery efforts regarding fish and wildlife populations in the Region, decisionmakers must understand three things:

- where we have been,
- where we are now, and
- what policy options are available for the future.

This chapter offers an overview of how policy regarding fish and wildlife has developed over the centuries, up to and including today.

In reading these sections, please keep in mind that we have worked to report data as objectively as possible. Analyzing history always presents the problem of which events to include and which ones to exclude, because there are a myriad of details to consider. We have worked diligently to include the history of policies and practices that have been the most influential in leading the Region to where we are today and establishing the range of choices from which we must now choose. To minimize subjective and partial analysis, we have tried to keep focused on what has been done and what happened to the environment as a result. Our goal was to present enough history so we can learn from past decisions and develop the best choices for the future.

2.2 BPA SERVICE TERRITORY AND COLUMBIA RIVER BASIN

This section provides a brief description of the Columbia River Basin, including its air, land, water, fish, wildlife, and peoples.

2.2.1 Natural Setting

The Columbia River Basin, approximately 260,000 square miles, and BPA's service territory generally coincide with the Pacific Northwest states (see Figure 2.2). The Columbia River is the predominant river within Bonneville's service area. This river flows over 1,200 miles from British Columbia south through eastern and central Washington, and then west between Washington and Oregon, to the Pacific Ocean. The Columbia River is often used to define the Pacific Northwest Region and is cited as the outstanding natural resource of the Region.

Many tributaries feed the Columbia. The largest of these—the Snake River—drains more than 40% of the surface area of the Columbia Basin, and supplies about 20% of the Columbia's flow. Most of the Snake River Basin lies in southern Idaho and the easternmost part of Oregon, a dry region whose development has depended almost totally on water availability. A lesser part of the Basin drains western Wyoming and small pockets of northern Utah and Nevada. The major tributaries of the Snake River include the Salmon, Clearwater, Boise, Owyhee, Grande Ronde, Palouse, and Tucannon. Other streams drain central Idaho and a portion of Montana west of the Rockies.

Other tributaries to the Columbia River include Kootenai, Pend Oreille, Spokane, Okanogan, Wenatchee, Yakima, Walla Walla, John Day, Deschutes, Hood, and Willamette rivers. Rivers not part of the Columbia River system but within Bonneville's service area include the Skagit, Skykomish, Snoqualmie, Nisqually, Chehalis, Nestucca, Flathead, Bitterroot, and Umpqua rivers.

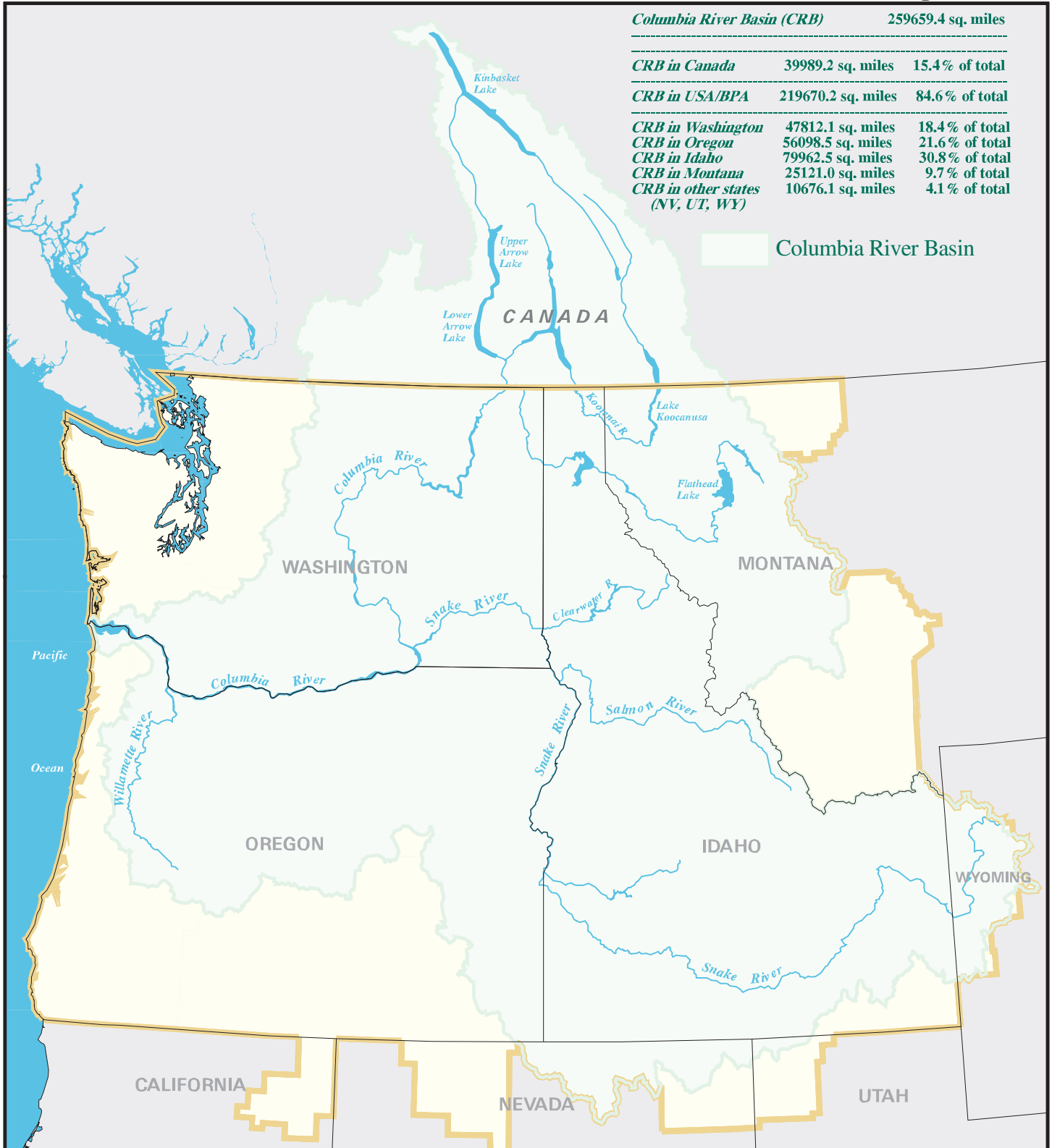
The Pacific Northwest environment is highly complex, principally because of the ocean and mountains. Climate close to the coast is strongly influenced by the Pacific Ocean. At lower elevations west of the Olympic Mountains and the Coast Range, temperatures remain consistently mild and summer fog reduces moisture stress during an otherwise dry season. Dense, moist forests of primarily western hemlock and Douglas fir predominate west of the Cascades. Cool, wet winters; warm, dry summers; and rich soils promote fast and prolonged vegetation growth.

East of the Cascades, increased aridity and frequent fires promote open, park-like stands of ponderosa pine, lodgepole pine, and western larch in mountainous areas and juniper woodlands, sagebrush-steppe, and grasslands at lower elevations. The Klamath Mountains ecoregion supports a diverse mixture of drought-resistant conifers and hardwoods, a result of lower precipitation and a complex geological and ecological

BPA Service Area & Columbia River Basin

Figure 2.2

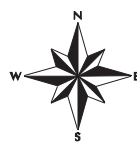
Columbia River Basin (CRB)	259659.4 sq. miles	
CRB in Canada	39989.2 sq. miles	15.4% of total
CRB in USA/BPA	219670.2 sq. miles	84.6% of total
CRB in Washington	47812.1 sq. miles	18.4% of total
CRB in Oregon	56098.5 sq. miles	21.6% of total
CRB in Idaho	79962.5 sq. miles	30.8% of total
CRB in Montana	25121.0 sq. miles	9.7% of total
CRB in other states (NV, UT, WY)	10676.1 sq. miles	4.1% of total



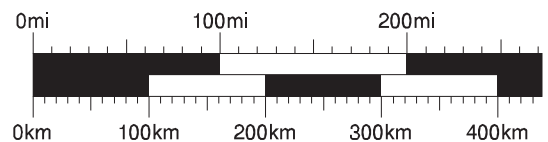
 BPA Service Area

BPA Service Territory 315434.8 sq. miles

BPA in Washington	67477.8 sq. miles	21.4% of total
BPA in Oregon	96911.4 sq. miles	30.7% of total
BPA in Idaho	83425.0 sq. miles	26.4% of total
BPA in Montana	38969.3 sq. miles	12.4% of total
BPA in other states (CA, NV, UT, WY)	28651.3 sq. miles	9.1% of total



Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.
Source: BPA Regional GIS Database, 2002.



history. In addition, the lowland river valleys of western Oregon and Washington support extensive oak woodlands, grasslands, and wetlands composed of herbaceous plants.

Although conifers dominate many areas, the Region also includes large areas of temperate and semi-arid grass- and brush lands. Rainshadow effects of the mountains cause aridity and temperatures to increase progressively farther inland, especially east of the Cascade Range. The warmest and driest habitats in this region occur at low elevations in the Snake River Basin - High Desert region. Here, semi-arid deserts of sagebrush and grasses dominate the landscape. These varied ecosystems support a vast diversity of wildlife species.

There is substantial variation in weather from year to year. The amount of precipitation especially varies, depending on ocean conditions, and annual precipitation amounts in some locations can vary by an order of magnitude.

Rivers and streams support a large number of anadromous fish species (species that migrate to the ocean to mature, then return to their natal streams to spawn; see map Figure 2.17 at the end of this chapter), as well as varied populations of resident fish (fish that live their entire lives in fresh water). The Columbia River and its tributaries are home to a variety of native salmonid and non-salmonid fish. A number of fish and wildlife species are listed as threatened or endangered under the ESA (see Appendix C) or as sensitive (special designations by the U.S. Forest Service [USFS] or the Bureau of Land Management [BLM] for species in decline).¹ Listed fish species include some runs of coho, chinook, chum, and sockeye salmon, and steelhead and sea-run cutthroat trout, the Kootenai River white sturgeon, and bull trout (see map Figure 2.8 at the end of this chapter). Bird species currently listed as threatened or endangered include the bald eagle, northern spotted owl, and marbled murrelet. Listed mammals include the Canadian lynx, woodland caribou, grizzly bear, Columbian white-tailed deer, and gray wolf (see map Figure 2.11 at the end of this chapter).²

2.2.2 Human Population

It is not known exactly when Native Americans began to inhabit the continent of North America. However, their settlements occurred widely across the Pacific Northwest, shaped in many cases by the natural resources that supported their lives—fish, forest-, or plains-dwelling animals; water for drinking, fishing, or transportation; forests and plant materials. Each tribe developed its own unique cultural adaptations. When European explorers (and later settlers) came to the Columbia Basin, they found a relatively stable balance of abundant resources that had readily supported growing tribal populations for thousands of years.

¹ USDOE/BPA 2000a, p. 130. See Appendix C of this Final EIS for a complete list of ESA-listed species.

² USDOE/BPA 2000a, p. 132.

European-Americans settled and developed the West generally in response to two factors:

- the presence of ample natural resources; and
- the evolution of Federal land policies.

National and international demand shaped the economic development of the Region, as natural resources were identified, obtained, and marketed by non-Indian settlers. First sought were marine and terrestrial fur-bearing animals. Next was land with favorable climate, ranging from cool and wet west of the Cascades to temperate and dry to the east. Gold and other minerals, timber, salmon, and the Columbia River itself were targeted for development. Those goals—and the methods used to pursue them—significantly changed the environment, and profoundly diminished both tribal well-being and tribal access to traditional natural resources.

The attraction of the Pacific Northwest continues today, demonstrated by steadily increasing populations, as people migrate here from other parts of the United States and abroad. Between 1990 and 2000, based on the U.S. Census Bureau data, the Region (OR, WA, ID, MT) experienced about a 21% growth in population; it has a projected growth of about 19% between 2000 and 2015.³ Table 2.2-1 below depicts the Region's state-specific population estimates for 2001 and percent increase from 1990 to 2000. The growing population continues to shape the uses of the Region's natural resources and puts an increasing pressure on them (see map Figure 2.10 at the end of this chapter).

Table 2.2-1: Regional Population Estimates and Growth Rates

State	2001 Estimated Population	Percent Increase 1990-2000
Idaho	1,321,006	28.5
Montana	904,433	12.9
Oregon	3,472,867	20.4
Washington	5,987,973	21.1

2.3 POLICY EVOLUTION

The evolution of fish and wildlife public policy—state, Federal, and tribal—in the Region has affected, and has been affected by, the human environment. The closer we get to the present, the more complex and inconsistent public policy has become. The discussion below summarizes that evolution. The first major section (2.3.1) reviews the evolution of policy up to 1980 (the year of the passage of the Regional Act). The second section (2.3.2) focuses on policy from 1980 to the present. To begin, Table 2.3-1 captures major events shaping fish and wildlife policy in the Columbia River Basin.⁴

³ USDOC/US Census Bureau 1996.

⁴ Some of the major events listed on this table through 1994 came from a timeline taken from Mighetto, L. and Ebel, W.J. 1994.

Table 2.3-1: Major Events Shaping Regional Fish and Wildlife Policy

Date(s)	Events
1800	An estimated 8-10 million salmon and steelhead return annually to the Columbia and Snake rivers
1855-1868	Era of treaties with tribes, followed by movement to reservations
1859	First irrigation project established in Columbia River Basin
1878	First hatchery established in Columbia River Basin, located on Clackamas River
1880s-1890s	Effects of mining, logging, farming, and fishing become apparent in declining salmon runs
1887	Congress directs Corps to investigate causes of declining salmon runs
1880-1890	Columbia salmon fisheries landings and cannery pack reach peak production
1900-1937	Major development of wildlife protection laws such as the Lacey Act (1900), Migratory Bird Treaty Act (1918), Migratory Bird Conservation Act (1929), Migratory Bird Hunting and Conservation Stamp Act (1934), Federal Aid in Wildlife Restoration Act (1937)
1935	Commercial fish wheels prohibited
1937	BPA created to market the power from the Federal hydroelectric projects
1938	Mitchell Act hatcheries authorized by Congress to mitigate for the effects of the fishing industry on declining fish populations
1938	Corps completes Bonneville Dam with fish passage facilities on the Columbia River
1941	Bureau begins operating Grand Coulee Dam, closing Upper Columbia River Basin to salmon migration
1948	Vanport flood
1950	Commercial fishing seines, traps, set nets prohibited
1950	Federal Aid in Sport Fish Restoration Act enacted to provide Federal aid to the states for management and restoration of fish having "material value in connection with sport or recreation in the marine and/or fresh waters of the United States"
1953-1975	15 Federal dams built on the Columbia and Snake rivers
1955	Corps, in consultation with the fisheries agencies, establishes laboratory at Bonneville Dam for anadromous fish research
1956	Native American fishery at Celilo Falls flooded by The Dalles Dam
1960	The Multiple-Use Sustained-Yield Act declares the purposes of the National Forest include outdoor recreation, range, timber, watershed, and fish and wildlife
1960s-1970s	Nitrogen supersaturation noted as an important source of salmon mortality, fish passage improvements added to dams
1961	Corps begins operating Ice Harbor Dam on Snake River
1964	The Wilderness Act establishes the National Wilderness Preservation System, designating natural areas for preservation and protection before they became occupied or modified
1967	Last summer chinook commercial fishing season until 2001
1967	USFWS list Columbian white-tailed deer as endangered
1967	Idaho Power Company completes Hells Canyon Dam, blocking salmon from Upper Snake River

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Date(s)	Events
1968	The Wild and Scenic River Act passed to preserve free-flowing rivers, including river segments
1968	<i>US v. Oregon</i> treaty fishing rights case filed in Federal district court
1969-1976	Major development of broad-based environmental laws such as the National Environmental Policy Act (1969), Clean Water Act (1972), and Endangered Species Act (1973)
1975	Corps begins operating Lower Granite Dam, Columbia River Basin's last federally authorized and constructed dam
1977	BPA funding helps establish the Columbia River Inter-Tribal Fish Commission (CRITFC)
1977	Last major spring chinook commercial fishing season until 2000
1980	Congress passes Regional Act and creates Northwest Power Planning Council
1982	Council issued its first Columbia River Basin Fish and Wildlife Program
1990	First petitions submitted to list Snake River Sockeye and Spring/Summer and Fall Chinook
1990	USFWS lists northern spotted owl as threatened
1990	Northwest convenes the Salmon Summit to address the problem of declining salmon stocks
1991-1992	NMFS lists Snake River Sockeye as endangered and Snake River Spring, Summer, and Fall Chinook as threatened, later changed to endangered
1991-1996	12 anadromous fish stocks listed under ESA
1992	USFWS lists marbled murrelet as threatened
1993	President Clinton holds the Forest Conference to address issues surrounding the management of Federal lands in the Pacific Northwest and California
1994	U.S. District Judge Malcolm F. Marsh orders Federal government to improve dam operations, lessening their hazards to salmon
1994	USFWS lists Kootenai River white sturgeon as endangered
1994	Forest Service and BLM issue "The Northwest Forest Plan" Record of Decision
1994	Ocean salmon fishing banned for first time off northern Oregon and Washington coasts
1995 ⁵	NMFS issues its Biological Opinion: Reinitiation of Consultation on 1994-1998 Operations of the Columbia River Power System and Juvenile Transportation Program in 1994-1998. Endangered Species Act—Section 7 Consultation (NMFS)
1996	Five Federal departments enter into a Memorandum of Understanding outlining budgetary and other responsibilities for anadromous fish mitigation recovery for the USFS, BLM, USFWS, NMFS, the Bureau of Indian Affairs (BIA), Corps, Bureau, BPA, and the National Resources Conservation Service (NRCS). BPA's commitment includes \$127 million annually for the Council's direct program plus the costs of operations

⁵ Events from 1995 through 2001 are from the following sources: NMFS 1995; NMFS 1998a; NMFS 1998b; NMFS 2000b; USDOJ/USFWS 2000; USDOE/BPA 2002d; USDOE/BPA 2002b; *US vs. OR*, Technical Advisory Committee 1997; Corps 2002b.

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Date(s)	Events
1998	USFWS and NMFS issue InFish and PacFish Biological Opinions for listed bull trout, salmon and steelhead in water bodies throughout Forest Service and BLM lands
1998	NMFS issues Supplemental Biological Opinion: Operation of the Federal Columbia Power System, Including the Smolt Monitoring Program and the Juvenile Fish Transport Program: A Supplement to the Biological Opinion Signed on March 2, 1995, For the Same Projects. Endangered Species Act—Section 7 Consultation
2000	NMFS & USFWS issue Biological Opinions on the Operation of the Federal Columbia River Power System
1991-2001	In the past 1,000 years, 9 of the 10 warmest years have occurred since 1990. Concern is raised because climate changes may significantly affect fish survival in freshwater as well as the ocean. The changes are largely beyond human ability to manage
2001	NMFS receives de-listing petitions and revisits listing decisions for salmon ESUs in response to Judge Hogan's opinion in <i>Alesea Valley Alliance v. NMFS</i>
2001	Second worst water year on record; BPA declares power emergency, limits spill for fish, increases power rates by 46%, takes over \$550 million in Treasury credit using §4(h)(10)(C) authorities
2001	1996 Fish Budget MOU expires; BPA plans for integrated direct program funding through 2006, which includes funding for offsite mitigation and recovery actions under the Council Program and BiOps
2001	Federal Caucus issues its Basinwide Strategy Paper outlining conceptual plan for recovery of listed ESUs
2001	Largest fish runs of salmon and steelhead through Bonneville Dam since the count of fish began in 1938: three times the average number of fish over the last 10 years
2001	First tribal commercial fishery harvest for spring chinook salmon since 1977
2002	NOAA Fisheries (formerly known as NMFS) issues specific interim "abundance and productivity targets" for each of the seven salmon and steelhead runs in the Columbia River Basin that are listed under the ESA
2002	Corps issues Record of Decision ROD for its Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS; this ROD adopts the Major System Improvements (Adaptive Migration) alternative, which includes structural and operational measures to lower Snake River dams to improve fish passage rather than dam drawdown or breaching.

2.3.1 Historical Perspective: Policy Evolution from Subsistence Use of Fish and Wildlife Resources to 1980

Over the past two hundred years, the human environment of the Pacific Northwest has changed dramatically. Some normal variations (such as weather or ocean conditions) and natural disaster events are, of course, beyond human control. However, the vast majority of the changes, at least in number, has resulted and continues to result from expressed or implied public policies. Consequently, the state of the Pacific Northwest's human environment today is largely a direct or indirect consequence of policies followed over the last two hundred years. This section discusses how the human environment changed

from an era of almost exclusive subsistence use of fish and wildlife resources to the era of Federal intervention and the passage of the Regional Act in 1980.

- *Note: This section is a brief summary. More complete discussions of the development of the FCRPS and BPA are in Columbia River Power to the People: A History of Policies of the Bonneville Power Administration (Norwood, 1981), and Richard White's The Organic Machine (1995). The history of water policy and effects from water usage is documented in John Volkman's A River in Common: The Columbia River, the Salmon Ecosystem, and Water Policy (1997). Several comprehensive sources of information about the current salmon and resource problems in the Basin include the National Research Council's Upstream: Salmon and Society in the Pacific Northwest (NRC, 1995); Jim Lichatowich's Salmon Without Rivers (1999); the Snake River Salmon Recovery Team's Final Recommendations to the National Marine Fisheries Service (Snake River Salmon Recovery Team, 1994); Saving the Salmon, by Lisa Mighetto and Wesley J. Ebel (1994); and The Great Salmon Hoax, by James Buchal (1997). Several sources are especially helpful for a fuller understanding of tribal rights and interests, including the following: Felix Cohen's Handbook of Federal Indian Law (1945); Steven Pevar's The Rights of Indians and Tribes: the Basic ACLU Guide to Indian and Tribal Rights (1992); and the Columbia River Inter-Tribal Fish Commission's Spirit of the Salmon (Wy-Kan-Ush-Mi Wa-Kish-Wit) (CRITFC, 1996)*

2.3.1.1 The Era of Basic Subsistence: Early Native American Indians through the Arrival of Lewis and Clark in 1803

Over two hundred years ago, the human population in the Columbia River Basin consisted almost exclusively of American Indian peoples. The Cascade Range divided semi-arid deserts from rich fertile forestland. The Columbia River flowed uncontrolled and unpredictably through the Region, sustaining enormous runs of anadromous fish (see map Figure 2.17 at the end of this chapter), as well as abundant populations of resident fish and wildlife.

The first residents of the Pacific Northwest developed distinctive coastal and inland cultures that are now thousands of years old. Survival depended on use of the natural resources within the Region—the air, land, and water that supported vegetation, fish, and wildlife—and on elaborate trade networks. For tribes that were not too far upriver, the basis of the aboriginal economy was fishing.⁶ For some tribes, salmon was not merely an important food, it was at the heart of an entire way of life. It was the staple item in the tribal year-round diet and a major commodity in trade between tribes.⁷ Numerous tribes caught salmon at various locations along the river as the fish swam upstream to spawn. Other fish, marine mammals, waterfowl, game, and plant food sources were also plentiful.

⁶ White, R. 1995, p. 18: "At The Dalles the Wishrams and Wascos derived between 30 and 40% of their annual energy requirements from salmon; at the other extreme, farther up river, the Kutenais, Flatheads, and Coeur d'Alenes obtained 5% or less."

⁷ American Friends Service Committee 1970, p. 3.

The policies regarding fish and wildlife for the Columbia River Basin consisted of traditional cultural practices directed and preserved by elders of the many tribes and bands that inhabited the area. In general, these practices were based on the belief that there is a close physical and spiritual interrelationship between humans and nature. This close bond of the North American Indian to the natural world was demonstrated by the seasonal cycle of subsistence that formed an integral part of the tribal cultural fabric. Some Columbia River tribes engaged in ceremonies to help ensure the return of the sacred salmon.⁸ They waited for salmon with anxiety because there were times when natural events precluded or drastically reduced the salmon runs.⁹ The tribes also placed special significance on certain places in the landscape, especially near the river. Tribal elders used traditional practices to implement spoken policies requiring members to honor and respect the sacredness of the natural world. These policies allowed for the harvesting of natural resources for basic subsistence and for trade and commerce with other tribal groups. Part of this cultural view saw land as sacred, something never to be actually owned, although human occupants might serve as its guardians or custodians.

When Europeans first arrived in the Pacific Northwest, they found an environment rich in natural resources: a braided network of rivers running clear; a wide range of ecosystems that supported fur-bearing and other animals; abundant game and non-game species of birds and animals; and vast sweeps of forest. Fish were usually abundant in the Columbia River system. In 1803, when Lewis and Clark first encountered the Columbia River in their search for a westward path to the sea,¹⁰ they found a river running with what may have been historic peak numbers¹¹—approximately 8-10 million adult salmon.¹² Air, land, and water were clean and pristine, and the ecosystem functioned in a natural balance, without significant human intervention.

2.3.1.2 The Era of Land Claims and Commercial Development: 1803 through the mid-1930s

With European-American exploration and settlement in the Region, the age-old policy direction of basic subsistence soon gave way to a new era of an emerging commercial focus, as competition for the sea otter fur trade brought non-Indians to the Oregon Territory. These settlers regarded resources differently from Native Americans. Wildlife and other resources were taken, not just for subsistence, but for their commercial value. Conflicts over land ownership, exploitation of resources, and a host of related issues with particular significance for Native American peoples would begin to surface.

⁸ Lichatowich, J. 1999, pp. 33-37.

⁹ White, R. 1995, pp. 18-19.

¹⁰ See quotes from a letter from President Thomas Jefferson to Meriwether Lewis, dated April 27, 1803, describing the object of their exploration, included as attachment to the comment letter submitted by Inland Ports and Navigation Group (comment letter # 29).

¹¹ There is evidence that ocean conditions did not begin to favor the colonization of the Pacific Northwest by anadromous fish until approximately 10,000 years ago and that the most favorable ocean conditions, which resulted in the highest salmon returns, occurred in the 1800s. James Chatters 1997.

¹² NRC 1996, p. 15. The Council suggests that the number may have been higher, perhaps as high as 16 million salmon returning to spawn every year. See Council 1986. For an excellent account of Columbia River salmon issues generally, see Wilkinson, C. 1992.

Before the Pacific Northwest Region became part of the United States, European nations competed to control its important seaports and natural resources. Beginning with the Lewis and Clark expedition in 1803, the United States government, motivated by what has become known as Manifest Destiny,¹³ began to invoke actions to claim territories of the west, induce settlement on the claimed territories, and commercially exploit the vast natural resources of the Region.

This new policy direction shifted emphasis to the following:

- control of the territory,
- displacement of Native American Indian tribes,
- settlement and withdrawal of lands,
- government ownership of lands,
- extraction of natural resources,
- harnessing of the river(s) for irrigation and flood control, and
- development of hydroelectric power.

By about 1830, settler-carried diseases had spread as epidemics among the vulnerable area tribes, killing about 90% of the individuals of the lower Columbia River tribes.¹⁴ When, in the 1840s, the first major wave of European-American settlers arrived along the Oregon Trail, there was still no established national sovereignty over the Region. As a result, there were several years of struggle among national, religious missionary, and ethnic factions. Settlement by non-Indians continued to bring disease and discord to the native Indians, with disastrous effects on the various tribal populations.

Commercial Trapping¹⁵

In a cultural (and therefore policy) shift, the new immigrants took wildlife, not just for subsistence, but for its commercial value. While the use of fish and wildlife for trading purposes was pre-historic, indigenous peoples had self-regulated their usage with taboos and punishment.¹⁶ However, trappers continued to trap and sell pelts from fur-bearing animals without regulation. The trade flourished through the early 1800s, but ceased to be a significant economic activity by 1850, largely because animals were hunted to near-extinction. By 1829, for example, the sea otter had been all but exterminated. Americans then began to bid for inland furs, primarily beaver. It took just two years to reduce the beaver population to near-extinction levels in the Snake River area.¹⁷

¹³ A U.S. policy during the 19th and early 20th century of imperialistic expansion defended as necessary or benevolent (1984, Webster's II New Riverside University Dictionary).

¹⁴ Cone, J. 1995, p.108.

¹⁵ Information in this discussion is from USDOE/BPA, Corps, and Bureau 1995.

¹⁶ Lichatowich, J. 1999, p. 40.

¹⁷ Lichatowich, J.A. and L.E. Mobrand 1995; and Wissmar, R.C., et al. 1994. See also Council 2000b, pp. 143-45.

Commercial Fishing

By mid-nineteenth century, the burgeoning European-American population of the Northwest had found many ways to make a living. Aside from would-be gold miners, there were farmers and ranchers, trappers (although, as the resource dwindled, so did the profession), and merchants. Anyone near a river still frequently saw a glittering bounty of fish available for the taking.

- The 50,000 to 60,000 Native Americans who lived in the Columbia Basin in the early 1880s are estimated to have harvested about five to six million adult salmonids per year.¹⁸
- Non-Indian commercial harvest had occurred in the Lower Columbia River since the 1860s and peaked for the different runs in the late 1880s and 1890s with the harvest of chinook at 43 million pounds, sockeye at 45 million pounds, coho at 7 million pounds, and chum at over 8 million pounds.¹⁹
- During this time, canneries packed as many as 630,000 cases of forty-eight one-pound tins during the annual runs. In 1906, fish wheels were taking more than a million fish each year. There were 55 canneries in Oregon alone.²⁰

As with the sea otter and beaver, this intensifying harvest effort soon led to repeated declines in the annual catch. Toward the end of the nineteenth century, Oregon and Washington began to impose restrictions on harvest and to establish closed seasons to protect the commercial fisheries. However, the laws were haphazard and provided little effective protection. By the 1870s, the states of Oregon and Washington had begun to turn their attention to hatcheries, using artificial production to supplement runs already decimated by habitat damage (due primarily to destructive mining, grazing, and logging practices in tributary stream watersheds), commercial fishing, and an absence of fisheries management. Through the 1920s, salmon in the Columbia River were typically harvested for commercial purposes with gillnets and fish wheels. No serious effort to limit harvests would be taken for years. In the meantime, under the combined effects of excessive harvesting and tributary habitat degradation, salmon populations dwindled.

Timber Harvest

The vast forests of the Pacific Northwest were initially seen as both opportunity (materials for homes and businesses and fences) and impediment. Commercial cutting began in the 1800s when the first non-Indian immigrants settled and farmed the interior valleys of western Oregon and the Puget Sound region. The extensive forests and the riparian areas that covered much of the landscape were cleared and burned to make way for agriculture. Streams and rivers were channelized (directed and contained), and large tree and riparian vegetation were removed. These actions drained the extensive wetlands and increased the rate of water runoff. Because the supply of trees seemed inexhaustible,

¹⁸ Council 1986, Chapter 3.

¹⁹ Council 1986, Chapter 2.

²⁰ Council 1986, Chapter 5.

and because it was hard and time-consuming work to fell trees with handsaws and axes, any trees with low commercial value were frequently left standing.

Commercial lumber operations meant not only cutting trees, but also constructing temporary dams to float logs downriver. Such dams altered river flows, affecting fish, wildlife, and riparian vegetation. Rafts of logs, shooting down small rivers, scoured the channels bare of spawning gravels, riparian vegetation, and instream cover. Little or no attention was given to mitigating this habitat destruction. Some early attempts through hatchery mitigation occurred, in part, to offset these destructive logging practices in tributaries.

Mining²¹

Mining for precious metals in the Pacific Northwest has continued from the early days of settlement until the present.²² Finding gold and silver was the priority of the first miners in the 1800s and early 1900s. Mining, whether for gold or gravel, usually took place in or near streams and creeks—the same waterways salmon used for spawning and rearing.

The initial mining practices (some underground mining, but mostly placer, or dredge, mining) caused tremendous destruction of salmon habitat in streams and creeks. With placer or dredge mining, miners removed large amounts of the stream bed, washed and screened the material to find precious metals, and finally discarded the processed material along stream banks. Mining might have released or concentrated naturally occurring hazardous materials such as mercury, which may then have become concentrated in aquatic life and in those who dined upon it—especially Native Americans. In the case of underground, or hard-rock, mining, water from streams was needed to wash the mined material.

These operations disrupted salmon activity in the affected streams and created permanent changes in stream structure. For example, scooping out the streambed deepened the channel of the stream. This deepening may have increased the speed of the water flow in the stream, disturbing or destroying salmon spawning grounds and removing streamside vegetation. (Juvenile salmon need calm, slow-flowing water to live in as they develop.) Also, erosion from the tailings of hard-rock mining carried trace amounts of toxic chemicals, such as mercury, into streamflows or into sediments in streambeds and floodplains.

Relationships with Native Americans

The establishment of the Oregon Territory in 1848 created a problem: How to bring about ownership of land—desirable land—where other peoples were already living and on which they depended for their survival. Beginning in the 1850s, the United States government enacted laws and regulations that would displace the native inhabitants of the

²¹ The following material is from Rost, Bob 1998. The history of mining activity and its environmental impacts in Oregon is similar to the experiences of the other Pacific Northwest states.

²² Mining is not currently a major industry in the Pacific Northwest. See discussion under Section 2.3.1.3.

Oregon Territory from their traditional use lands and allow the United States to claim title to those lands.

Conflict between missionaries and the interior-basin Indian tribes erupted as the stream of settlers moving into the Region increasingly alarmed the Indian inhabitants.²³ Hostilities between settlers and the Indians were fueled, in part, by the lack of treaties. In 1850, Congress passed the Indian Treaty Act, which authorized the purchase of lands from various tribes and removal of Indians to other areas (albeit, where settlers did not want them). Treaties were negotiated with some tribes who were willing to cede some of their lands. Relocation of tribes to reservations was a wrenching and socially disruptive event for tribal people. Unrelated tribes or bands were sometimes grouped together for expediency by the government and relocated onto reservations far from ancestral lands and resources. However, virtually all of the tribes asserted the need and desire to retain some lands for their own use.

Washington became a territory of the United States on March 2, 1855. A key mission in Washington (and Oregon) was the disposition of Indian land rights. Indian lands were rapidly being taken by settlers who were encouraged by the Oregon Donation Land Act.²⁴ In order to foster development and "pacify" the tribes, Isaac Stevens (Washington governor and superintendent of Indian affairs) pushed for treaties with Indians who lived along proposed railroad routes.²⁵ During the same year, Joel Palmer, superintendent of Indian Affairs in Oregon, pursued similar treaties with several Oregon tribes. The desired effects were to extinguish Indian land ownership in exchange for certain protections for the tribes and create enticements for Indians to become agrarian.

Stevens (and Palmer) discovered that the Indians, though recognizing the necessity for selling much of their land, were adamantly against being moved away from it, and refused to accept centralized reservations. A basic misunderstanding during treaty-making lay in the differing concepts about land. Non-Indian culture regarded land as a commodity to be owned, fenced, bought, and sold. To the Native American Indians, land was part of a spiritual heritage, not an article of trade. Stevens acceded to the tribes' reserving a portion of their homeland.

The importance of fish to the Indians seems to have impressed Stevens. He did not intentionally reserve to the Indians any more rights than he thought necessary, but he understood that the one indispensable requirement for securing agreement of any kind from Pacific Northwest Indians was to assure their continued right to fish. That right was as valuable to them as their lives: "It was also thought necessary to allow them to fish at all accustomed places, since this would not in any manner interfere with the rights of citizens, and was necessary for the Indians to obtain a subsistence."²⁶

²³ American Friends Service Committee 1970, p. 16.

²⁴ American Friends Service Committee 1970, p. 16.

²⁵ American Friends Service Committee 1970, p. 19.

²⁶ American Friends Service Committee 1970, p. 21.

Through treaties with the United States, several Columbia River tribes²⁷ reserved their right to fish inside and outside reservation boundaries. These rights would become, by the mid-20th century, an important point of contention and source of legal action, as well as an issue with biological and cultural significance.²⁸ In a treaty with the United States, the Shoshone-Bannock Tribes of the Fort Hall Reservation reserved rights to fish for anadromous species. Also, in the northern Great Basin of Idaho and Oregon, a series of peace treaties was conducted with several Shoshone and Bannock groups, culminating in the Fort Bridger Treaty of 1868.

In short order, conflict erupted over the recently concluded treaties. Settlers, misled by word that the treaties were in full effect, began moving onto Indian lands before congressional ratification. The tribes had been promised that they would not have to move until the treaties were ratified—perhaps two years later—and tribal distrust of the terms of the treaties grew. A period of hostilities and, in some cases, war erupted in the aftermath. Congress delayed ratification of most treaties until hostilities were ended.

In 1871, Congress passed legislation to cease any new treaties with Indian tribes and stopped recognizing additional tribes as separate nations. The legislation specifically recognized that all existing treaties then in existence were to be honored. The Federal government thereafter relied upon Agreements and Executive Orders to legally acquire Indian lands, allow tribes to cede lands, establish reservations, provide Federal recognition of tribes, and remove Indian peoples to reservations. Tribes also had, and have, constitutions and by-laws that formalize their governmental organization and express their relationship with the Federal government.

In 1887, Congress passed the General Allotment Act (the Dawes Act). This legislation allotted reservation lands to individuals. Under the treaties, land was held in common by the tribe and the concept of individual ownership was unknown. The stated purpose of the Dawes Acts was to encourage individual ownership and farming. In practice, however, this program failed and much of the lands reserved in the treaties passed from tribal ownership and was subsequently sold.

Under the Federal goal of settling the land, the government encouraged immigrants to develop the West, securing the young country's claim to its borders and all that lay inside them. The government began to grant land rights to settlers and railroads. The resulting differences in land ownership and management practices and objectives, and the increasing population pressure on land, water, fish, wildlife, and vegetation, would set the stage for a policy of enhancing commerce at the expense of natural resources (for land ownership see map Figure 2.13 at the end of this chapter).

²⁷ These four tribes are the Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Indian Nation, which have reserved the right in fish in "usual and accustomed places" along with "citizens of the territor(y)."

²⁸ See generally Corps 1999c.

Commercial Development

The gold rushes of the 1850s and 1860s stimulated another kind of commerce—agricultural development. The Region became populated with erstwhile miners who had migrated West to seek their fortunes, but who—finding rich soil instead—stayed to farm.²⁹ Inland settlers found a vast, arid prairie ideal for raising livestock: more than 90 million acres of grassland covered eastern Oregon and Washington and southern Idaho. Where settlers had access to waterways, wheat and grain farming quickly became the dominant economic activity.³⁰

The gold rush, and subsequent agricultural development, further increased environmental pressures on natural resources. Any impulse toward cooperation tended to be undermined by the stipulations of land initiatives, which inadvertently promoted *individual* gain rather than collective benefit.³¹ Resources were used without regard for future consequences.

Near the end of the nineteenth century, Federal interests began a shift in policy direction: from exploration and development to retention and management of those lands—keeping them (more safely, it was thought) under the wing of the government itself. Lands were now withdrawn to delineate Indian lands, timber resources, potential power sites, scenic areas, grazing lands, and lands to be managed for other public uses. The 1890s saw withdrawals of land that eventually became National Forests administered by the USFS. Some withdrawn areas were subsequently designated as national parks to be managed by the National Park Service (NPS).

That control extended to the waters of the United States as well: canals and locks were built to enable commerce, interrupting river flow and blocking passage for anadromous fish upstream to their natal streams. Nevertheless, commercial development remained the policy focus through the 1930s, as fish harvests became more efficient with new technology and rivers were harnessed by dams for irrigation and flood control, as well as for the production of hydroelectric power. Issues such as effects on fish, wildlife, vegetation, or even the regional population were considered only minimally, if at all.

Early 20th Century: Taming Land and Water

The Reclamation Act of 1902 brought about the construction of large, multiple-use Federal dams, such as the Minidoka in Idaho, which combined the purposes of flood control, irrigation, and hydropower. However, a change in the accustomed flow of water at any one point inevitably affects fish, wildlife and human uses both at that point and downstream. At this time, the policy was in favor of development and use of natural resources without regard to environmental impacts.

²⁹ Pacific Northwest River Basins Commission 1971, Appendix IX: Irrigation, p. 4.

³⁰ PNRBC 1971, p. 3.

³¹ Fahey, J. 1986, pp.88-90, 97-99; Lichatowich 1999, pp. 48 and 50.

In 1915, more canals and locks were built on the river, this time at Celilo Falls. When the project was completed in May of 1915, six steamboats passed through the newly opened canal. Waterborne commerce developed as planned, and the canal helped keep rail rates below monopoly levels.

In 1920, Congress responded to the surge in demand for electric power created by World War I by enacting the Federal Water Power Act, which established the Federal Power Commission (FPC), later to become the Federal Energy Regulatory Commission (FERC). The FPC was responsible for licensing non-Federal hydroelectric power projects that affect navigable waters, occupy Federal lands, use water or water power at a government dam, or affect the interests of interstate commerce. The Act also required the FPC to license only those projects that, in its judgment, were "... best adapted to a comprehensive plan for improving or developing a waterway or waterways"³²

Commerce on the river remained light until the multi-purpose dams were constructed in the Columbia and Snake rivers (beginning in 1938). In the Rivers and Harbors Act of 1945, Congress authorized construction of an inland navigation system on the Snake River.³³ Five years later, Congress authorized construction of the John Day and The Dalles dams, pursuant to Section 204 of the Rivers and Harbors Act of 1950.³⁴

Between 1803 and 1930, almost all the policy issues that currently interweave and conflict had developed: governmental authority, fishing rights, irrigation, transportation, flood control, hydroelectric power, land use, land ownership, and so on. The fish and wildlife resources were in substantial decline from the immense immigration of European settlers, who developed the land and used the water. Recognition of environmental issues lagged behind in the continuing drive to settle the West, exploit its vast natural resources, and move the country to a position of commercial (and therefore political) power.

Early State and Federal Fish and Wildlife Management

Two of the contemporary deans of environmental law have observed that "[t]he public attitude toward wildlife as a resource has shifted from that of putting food on the table to one of recreational, scientific, and aesthetic interest, and wildlife management and protection has become a legal matter."³⁵ In most of the nineteenth century, the few basic state fish and wildlife statutes were ineffective due to lack of funding for wardens, equipment, and programs. The 20th century, however, saw the evolution of fish and wildlife law from a set of relatively narrow state hunting and fishing rules to more comprehensive, frequently interjurisdictional, statutes of broader dimensions and perspectives.

Some examples of major early Federal statutes addressing fish and wildlife management include the following:

³² Federal Power Act, 16 USC 803 (a)(1).

³³ Comment letter from the Inland Ports and Navigation Group (IPNG) dated August 31, 2001.

³⁴ IPNG comment letter, 2001.

³⁵ Coggins, G. and C. Wilkinson 1987, p. 779.

Lacey Act (1900)

This Act was passed in response to the rapid depletion of game, as a result of market hunting, and the decline of non-game bird populations, shot for the plume market. The Act, later amended, prohibits the interstate shipment of fish and wildlife taken in violation of a Federal, state, tribal, or foreign law.

Migratory Bird Treaty Act (1918)

The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and Russia. The Act made it unlawful to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention ... or any part, nest, or egg of any such bird" unless otherwise permitted by regulation.

Migratory Bird Conservation Act (1929)

The Act established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The Commission is directed to report each year to Congress on its activities during the preceding fiscal year. The Secretary of the Interior is authorized to cooperate with local authorities in wildlife conservation, to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. The Act provides for cooperation with states in enforcement. It established procedures for acquisition by purchase, rental, or gift of areas approved by the Commission for migratory birds.

Migratory Bird Hunting and Conservation Stamp Act (1934)

The "Duck Stamp Act" requires each waterfowl hunter 16 years of age or older to possess a valid Federal hunting stamp. Receipts from the sale of the stamp are deposited in a special Treasury account known as the Migratory Bird Conservation Fund and are not subject to appropriations. Funds are merged with receipts under the Wetlands Loan Act for the acquisition of migratory bird refuges.

Fish and Wildlife Coordination Act (1934)

This Act created several different authorizations. It grants the Secretaries of Agriculture and Commerce the authority to both assist and cooperate with Federal and state agencies to protect, rear, stock, and increase game and furbearer populations. It also allows for the study of the effects of domestic sewage, trade wastes, and other polluting substances on wildlife. Finally, the Act requires that impounded waters are to be used for fish-culture stations and migratory bird areas, and that any new dam construction allow for fish migration.

Federal Aid in Wildlife Restoration "Pittman-Robertson" Act (1937)

Funds from an excise tax on sporting arms and ammunition are appropriated to the Secretary of the Interior and apportioned to states on a formula basis for paying up to 75% of the cost of approved projects. Project activities include acquisition and improvement of wildlife habitat, introduction of wildlife into suitable habitat, research into wildlife problems, surveys and inventories of wildlife problems, acquisition and development of access facilities for public use, and hunter education programs, including construction and operation of public target ranges.

With the clarification, in 1896, that wildlife was owned in trust by the states for their people, states began exercising a fundamental right stemming from that authority: taxation. Hunting and fishing license fees generated considerable state revenues and became the primary source of funds for fish and wildlife management. A symbiosis then developed in which the states' resource regulators began regulating on behalf of those who paid for the regulations: hunters and fishermen. With few exceptions, until the mid-1960s, Congress imposed minimal requirements on states' management of fisheries and wildlife.

2.3.1.3 The Era of Federal Intervention: The mid-1930s up to the Regional Act in 1980

After the stock market crash of 1929, and during the subsequent multi-year Depression, Federal action focused both on managing the resources and providing economic support for the shaken economy in the form of projects. These projects—large and small—would provide work and jobs, and would support a strong nation. This meant that the policy was to make major and broader changes to the environment, both water and land.

Although early settlers had turned their attention to canals and dams on tributaries, the Columbia River itself was difficult to harness. Some private entrepreneurs sought authorization to build some projects. However, by 1930, the FPC had withdrawn four hydro project licenses from one potential developer who was not moving quickly enough to build dams at the current locations of Chief Joseph and McNary Dams. In 1931, non-Federal developers began construction of Rocky Reach Dam.

Federal Hydroelectric Development

The Federal government itself did not seriously consider the Columbia River for development until 1925, when the Rivers and Harbors Act instructed the Corps to survey and report on the Columbia's potential for electric power, navigation, flood control, and irrigation development. The authorizing legislation specified the purpose, or purposes, for which the Corps may operate the dams. Completed in March 1932, the 1845-page "308 report" document characterized the Columbia as the "greatest system for water power to be found anywhere in the United States,"³⁶ and recommended ten dams for navigation and electricity production.

³⁶ House Document No. 308 (308 Report) 1927.

A commerce-driven policy was now moving to center stage. Decisionmakers recognized both the potential bonus for development offered by dam-building *and* the possibility that the anadromous fish populations would increasingly be hampered in their attempts to travel from their natal stream to the ocean and back. Human needs were given priority, and the report was approved. Construction of dams was authorized to meet these needs. Construction soon began on two massive dams: the Grand Coulee Dam in 1937, and the Bonneville Dam in 1938. A 1937 compromise created BPA as an interim agency within the Department of Interior (DOI). The agency was to market power output from the Federal dams on the Columbia, giving preference to public customers.

In addition to hydropower generation and marketing, navigation,³⁷ and irrigation, flood control was an important aspect of dam-building that supported human needs. The Columbia and other major tributary rivers were not yet tamed by the dam projects suggested by the Corps' report. Flooding was a frequent, but unpredictable, occurrence as winter snows melted or storm cycles passed through the Region. Significant flood events occurred throughout the Columbia River Basin, washing away vegetation, changing the river course, and renewing low-lying lands with rich deposits from upstream.

From 1953 to 1975, 15 Federal dams were built on the Columbia and Snake Rivers, a dramatic increase over the preceding era. Twelve of the dams are part of the FCRPS, for which the Corps maintains primary responsibility for day-to-day operation and maintenance. In 1964, the Corps, the Bureau, and BPA entered into an inter-agency contractual agreement, the Pacific Northwest Coordination Agreement, to coordinate operations of the FCRPS and non-Federal dams in the Basin.

The Federal government also looked beyond its borders: in 1961, the United States and Canada entered into the Columbia River Treaty. The treaty, however, which allows joint United States/Canada development on the river, addresses only two issues: hydropower generation and flood control. The agreement contains no provisions related to environmental concerns or the needs of salmon, and is therefore very limited in its reach.

The Northwest transmission system was developed simultaneously with hydroelectric development (see map Figure 2.15 at the end of this chapter). The transmission lines were built to move the new generation to the load areas. The capability of the transmission system is tied to generation levels, especially at the critical hydroelectric projects along the lower Columbia and lower Snake rivers.

Columbia River Treaty

The Federal government also looked beyond its borders. In 1961, the United States and Canada signed the Columbia River Treaty; it was ratified in 1964. The Treaty provided for building four storage dams: three in Canada (Mica, Keenleyside, and Duncan) and one in the United States (Libby). The reservoirs built and operated under the Treaty

³⁷ See comment letter #29, from the Inland Ports and Navigation Group, dated August 31, 2001, for a more detailed history of the importance of navigation on the Columbia and Snake rivers.

represent almost half the water storage capacity on the Columbia River system. The Treaty, however, addresses only hydropower generation and flood control. It contains no provisions related to environmental concerns, specifically the needs of salmon.

The three Canadian storage dams provide regulated flows that enable hydroelectric projects downstream in the United States to produce additional power benefits. The Treaty requires the United States to deliver to Canada one-half of these downstream power benefits—the Canadian Entitlement. The United States' obligation to deliver the Entitlement extends to 2024, the first year the Treaty can be terminated with 10 years' notice. The Canadian Entitlement Allocation Agreements (CEAA), also executed in 1964, established how the Canadian Entitlement was to be attributed to the six Federal and five non-Federal downstream hydroelectric projects. The CEAA have been extended until 2024.

The Pacific Northwest Coordination Agreement (PNCA) is a direct outgrowth of the Columbia River Treaty. The PNCA, also signed in 1964, is a complex contract that provides for coordination of electric power production on the Columbia River to maximize reliability and power production, while providing priority to non-power objectives.

Non-Federal Hydroelectric Development

By 1932, the Oregon Fish Commission estimated that "approximately 50% of the most productive area within the basin [had] been lost to the salmon industry by the construction of dams for irrigation and power, thus isolating spawning areas."³⁸

The Federal government was a prime mover for building non-Federal dams in the 1930s, 40s, and early 50s and beyond. Congress authorized Grant County Public Utility District to file an application for a license to build a dam at Priest Rapids (mid-Columbia). That license was followed by licenses for more dams, all to be operated by the mid-Columbia public utility districts. FERC has regulatory authority over non-Federal hydroelectric projects on the Columbia River and its tributaries (see map Figure 2.14 at the end of this chapter). Until 1986, FERC was not required by law to include provisions for fish and wildlife affected by the licensed projects. FERC must now consider Federal and state fish and wildlife agency recommendations to protect and mitigate damages caused by the licensed projects. Many of the original licenses granted by FERC were issued several decades ago, for a period of fifty years. Most contain no fish and wildlife conditions. Numerous projects in the Region have licenses that will expire within the next decade and must be relicensed by FERC. The ongoing and future relicensing process provides an opportunity to set conditions for project operations to meet the needs of fish and wildlife.

In the early 1950s, the Eisenhower Administration moved to encourage private development, rather than Federal control, of hydroelectric projects. The Idaho Power Company received its license to build a series of three dams, the Hells Canyon Complex,

³⁸ Lichatowich, J. 1999, p. 70.

in 1955. When complete, the complex blocked 80% of the habitat for Snake River fall chinook and created water quality problems, such as increased water temperature, that remain unresolved.

Effects from Dam Construction and Operation on Fish and Wildlife

Dams have had an enormous effect on downstream and upstream fish and wildlife habitat. Grand Coulee Dam (completed in 1941) permanently blocked 1400 miles (2253 km) of spawning habitat for chinook.³⁹ It eliminated the famed Kettle Falls fishery and all remnants of many upriver fish runs and inundated 56,000 acres⁴⁰ of land that previously supported a variety of wildlife. The Hell's Canyon Complex, constructed by Idaho Power Company in 1967, eliminated all remaining anadromous fish production in the upper Snake River Basin, including sockeye, spring/summer, and fall chinook salmon;⁴¹ it also inundated wildlife habitat. This was especially offensive to fishery interests because Idaho Power Company's Federal license to build the dam required passage for salmon. The National Research Council has estimated that, of the original salmon and steelhead habitat available in the Columbia River Basin, "55% of the area and 31% of the stream miles have been eliminated by dam construction."⁴²

Other run-of-river dams (such as the John Day, 1968) on the Columbia and lower Snake all have fish ladders and, therefore, allow passage of adult salmon.⁴³ However, the reservoirs created by storage dams inundated salmon spawning grounds, wildlife habitat, and cultural resource sites. It took years for many in the Region to recognize the negative ecological and economic consequences to the fishery from more than 100 years of development. Hatchery fish mitigation tended to mask the effects: even though up-river species of salmon were only a fraction of their historic abundance, the average total harvest in the mainstem Columbia was around 550,000 fish in the 1960s and 1970s. The catch rose to around 720,000 in the 1980s; 1.6 million fish were taken in 1986, largely due to the success of hatchery operations in the lower Columbia River. Today, hatchery fish constitute 80% or more of the catch for most chinook and coho species. Tribal fisheries in the upper Basin were particularly hard hit, because hatchery programs did not necessarily mitigate for the species affected or provide mitigation in locations where fish losses occurred.

Timber Harvest

The commercial interest in timber also continued to grow. With the invention of the gas-powered chainsaw and improvements in transportation soon after World War II, logging greatly increased on Federal, state, and private lands in the Pacific Northwest.

³⁹ Lichatowich, J. 1999, p. 222.

⁴⁰ Note: This figure represents land area inundated, and does not include former river area. Sprinkle, Craig 2000.

⁴¹ Snake River Salmon Recovery Team 1994, p. II-8; Council 1992, Vol. I, pp. 28, 33.

⁴² NRC 1996, p. 53.

⁴³ Berryman, A.A., et al. n.d.

Timber harvesting had important consequences for wildlife, soils, vegetation, water quality and fish—as well as for local economies. Human needs for recreation (in the form of hunting and fishing), as well as Federal revenue needs and commercial desires for the easiest possible harvest, shaped timber harvest management. Forests were fragmented to increase habitat conditions preferred by deer and elk populations. Extensive road systems were developed to facilitate timber harvest and provide easy hunting and fishing access. Revenues from timber harvest improved local economies and provided substantial funds to the Federal Treasury. It was assumed that forests managed in this manner could be cut and regrown at relatively short intervals (such as 40 to 80 years) without negatively affecting other resources such as water, fish, soils, or terrestrial wildlife.

Mitigation/The Environmental Movement

For more than 150 years, the European-American settlers of the West and their descendents had exploited the Region's natural resources—including its fish and wildlife. "The belief was that wildlife resources were unlimited and harvest could continue forever. They did not. Wildlife populations fell and species became extinct."⁴⁴ Public awareness of declining conditions began to affect public policy in the middle of the twentieth century. People saw clearcuts not returning to their healthy pre-cut state, the game they hunted become more scarce, the streams plug up with silt when heavy rains washed dirt down eroded banks, and the numbers of salmon returning from the ocean steadily diminish. In response, a number of environmental laws directly affecting fish, wildlife, and their habitat were passed.

Mitchell Act (1938)

The act authorized funding for state and Federal hatcheries on the Lower Columbia River. This was the first major Federal funding for fish mitigation, although hatcheries had existed since the turn of the century (see map Figure 2.9 at the end of this chapter; for a detailed list of hatcheries see Appendix G). The hatcheries were meant to offset the consequences on fish primarily from irrigation projects and overfishing, but also for the consequences from construction of Bonneville and Grand Coulee dams. Funds were used to pay for large irrigation diversion screening programs and hatcheries, mostly in the lower Columbia River below the dams, and where they would intentionally benefit non-Indian fisheries in the ocean and lower river (see Section 2.3.2.3). Because upper-basin stocks losses were not mitigated with hatcheries until later, catches (especially those in upriver tribal fisheries) continued to decline. At the time, hatcheries were chosen to remedy the loss due to dams and other related actions, without an understanding of genetic consequences and potential effects on wild fish. Salmon production during the current era would have probably fallen even more precipitously if salmon produced in hatcheries had not increased sharply after World War II.

⁴⁴ Moulton, M.P. and J. Sanderson 1997, p. 19.

Federal Aid in Sport Fish Restoration "Dingell-Johnson" Act (1950)

Also known as the Wallop-Breaux Act, it provided Federal aid to the states for management and restoration of fish having "material value in connection with sport or recreation in the marine and/or fresh waters of the United States." In addition, amendments to the Act provide funds to the states for aquatic education, wetlands restoration, boat safety and clean vessel sanitation devices, and a nontrailerable boat program. Funds distributed to states for the various programs funded in the Act are collected in an account known as the Sport Fish Restoration Account. Funds are derived from an excise tax on certain items of sport fishing tackle, fish finders and electric trolling motors; import duties on fishing tackle, yachts and pleasure craft; interest on the account; and a portion of motorboat fuel tax revenues and small engine fuel taxes.

Multiple-Use Sustained-Yield Act (1960)

In this act, Congress declared that the purposes of the National Forest include outdoor recreation, range, timber, watershed, and fish and wildlife. The Act directed the Secretary of Agriculture to administer National Forest renewable surface resources for multiple use and sustained yield. The Act does not affect the jurisdiction or responsibilities of the states, the use or administration of the mineral resources of National Forest lands, or the use or administration of Federal lands not within the National Forests. Under the Act, multiple use means management of all the renewable surface resources of the National Forests to meet the needs of the American people. Sustained yield means achievement and maintenance of a high-level regular output of the renewable resources of the National Forest without impairment of the land's productivity.

Bald and Golden Eagle Protection Act (1962)

When passed in 1940, this act only protected bald eagles, however, it was amended in 1962 to include golden eagles. Congress originally protected bald eagles in order to protect the "symbol of American ideals of freedom." The act protects not only bald and golden eagles, but also their parts, eggs or nests. The act makes actions to "take" or "possess" eagles illegal, as well as actions that included selling, purchasing or transporting eagles. However, Congress has amended the act several times creating exceptions to the "take" restrictions particularly when used for the religious purposes of Indian tribes, when golden eagles are taken as a result of livestock depredation, and when golden eagle nests interfere with resource development.

Wilderness Act (1964)

The Wilderness Act established the National Wilderness Preservation System. The intent was to designate natural areas for preservation and protection before they became occupied or were modified. The Secretary of the Interior was directed to review every roadless area of 5,000 acres or more and every roadless island within the national wildlife refuge and national park systems for possible inclusion in the System. The Act also included some National Forest lands in the System and directed the Secretary of Agriculture to recommend others. To date, over 100 million acres have been included in the National Wilderness Preservation System.

Anadromous Fish Conservation Act (1965)

This act authorized the Secretaries of Interior and Commerce to enter into cooperative agreements with states and other non-Federal entities to further the conservation, development, and enhancement of anadromous fish. The types of activities that are authorized include investigations, engineering and biological surveys, research, stream clearance, construction, maintenance and operations of hatcheries, and devices and structures for improving movement, feeding, and spawning conditions. As part of these agreements these Departments can contribute up to fifty percent of the cost—the Federal share.

Wild and Scenic Rivers Act (1968)

In 1968, Congress declared that some rivers possessed "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other value" and should be protected. The protection of these rivers, or a segment of a river, is meant to preserve both the river in its free-flowing form and its immediate environment. This Act was meant to address the national policy of water development (e.g. dam construction) by allowing for non-developed areas of rivers to be protected in their natural form. A number of rivers throughout the Northwest enjoy protection under this Act.

Marine Mammal Protection Act (1972)

The Marine Mammal Act was the first Federal wildlife statute that focused on species populations and ecosystem protection. Other laws up to this point had either reinforced state law, protected individual species, or prohibited certain conduct. The only law that was similar to this act was the Migratory Bird Treaty Act, although it primarily focused on hunting. This law protects all marine mammal species including whales, porpoises, seals, walrus, manatees, polar bears, and sea otters. It was passed as concern grew over the number of marine mammal mortalities from commercial fishing. The Act put an indefinite moratorium on the take or importation of marine mammals. However, this law was later amended, removing the "take" ban as it applied to incidental mortality from commercial fishing and allowing for management based on acceptable mortality levels.

Magnuson-Stevens Fisheries Conservation and Management Act (1976)

This statute, amended in 1996, was passed due to a growing concern over the decline of certain fish stocks as a result of increased fishing pressure, the inadequacy of conservation practices and controls, and habitat loss—both direct and indirect. The decline in fish stocks had adverse effects on commercial and recreational fishing, further increasing the need for Federal intervention. The purposes of the act were to "conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resource"; and enforce international fishery agreements pertaining to highly migratory species.

The noticeable environmental pressures from decades of population and commercial growth brought a surge of environmental legislation from the United States Congress. The passage of the National Environmental Policy Act in 1969 increased the momentum

(see Section 2.3.2.1). From 1970 through 1980, Congress promulgated the following additional major environmental statutes:

- Resource Conservation and Recovery Act (1972);
- Marine Protection, Research, and Sanctuaries Act (1972);
- Clean Water Act (1972, 1977) (see Section 2.3.2.1);
- Endangered Species Act (1973) (see Section 2.3.2.1);
- Safe Drinking Water Act (1974);
- Toxic Substances Control Act (1975);
- Coastal Zone Management Act (1976);
- Hazardous Materials Transportation Act (1977);
- Clean Air Act (1977);
- Fish and Wildlife Conservation Act (1980); and
- Comprehensive Environmental Response, Compensation and Liability Act (1980).

Together with ocean harvest reforms adopted in the Magnuson Fishery Conservation and Management Act (1976), the United States-Canada Pacific Salmon Treaty (1985), and the *U.S. v. Oregon* treaty rights case (1968), a substantial number of environmental rules and regulations with which to protect and enhance fish and wildlife, including Columbia River anadromous fish, had been established.

2.3.2 Recent Developments: The Period of "Equitable Treatment" for Fish and Wildlife (1980—2002)

By 1980, it was accurate to say that Columbia River fish and wildlife policy was in many respects dictated by Federal statutes and the implementing policies and regulations. Crucial decisions, especially those involving the Columbia River hydropower system, were made by Congress, Federal agencies, and the Federal courts. In 1980, Congress passed the Regional Act, which provided "equitable treatment" for fish and wildlife. Federal, state, tribal, and local governments, and citizen efforts to recover salmon populations accelerated in the 1990s. The first significant event was the Northwest Salmon Summit, convened in 1990 to address the problem of declining salmon stocks. The intent was to reach a consensus among diverse Northwest interests to formulate a plan to reverse this trend. Unsuccessful in being able to reach a consensus on a comprehensive plan of action, however, it was successful in bringing a diverse group together to address salmon issues and commit to continue efforts to rebuild depleted salmon stocks. These efforts continued through the 1990s and continue today.

2.3.2.1 Primary Federal Statutes

Several environmental statutes—the National Environmental Policy Act, the Clean Water Act, Endangered Species Act—and the Pacific Northwest Electric Power Planning and

Conservation Act (Regional Act) had enormous influence on regional decisionmaking. Two of the Acts were passed in the early 1970s, but their impacts were not realized until the 1980s. The intent and consequences of these statutes and related decisions are now an integral component of regional fish and wildlife policy. While these statutes are but three of the many statutes defining BPA's legal responsibilities, they tend to be the most commonly discussed with respect to fish and wildlife mitigation and recovery issues. Accordingly, a brief summary is provided here.⁴⁵

The National Environmental Policy Act of 1969

In 1969 Congress declared the nation's environmental policy when it passed the National Environmental Policy Act (NEPA). Concerned with the impact of man's activity on the natural environment, Congress created legislation that recognized the influences that population growth, urbanization, industrial expansion, resource exploitation, and expanding technological advances had on the environment. Further, it noted that restoring and maintaining environmental quality was critical to the welfare of humans. Therefore a goal of NEPA was to create and maintain "conditions under which man and nature can exist in productive harmony."

NEPA, a procedural act in nature, applies to all Federal agencies and requires them to prepare environmental impact statements for major Federal actions that may significantly affect the quality of the human environment. Major Federal actions include the adoption of formal plans or official policies that guide or prescribe alternative uses of Federal resources, upon which future agency actions will be based. Information about the potential environmental consequences of the actions must be made available to decisionmakers and to the public before decisions are made and before actions are taken.

NEPA compliance in the Pacific Northwest has resulted in hundreds of documents analyzing even more potential Federal actions. These documents have addressed site-specific actions, such as hatchery construction or habitat enhancement, as well as program development for watersheds and wildlife. As noted in Chapter 1, many of these documents have been incorporated by reference in this EIS.

The Clean Water Act (1972)

The CWA was passed in 1972 and amended in 1977, with a goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. It authorizes the Administrator of the EPA to take the necessary action to prevent, reduce, or eliminate the pollution of navigable waters and ground waters and improve the sanitary condition of surface and underground waters.

Like the ESA, the CWA is a source of increasing conflict between natural resource use and environmental protection. The Act has resulted in important changes to water

⁴⁵ The ESA, CWA, and Regional Act are certainly not the only relevant statutes with respect to this issue. One commenter requested that a similar summary be provided for all statutes affecting fish and wildlife issues; however, we determined that such an exercise would unnecessarily lengthen the EIS, especially given that many resources are readily available to obtain such information. See Appendix B for a listing.

management practices, regulated point-source discharges, and increased funding and management for non-point source pollution. Increasingly, the Act is viewed as a mechanism to obtain ecosystem improvements, particularly to improving temperature and dissolved gas levels in the Columbia and Snake Rivers. Most water quality issues are the result of complex watershed-wide interactions among numerous factors, many of which are not related to the hydropower system. Such issues cannot be addressed solely by changing operations at the dams. Other improvements in water quality are at times in conflict with the needs of endangered species. For example, efforts to reduce total dissolved gas levels for CWA purposes appear to conflict with the direction from NMFS for the Corps to spill more water (an action that increases total dissolved gas levels) for salmonid migration.

Although Federal agencies play a significant role in the Columbia River Basin, states have primary authority to govern water allocation systems within their boundaries. States also play a role in regulating hydroelectric projects throughout the Region under both state and Federal laws. The states of Oregon, Washington, and Idaho are all operating under consent decrees with the EPA to develop total maximum daily load (TMDL) standards. Among the three states, there are over 2,500 water bodies that fail to meet CWA standards (see map Figure 2.7 at the end of this chapter).

In early 2002, Northwest Environmental Advocates announced its intent to sue the Federal EPA because Oregon had not adjusted its water quality standards for toxic chemicals since 1988. Out-of-date standards allegedly affect both the safety of water for humans and the way in which the Oregon Department of Environmental Quality rules on water quality permits. The CWA allows the EPA to delegate enforcement responsibility to the states; however, when states fail to review standards every three years, the EPA must step in and do it for them. This and similar suits that could be brought against other states may compel Federal agencies to take stronger stances as they fulfill their regulatory roles under the CWA.

The Endangered Species Act (1973)

The ESA was passed in an effort to conserve threatened and endangered species. Generally, it authorizes the Secretary of Interior (through USFWS), or the Secretary of Commerce (through NMFS, in the case of anadromous fish and marine species) to determine whether a species is endangered or threatened and to recommend a means to protect it. Thereafter, a Federal agency must consult with the appropriate Federal agency (Interior or Commerce) to ensure that its actions will not jeopardize the continued existence of the listed species. Formal consultations typically conclude with the issuance of a Biological Opinion (BiOp) stating whether the proposed Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. Should a BiOp reach a jeopardy or adverse modification conclusion, reasonable and prudent alternatives are offered as options to project implementation that would avoid the likelihood of jeopardy to the species or adverse modification of critical habitat.

If a jeopardy opinion containing a reasonable and prudent alternative(s) is issued, the action agency may: (1) adopt the reasonable and prudent alternative(s); (2) not undertake the proposed action; (3) request an exemption from Section 7(a)(2) of ESA; (4) reinstate consultation based on modification of the proposed action or development of a reasonable and prudent alternative not previously considered; or (5) proceed with the action if it believes, upon review of the BiOp, that such action satisfies Section 7(a)(2).

In the Columbia River Basin, Snake River chinook and sockeye salmon runs were listed under the ESA in the early 1990s. As required under the Act, NMFS developed a BiOp evaluating the effects of Federal agency hydroelectric operations on those runs. Since that time, the FCRPS has been operated in accordance with that BiOp or its successors to ensure compliance with the ESA. These Snake River listings were followed in the mid-1990s with additional listings of anadromous fish stocks by NMFS and listings for Kootenai River white sturgeon and bull trout by USFWS. USFWS had previously listed the northern spotted owl and marbled murrelet.

The requirements of the ESA and the subsequent BiOps, habitat conservation plans, and rules for protecting critical habitat developed by NMFS and USFWS have become the guiding directives for Columbia Basin resource management and development. NMFS administers the Act as it applies to anadromous fish and marine mammals, while the USFWS does so for non-anadromous fish and other wildlife.

Current ESA listings affect the implementation of many laws and policies that allow and regulate natural resource use in the Basin, including legislation that defines BPA, Corps, and Bureau policies; Federal land policies; and international and domestic fishing laws. (See Appendix C for a recent listing of ESA-protected fish and wildlife species in BPA's Service Territory.)

NMFS, through the Habitat Conservation Plans (HCPs), critical habitat designations, and BiOps, is beginning to develop an overall recovery plan strategy for ESA-listed stocks of anadromous fish. Starting with the 2000 Biological Opinion of the FCRPS, NMFS has set survival and recovery goals for the listed fish it oversees. These goals will apply across the landscape to all agencies and all actions upon which NMFS is consulted. NMFS' metrics—measures of progress toward the survival goals—can also be applied to any proposed action. The ESA requires that recovery plans contain (1) objective, measurable goals for delisting; (2) a comprehensive list of the actions necessary to achieve the delisting goals; and (3) an estimate of the cost and time required to carry out those actions. In addition, National Oceanic and Atmospheric Administration (NOAA) Recovery Planning Guidelines suggest that recovery plans include an assessment of the factors that led to population declines and/or that are impeding recovery. Finally, it is important that the plans include a comprehensive monitoring and evaluation program for gauging the effectiveness of recovery measures and overall progress toward recovery.

Recovery goals must, at a minimum, restore listed ESUs (evolutionarily significant units) to levels at which they are no longer threatened and can therefore be delisted under the ESA. Recovery Teams will be formed and will (1) identify population and ESU de-

listing goals; (2) characterize habitat/fish abundance relationships; (3) identify the factors for decline and limiting factors for each ESU; (4) identify the early actions that are important for recovery; (5) identify research, evaluation, and monitoring needs; and (6) serve as science advisors to groups charged with developing measures to achieve recovery. Recovery plans will address all salmonid species within a series of discrete geographic areas, or domains.

The Basinwide Strategy Paper⁴⁶ is a recovery strategy that outlines the strategies and specific actions that Federal agencies operating within the Columbia River Basin should take to prevent extinction and foster recovery by improving survival across all life stages of listed anadromous fish ESUs. In addition, the Basinwide Strategy Paper is a blueprint to guide Federal actions and interactions with state and local governments and tribes as they take steps to comply with the ESA and exercise their authorities. BPA expects recovery planning for listed anadromous fish will likely proceed along the lines discussed in the Basinwide Strategy Paper.

The NMFS and USFWS BiOps build on the recommendations in the Basinwide Strategy Paper. Given the 10-year duration of the BiOps and the over 200 specific actions that they call for, the Action Agencies—the Corps, Bureau, and BPA—are committed to preparing Implementation Plans. In 2001, the agencies released and took public comment on the initial draft 1- and rolling 5-year plans.⁴⁷ The plans prioritize the specific actions for addressing the needs of listed species at the dams, in spawning and rearing habitats, at the hatcheries, and in managing harvest. The goals of the plans are to assist in meeting the recovery standards for the resident and anadromous fish listed under the ESA in the Columbia Basin; to conserve critical habitat upon which the listed species depend; and, when integrated with the Council's Program, to balance mitigation efforts under the Program with the recovery efforts under the BiOps. The Implementation Plans include provision for rigorous, uniform monitoring, evaluation, and research to track progress toward the targets set for mitigation and recovery. The Action Agencies have begun implementing the initial plans and have also started preparing future plans.

In the 20th century, state and Federal agencies with authority over fish species had increasingly begun looking to methods to manage fish populations, especially as non-native fish were introduced and began to prey on or compete with native species—factors that have contributed to the increased listings of threatened and endangered populations. A variety of methods was brought into play to manage fish populations, including the modification of angling regulations to protect some species or increase harvest of others; physical removal methods such as trapping or electroshocking fish; introduction of predators, explosives; and physical methods of manipulating flow or introducing physical barriers in a given stream.⁴⁸ These management techniques have had varied success, depending on the severity of the problem. When complete eradication of a fish species or

⁴⁶ Federal Caucus 2000b.

⁴⁷ USDOJ/ Bureau, Corps, and BPA 2001a and 2001b.

⁴⁸ American Fisheries Society 2002, pp. 3-4. See also the discussion under Judicial Impact on Natural Resource Policy in Section 2.3.2.3, later in this document.

of all fish in a body of water appears to be the only management solution, managers have used piscicides (chemical controls) or dewatering. The piscicides typically used are rotenone (a plant-derived chemical that has been tested and used for many decades in the U.S.), or antimycin. Piscicides can be used to remove undesirable fish populations that threaten the genetic purity of desirable strains. Although dewatering is less expensive, it is potentially more environmentally disruptive to an area.⁴⁹ All of these options are part of the array of techniques developed over the last 50 years to manage fish populations, originally to support human needs, but increasingly (as in the case of ESA-listed species) to support recovery of threatened ESUs.

In 2001 alone, the Action Agencies took hundreds of actions to further the mitigation and recovery of endangered salmon, steelhead, bull trout, and sturgeon in the Columbia River Basin. These actions represent the start, not the culmination, of their efforts to achieve biological objectives and performance standards under the BiOps. To track their efforts, the Action Agencies prepared a Progress Report. The agencies will prepare such reports annually for the duration of the BiOps. The 2002 report included the following elements:

- a summary of 2001 adult returns and prevailing conditions in the hydrosystem and power markets;
- a discussion of 2001 survival rates of juvenile and adult fish, and summaries of projects and measures implemented for the hydrosystem, habitat, hatcheries, harvest, resident fish, and research, monitoring, and evaluation programs;
- key conclusions and recommendations for more effective actions to achieve performance standards; and
- detailed results of dam passage and estuary research during 2001; a seasonal summary of drought and power emergency developments; and a more expansive list of measures taken in 2001, including a cross-reference to the BiOp Reasonable and Prudent Alternatives (RPAs) that each project targets.

In April 2002, NMFS issued interim estimates of abundance and productivity targets for ESUs of Pacific salmon and steelhead runs in the Columbia River Basin that are listed under the ESA. These targets were developed in support of regional, state, tribal, and local planning efforts and rely on work from earlier planning efforts.

Some wildlife species of the Pacific Northwest have also faced significant declines and subsequent protections under the ESA. These species—including grizzly bear, gray wolf, northern spotted owl, Columbian white-tailed deer, bald eagle, Canada lynx, and the marbled murrelet—have all gained protections under the ESA since its passage in 1973. However, the ESA is not the only protection available to wildlife. Some species also enjoy Federal protections pursuant to the Migratory Bird Treaty Act,⁵⁰ the Bald and

⁴⁹ American Fisheries Society 2002, pp. 2-3. After treatment, the lakes may then be re-stocked with genetically pure broodstock to preserve the wild strains of fish native to the waters.

⁵⁰ Migratory Bird Treaty Act of 1918, 16 U.S.C. §§ 703–711.

Golden Eagle Protection Act,⁵¹ and the Marine Mammal Protection Act⁵² (see Appendices B and C).

Wildlife management usually serves two general needs. First, management strategies are implemented to protect and enhance wildlife populations—especially those of protected species. These strategies are usually achieved by protecting, restoring and enhancing habitat. Second, management techniques are often used to control and manage abundant or nuisance wildlife species, especially those that have the ability to impact human activities or desired and protected species. Some frequently used wildlife management techniques include habitat modifications, removal/deterrence (including the changes in hunting regulations for game species [e.g. shooting, trapping, frightening, using repellants]), construction of fences and barriers, and biological and chemical controls (e.g. sterilization, rodenticide).⁵³

The Regional Act and Its Influence

The basis for starting this section of the FWIP EIS with the year 1980 was the passage that year of the Pacific Northwest Electric Power Planning and Conservation Act.⁵⁴ Concerns over adequate power supplies and fish and wildlife harmed by the hydroelectric system led to passage of the Act, which created the Council, an interstate compact agency, and directed the Council to put fish and wildlife mitigation and enhancement on a par with hydroelectric power generation in the operation of the FCRPS. The Act's goals include the following:

- (1) ensuring an adequate, efficient, economical, and reliable power supply, and
- (2) protecting, mitigating, and enhancing fish and wildlife harmed by hydroelectric projects.

The Council is responsible for promulgating a Regional Power Plan and a Fish and Wildlife Program. When developing its Fish and Wildlife Program, the Council defers to the recommendations of fish and wildlife managers—agencies and the tribes.

The Regional Act requires the Council to consider certain economic factors in its fish and wildlife decisions. The Fish and Wildlife Program must help assure an adequate, efficient, economical, and reliable power supply for the Region.⁵⁵ Fish and wildlife measures must "utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost."⁵⁶ The Act requires BPA to mitigate fish and wildlife in a manner consistent with the program and the other purposes of the Act. Other Federal agencies must also take the plans into

⁵¹ Bald and Golden Eagle Protection Act, 16 U.S.C. §§ 668–668d.

⁵² Marine Mammal Protection Act of 1972, 16 U.S.C. §§ 1361–1407.

⁵³ See generally, Dolbeer, R.A. et al. 1994.

⁵⁴ 16 U.S.C. §§ 839 to 839h; commonly referred to within the region as the Regional Act.

⁵⁵ 16 U.S.C. § 839b(h)(5).

⁵⁶ 16 U.S.C. § 839b(h)(6)(C).

account to the fullest extent practicable.⁵⁷ The Council, however, has no authority over the Federal agencies that implement the program.

The Regional Act includes a duty for Federal agencies that manage, operate, or regulate hydroelectric facilities in the Basin to provide "equitable treatment" for fish and wildlife with the other purposes for which the hydro facilities are managed and operated. The Council describes equitable treatment as "meet[ing] the needs of salmon with a level of certainty comparable to that accorded the other operational purposes."⁵⁸ BPA provides equitable treatment primarily by implementing all or part of the Council's Program and taking action to meet the terms of relevant BiOps. The Ninth Circuit Court has upheld BPA's interpretation, holding that it is reasonable to balance power needs and mitigation needs on a system-wide basis.⁵⁹

From 1998-2001, BPA spent over \$200 million dollars annually for hundreds of measures throughout the Region to help both anadromous fish, such as salmon and steelhead, resident fish, such as bull trout and sturgeon, and wildlife.⁶⁰ These projects include habitat restoration, hatcheries, monitoring and evaluation, fish screens and ladders at dams, education and training, water and vegetation management, predator control and research. BPA works in partnership on many projects with state and Federal agencies, Indian tribes, and non-government entities. In addition, BPA incurred additional costs to manage the FCRPS to benefit both listed and unlisted fish, resident and anadromous. These costs fluctuated with water conditions and power markets. A portion of this money is the value of foregone revenues, while the bulk is actually spent for power purchases to replace energy that could not be generated when fish operations took precedence over power.⁶¹ For example, in 2000 BPA spent approximately \$340 million on fish operations—about \$270 million in foregone revenue. In 2001, fish operations required BPA to incur over \$1.5 billion in costs—about \$115 million in foregone revenues and the balance in replacement power costs.⁶²

BPA also mitigates and improves wildlife habitat lost or disturbed as a result of FCRPS development and operation. This effort includes purchases to protect and enhance thousands of acres of habitat throughout the Northwest. Again, BPA works with other agencies, tribes and local interest groups, many of whom manage the habitat that BPA purchases. BPA also has set up trust-like agreements with states and tribes to facilitate wildlife habitat protection.⁶³

BPA has taken many substantive actions to ensure that fish and wildlife receive equitable treatment with the other purposes for which the FCRPS is managed. Some equitable

⁵⁷ 16 U.S.C. § 839b(h)(11)(A)(ii).

⁵⁸ Council 1992, Vol. II, p. 9.

⁵⁹ *Northwest Environmental Defense Center v. BPA*, 117 F.3d 1520, 1533-34 (1997).

⁶⁰ See Section 2.3.2.3 Current Policies—Conflicting Priorities; Managing the Money Resources.

⁶¹ USDOE/BPA 2002g.

⁶² Council 2002, p. 21.

⁶³ USDOE/BPA 2002g.

treatment actions are direct efforts to improve the environment for fish and wildlife, many of which are system-wide, including:

- The Water Budget – Discharge of water from storage projects to increase spring and summer flows for juvenile fish migration.
- Interim Flow Improvements – meeting flow targets by operating Federal storage projects to achieve flood control elevations by mid-April, and drafting those projects through the summer to minimum specified levels.
- Long-Term Spill Agreement – to help juvenile salmon and steelhead migrating from their spawning grounds to the ocean.
- Vernita Bar Agreement – providing certain flow levels from fall to spring to protect salmon spawning and hatching at Vernita Bar below Priest Rapids Dam.
- Non-Treaty Storage Fish Agreement – coordinating the use of 4.5 MAF of water storage behind Mica Dam in British Columbia.
- Managed Wildlife Habitat at Projects – much of the land within and adjacent to Federal project boundaries is designated and managed as wildlife habitat.

Discussions identifying some of those actions are found in Section 2.3.2.3, Judicial Impact on Natural Resource Policy. Other equitable treatment efforts include those that manage mitigation and recovery implementation in the same manner as BPA treats its other FCRPS management duties. Often such actions are business- or process-oriented, but they are critical to ensuring a reliably funded, cost-effective, biologically successful effort in a market-driven power marketing environment. Although the responsibility to provide equitable treatment applies specifically to management of the FCRPS, BPA has used its authority to take discretionary actions that extend beyond this limited obligation. A summary of some business-oriented actions that go beyond FCRPS management to help provide certainty for fish and wildlife comparable to other FCRPS purposes (and thus equitable treatment) includes the following:

- 1995 Reorientation of BPA Fish and Wildlife Program. In the 1995 Business Plan Final EIS Record of Decision, BPA decided that "[u]nder the Market-Driven alternative, BPA is reinventing its fish and wildlife program to emphasize better results, effectiveness, and efficiency. The program will be reoriented to establish priorities, provide stable funding, monitor results, and focus on ecosystem management."⁶⁴
- Examining mitigation and recovery needs in ratemaking processes and setting rates accordingly. BPA's 2000 rate case included a range of fish and wildlife costs to ensure that BPA met its mitigation and recovery obligations under a number of potential scenarios.
- Integrating fish and wildlife mitigation and recovery efforts in an overall unified plan that combines ESA, CWA, Indian treaty and trust responsibilities, and Regional Act mandates. BPA has worked with the Corps and the Bureau to create

⁶⁴ USDOE/BPA 1995b, p. 12.

Implementation Plans to prioritize and organize execution of the over 200 actions called for in the NMFS and USFWS BiOps. Simultaneously, BPA funds and participates in Provincial Reviews under the Council's Program to help unify its efforts.⁶⁵ Other statutory requirements, such as those under the National Historic Preservation Act, become part of the planning process as necessary, sometimes at the action implementation level.

- In December 2001 BPA announced in intended to continue aggregating BPA fish and wildlife spending estimates for mitigation and recovery planning purposes, including the capital costs of ESA offsite recovery and Council Program mitigation. However, as BPA's financial condition continued its unanticipated deterioration through 2002, BPA has signaled the likely need to cut costs in all of its program areas, including fish and wildlife. The results of the Financial Choices process and the changes to BPA's fish and wildlife spending estimates were not available at the time of completion of this EIS.⁶⁶
- BPA's entering into direct funding agreements to expedite both capital and operational mitigation and recovery actions at Corps, Bureau, and USFWS projects and facilities. These agreements allow these agencies to accept funding directly from BPA, so that they do not have to wait for appropriations for costs allocated to the power purpose of a dam.
- Spreading the costs of fish and wildlife mitigation throughout the FCRPS on a system-wide basis using the Section 4(h)(10)(C) financial crediting processes.⁶⁷ This helps achieve mitigation more quickly and diversely than would project-by-project 4(h)(10)(C) cost allocations. Wildlife especially have benefited because BPA has undertaken full mitigation where the power share of a dam's costs is nominal and decades have passed without appropriations being authorized for wildlife mitigation.
- Preparing NEPA analysis programmatically for watershed and wildlife projects. This action provides a broad overview of potential environmental impacts as well as standardizing and streamlining the NEPA compliance process.
- Developing a fish and wildlife policy manual that identifies what provisions will be in mitigation and recovery contracts and how BPA will administer them. By standardizing contractors' obligations and BPA's processes, BPA is attempting to guide implementation of projects in a consistent, standardized manner across the Basin regardless of the contractor. An independent auditor's report on the Program recommended this action.⁶⁸

These examples, as well as those elsewhere in this chapter, show how BPA has embraced its fish and wildlife responsibilities and placed them on par with its power-marketing obligations in just 20 years since the Regional Act became law. BPA has engaged fish

⁶⁵ USDOE/BPA 2001f.

⁶⁶ See Section 2.3.2.3 Current Policies—Conflicting Priorities; Managing the Money Resources.

⁶⁷ 16 U.S.C. § 839b(h)(10)(C).

⁶⁸ Moss-Adams LLP 1997, pp. 19-24.

and wildlife comprehensively, funding and implementing numerous fish and wildlife projects throughout the Region (see map Figure 2.14 at the end of this chapter illustrating BPA Fish and Wildlife Projects by Subbasin and Appendix H). In order to achieve its fish and wildlife goals, BPA created a permanent professional staff of nearly 100 biologists, engineers, planners, hydrologists, economists, contracting officers, support staff, and lawyers; a fish and wildlife division; and a senior policy advisor reporting directly to the Administrator. Dozens of other employees and contractors assist them in a temporary or part-time capacity. By managing the FCRPS for fish and wildlife mitigation and recovery—in a programmatic, systematic, market-driven manner—BPA provides equitable treatment for fish and wildlife.

National Environmental Policy Act Analyses Related to the Regional Act

The combination of the Regional Act, NEPA, and applicable environmental statutes caused a rapid increase in environmental analyses. In 1992, the Bureau, Corps and BPA prepared the *Columbia River Salmon Flow Measures Options Analysis EIS*. This EIS considered alternative actions at projects on the lower Snake and Columbia rivers to improve juvenile and adult salmon migration conditions. Next, the agencies prepared and issued the *Interim Columbia and Snake River Flow Improvement Measures for Salmon Supplemental EIS* to address water management activities to be implemented in 1993 and subsequent years. In 1995, the Bureau, Corps, and BPA issued the *System Operation Review (SOR) EIS*, which focused narrowly on long-term river management alternatives. In 2002, the Corps issued its *Lower Snake River Juvenile Salmon Migration Feasibility Report EIS*.⁶⁹

The SOR was initiated in 1990 by the Bureau, Corps, and BPA to review multi-purpose management of the Columbia-Snake River system, and to provide a strategy for system operations. The review started as a long-term study of system operations at Federal projects on the Columbia River and its tributaries, and became intertwined with activities taking place in the Basin for salmon recovery. Its focus then shifted to the role that hydrosystem operations could play in salmon recovery. When the SOR was completed, three salmon ESUs were listed in the Region.

The SOR provides detailed analyses of the environmental effects associated with changes in river operations. However, its scope was limited to analyzing the effects of long-term river management of hydro operations. Studies beyond its scope (e.g. structural modifications) were not considered in the SOR.⁷⁰ While individual structural modifications were not considered, system operations feasible only with those structural modifications were considered in the system operation strategies. Structural measures dismissed from detailed study in the SOR included actions such as modifying fish ladders; installing juvenile bypass facilities; installing fish screens at dams and over irrigation diversion outlets; and modifying recreational facilities to allow their use over a wider range of operating conditions.

⁶⁹ A Record of Decision was issued in September 2002. Corps 2002c.

⁷⁰ USDOE/BPA, Corps, and Bureau 1995, p. 10-1.

Structural modifications suggested but not pursued in the SOR, were part of the Corps' System Configuration Study initiated in 1991. This study evaluated major structural modifications at some of the major Federal projects. This study was divided into two phases, the second phase containing several studies including the Lower Snake River Juvenile Salmon Migration Feasibility Study.

The Lower Snake River Juvenile Salmon Migration Feasibility Study, which began in 1994, evaluated the technical, environmental, social and economic effect of potential modifications to the four lower Snake River dams in order to increase the survival of migrating juvenile salmon. This study resulted in the *Lower Snake River Juvenile Salmon Migration Feasibility Report EIS*. The EIS evaluated four alternatives that included: existing system, maximum transport of juvenile salmon, major system improvements, and dam breaching. This EIS was used as a resource document for the FWIP EIS when evaluating hydrosystem modifications, including breaching or drawing down the four lower Snake River dams.

The SOR also did not specifically address non-project measures. Many of these measures emphasized fish and wildlife concerns that had been under consideration in the Region for a decade or more. Some of these measures had been or would be implemented through the Council's program or through ESA requirements. Measures included improving streams and watersheds to restore salmonid spawning and rearing habitat; preserving and enlarging wildlife habitat; and expanding research on hatchery programs and preservation of native fish stocks, and improving hatchery operations.⁷¹

The SOR EIS noted that actions outside its limited scope (e.g., harvest, hatchery practices, and habitat) would likely require additional NEPA documentation. This FWIP EIS delivers on the assurances provided in the SOR EIS. However, the FWIP should not be interpreted as superseding the SOR. The SOR, including its analyses, is an important source document for this FWIP EIS and remains an important resource for the Region.

Since the SOR EIS was issued (1995), the Snake River wild steelhead, and nine populations of salmon and steelhead in Washington and Oregon have been added to the endangered species list. Consequently, additional and broader efforts were launched in the late 1990s, including the Framework process and the Conceptual Plan/Basinwide Strategy ("All H") process by the Federal Caucus (see Section 2.3.2.4).

2.3.2.2 Other Federal Agencies and General Statutory Responsibilities

The previous discussions describe BPA's responsibilities under the ESA, the CWA, NEPA, and the Regional Act. Equally important regionally, are the other Federal agencies that also have significant statutory responsibilities that bear upon the use of hydro resources for power, and on the responsibilities to administer and protect other resources of the Pacific Northwest. Over time, their roles and their priorities have changed to reflect new information and new policies.

⁷¹ USDOE/BPA, Corps, and Bureau 1995, pp. 4-23 to 4-25.

The **Bureau of Reclamation** (Bureau) operates 10 water-storage reservoirs in the upper Snake River, 16 reservoirs in the Middle Snake River, and a number of other storage projects that irrigate some 3 million acres of land: 53.9% of all Washington's irrigated land, 41.8% of Idaho's, and 22.5% of Oregon's.⁷² Water stored behind the dams is delivered to water users pursuant to contracts between the Bureau and irrigation districts. The Bureau's primary mission of providing water for irrigation has been expanded to include other uses; however, irrigation remains the agency's principal focus. In 1992, the agency redefined its mission from one of water development to one of water management.

The Bureau's projects affect downstream flow and water quality.⁷³ About 33 million acre feet (Maf) are diverted from the Columbia River for irrigation. About 14 Maf of this total are consumed—not returned to the river. Operation and configuration of the Bureau's irrigation projects can affect fish survival in many ways. Reservoir habitat replaces rivers, upstream passage is blocked, and downstream river flows are reduced by reservoir operations and irrigation diversions. Return flows may be impaired by sediment, agricultural chemicals, or temperature. Aquatic life can be killed by entrainment in diversions or other facilities.

The Bureau plays an important role in obtaining water from the upper Snake River for anadromous fish flows in the lower Snake and Columbia rivers. The Bureau is continuing to seek new sources of water to further strengthen its ability to provide 427 thousand acre-feet (kaf) under all water conditions.⁷⁴

The **U.S. Department of the Army, Corps of Engineers**, operates and maintains 12 projects in the FCRPS. Nine control the lower Snake and Columbia rivers; three provide storage in the upper reaches of both rivers. The Corps has a major role in coordinating the multiple uses of the system. It is responsible for managing flood control storage at all major reservoirs in the Columbia River Basin; maintaining navigation locks and channels to accommodate river transportation; and operating fish passage facilities and the fish transportation program.

Historically, the **Bureau of Land Management** (BLM), in the U.S. Department of the Interior, managed Federal public lands to support mining, grazing, and timber harvesting activities. More recently, the Federal Land Policy and Management Act of 1976 (FLPMA),⁷⁵ directs the agency to manage public lands for multiple uses, including fish and wildlife, recreation, watershed protection, and scenic values through the development of resource management plans. FLPMA directs the BLM to develop and maintain land use, or resource management plans, that adhere to multiple use and sustained yield principles. However, the newly recognized uses regularly conflict with historic uses.

⁷² Sprankle, C. 2000.

⁷³ Information about Bureau of Reclamation project impacts comes from NMFS 2000b.

⁷⁴ USDOE/BPA, Corps, Bureau 1999, pp. 3-13.

⁷⁵ 43 U.S.C. § 1732 et. seq.

Some timber harvest and grazing practices are important contributors to watershed deterioration.

The **U.S. Forest Service** (USFS), under the U.S. Department of Agriculture, historically focused on managing national forests for timber production purposes. The Agency has also been directed to shift from single-purpose commodity production to multiple-use management of Federal forest lands. The USFS has a mandate to "provide timber for the people" under the Organic Act of 1897.⁷⁶ This focus was shifted with the Multiple-Use Sustained-Yield Act of 1960,⁷⁷ which expanded the uses for which the USFS must manage National Forest lands to include fish and wildlife resources, recreation, and watershed protection. In 1976, Congress passed the National Forest Management Act to define and clarify national forest management.⁷⁸ This act directs the USFS to prepare land and resource management plans (LRMPs) for each national forest. The LRMPs must identify various uses and develop corresponding management guidelines, with the goal of supporting multiple uses and sustained yields. However, neither act prioritizes the specified uses, leaving the Forest Service to balance these often-conflicting uses. The USFS has discretion to make those land management decisions.

Recognizing the need to manage on an ecosystem basis and better coordinate efforts to improve watershed health, the USFS and BLM recently embarked on two efforts. First, in conjunction with the USFS, the BLM released "Rangeland Reform," a plan to better coordinate land management between the agencies on federally-owned rangelands in the West. The plan sets forth suggested changes to rangeland management, including the establishment of national grazing standards, limitations on the preference policy, and modifications to the makeup and authority of rangeland advisory councils authorized under FLPMA. While the BLM has adopted several of the changes in regulations, Congress has failed to enact legislation adopting Rangeland Reform. The USFS and BLM currently operate according to principles set out in their Inland Native Fish Strategy (INFISH) and Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon, and Washington, Idaho, and Portions of California (PACFISH).⁷⁹

Second, the Northwest Forest Plan represents an attempt to limit conflicts between timber harvest and species protection. Adopted by both the USFS and the BLM, the plan designates land under seven categories, and establishes standards and guidelines to regulate activity within these land areas. Of particular importance in the plan is the aquatic conservation strategy. This strategy, developed primarily to protect salmon and steelhead, consists of four main components: riparian reserves, key watersheds, watershed analysis, and watershed restoration. The aquatic conservation strategy sets forth restoration and maintenance criteria to maintain and improve fish habitat, riparian habitat, and water quality. This is accomplished through limiting potentially harmful

⁷⁶ 16 U.S.C. §§ 473 to 482.

⁷⁷ 16 U.S.C. §§ 528 to 531.

⁷⁸ 16 U.S.C. §§ 1600 to 1614.

⁷⁹ USDA/USFS 1995; USDA/USFS and USDO/BLM 1995.

activities near key watersheds, including timber harvest, road development, grazing, and mining.

The USFS and the Bureau propose to develop and implement a coordinated, scientifically sound, broad-scale, ecosystem-based management strategy for lands they administer across parts of Idaho, Oregon, Montana, and Washington (approximately 63 million acres). The Interior Columbia Basin Ecosystem Management Project (ICBEMP) Final EIS represents the analysis of the management alternatives for these important ecosystems. As a product of the ICBEMP process, *The Interior Columbia Basin Strategy* has been agreed upon in lieu of a formal basinwide decision.⁸⁰

Several additional Federal agencies have limited land management authority. The **U.S. Department of Agriculture** (USDA), in addition to the USFS operations, manages numerous programs that provide incentives for modified agricultural land use. Two important USDA programs are commodity programs, which were recently replaced by a system of market transition payments, and conservation programs. Conservation programs provide technical expertise, education, and subsidies for a number of programs targeted at environmental quality. In 1985, Congress established the Conservation Reserve Enhancement Program (CREP), a voluntary program that uses financial incentives to encourage agricultural landowners to retire certain lands from production for a period of 10-15 years. In return, the landowners receive rental payments from the USDA. Both Oregon and Washington have entered into Federal-state conservation partnerships under a newly funded phase of CREP that provide for the restoration of up to 100,000 acres of environmentally sensitive land. The state conservation enhancement programs will target revegetation, fencing, and other restoration of riparian areas bordering salmon-bearing streams.

Finally, the **Natural Resources Conservation Service (NRCS)**, also in the U.S. Department of Agriculture, has responsibilities under the Soil and Water Resources Conservation Act of 1977⁸¹ and the Farm Bills of 1994⁸² and 1996.⁸³ The NRCS works with local conservation districts to develop plans uniquely suited to individual landowners. The plans seek to reduce erosion, protect and conserve water resources, protect and enhance wetlands, and protect wildlife habitat.

In an effort to account for changing values and restore the ecological health of the river, Congress enacted several statutes that call for the **Corps** and/or the **Bureau** to consider fish and wildlife when operating water resource development projects. The Water Resources Development Act of 1986⁸⁴ requires water resource managers to consider fish and wildlife conservation. The Water Resources Development Act of 1990⁸⁵ places

⁸⁰ USDA/USFS and USDO/BLM 2003.

⁸¹ 16 U.S.C. § 2001.

⁸² 7 U.S.C. § 6962.

⁸³ 7 U.S.C. § 7201.

⁸⁴ 33 U.S.C. § 2263(a).

⁸⁵ 33 U.S.C. § 2316(a).

environmental protection as a "primary mission" of the Corps. However, Congress also stated that environmental protection should not interfere with the Corps' pre-existing duties of navigation improvements and flood control.⁸⁶ Finally, in 1992, Congress passed the Reclamation Projects Reauthorization and Adjustment Act,⁸⁷ which requires the Bureau to consider environmental protection and water quality at its water resource development projects.

2.3.2.3 Current Policies—Conflicting Priorities

The preceding sections have referenced the primary Federal statutes and implementing regulations; the variety of Federal agencies with interests in fish and wildlife mitigation and recovery efforts and with natural resource management in the Pacific Northwest; and the conflicts that have arisen as mandates change, as new information about species survival emerges, and as competition for project funding increases.

Some of the most critical inconsistencies or conflicts are shown in Table 2.3-2. These conflicts are further complicated by judicial rulings and changes in policy regarding federally-recognized Indian tribes and Indian resources, water resources, state harvest and hatchery policies, and the ESU policy of identifying endangered salmon species by stocks. Also part of the complication are international treaties and other agreements regarding Pacific salmon, and the requirement to consider funding as a resource that must also be managed in the growing era of deregulated energy supply.

Table 2.3-2: Conflicting Priorities

Policy Conflicts		
Policies that encouraged settlement and taking of tribal land	<i>Versus</i>	Tribal treaties to preserve certain land for tribes
Policies that allowed depletion of fish habitat and fish runs		Tribal treaty fishing rights
Policies that encouraged resource extraction and production—mining, hydropower development, USFS multiple use, BLM grazing, and homesteading		Later policies for environmental protection, including the ESA and CWA
Acts that define the purposes and priorities of the Corps, Bureau, USFS, BLM, and BPA (in BPA's case, the Regional Act)		The ESA, which requires Federal agencies to operate to protect endangered species
Federal treaties and state policies that allow harvest or indirect take of endangered species		The ESA, which prohibits take
Policies that recognize private property rights		ESA take and critical habitat provisions that may limit private property rights

⁸⁶ 33 U.S.C. § 2316(b).

⁸⁷ 43 U.S.C. § 371.

Policy Conflicts		
Policies to reduce costs and increase market forces in the power industry	<i>Versus</i>	Environmental policies (ESA, FERC, CWA) that increase costs and limit the flexibility of power producers and transmission providers to respond to market forces
Policies that support hatcheries for mitigation and lost harvest opportunity		Policies that discourage hatchery production that may compete with native fish
CWA dissolved gas standards		Spill to move fish down river
Protection of endangered species (e.g., salmon)		Protection of marine mammals (e.g., sea lions or seals)

Judicial Impact on Natural Resource Policy

The judicial branch of the Federal government occasionally renders opinions that dramatically shape and define resource management policy. One notable example is Judge Malcolm Marsh's 1994 opinion in *Idaho Department of Fish and Game v. National Marine Fisheries Service*. The Idaho Department of Fish and Game brought suit, claiming that NMFS BiOp was arbitrary and capricious. At issue was the way in which NMFS had prepared and issued its 1993 BiOp on FCRPS operations. Ultimately, Judge Marsh ruled that NMFS was arbitrary and capricious in the way it constructed its 1993 BiOp on FCRPS operations.

Perhaps as important, Judge Marsh observed that "the underlying root of the litigation problem is the feeling of these parties that the Federal government is simply not listening to them."⁸⁸ In subsequent cases, Judge Marsh has continued to remind the Federal defendants of the need to coordinate more effectively with the state and tribal resource managers. Since then, the Federal agencies in the Region have engaged in numerous cooperative efforts with regional states and tribes, including: the Forum, the Council's Framework Process, the Council's Program amendment process, the Conceptual Plan/Basinwide Strategy, and solicitation of comments from states and tribes on the draft 2000 hydrosystem BiOp (see Section 2.3.2.4). The success of these efforts has often been perceived differently by different participants.

In response to Judge Marsh's 1994 characterization of the NMFS' BiOp as simply tinkering, when the hydrosystem "cried out for a major overhaul,"⁸⁹ NMFS rewrote the Opinion, laying the groundwork for significant and far-reaching changes. These changes can be credited, at least in part, to Judge Marsh's ruling:

- Fish First – Operational Improvements
 - While maintaining all flood control requirements, the priority of FCRPS operations (e.g., flow management, spill, operations and maintenance [O&M])

⁸⁸ 850 F. Supp. 886, 900 (D. Or. 1994).

⁸⁹ 850 F. Supp. 886, 900 (D. Or. 1994).

has shifted to fish protection. Power production is now secondary, except in the cases of declared emergencies.

- **Structural Improvements**
 - Substantial investments have been made in structural modifications at the dams that have significantly improved fish passage and survival.
- **Operations**
 - On a 50-water-year average basis, 7.2 Maf of flow augmentation is provided to enhance fish passage. This equates to approximately one-and-one-half times the storage capacity at Grand Coulee Dam.
 - On a 50-water-year average basis, about 1000 average megawatts (aMW) of energy are not generated, and are instead spilled during the April–August migration period to improve fish passage. This is equivalent to 10% of annual average Federal generation, and almost enough energy to serve the city of Seattle for a year.
- **Configurations**
 - From 1996 - 1999, several hundred million dollars were invested in actual structural modifications at the dams to improve passage conditions, as well as in studies and planning to support additional modifications that are underway, under development, or are currently under consideration.
 - The cumulative effect of these structural changes is a 30% decrease in turbine passage, which equates roughly to a 5% increase in fish survival at each dam.
 - Future configuration and survival improvements draw from the strategies outlined in the Basinwide Strategy paper.⁹⁰ Performance standards leading to recovery are used to guide these efforts.
- **Predation Management**
 - Predator control actions throughout the FCRPS and the estuary save approximately 3.8 million smolts per year. This represents about 2% of the overall population.⁹¹
- **Juvenile Survival Improvements from Operations and Configurations**
 - NMFS Draft White Papers provide PIT-tag survival data that illustrate an upward trend in juvenile fish hydro system survival.⁹² Pit-tag survival estimates for Snake River spring/summer chinook have increased from 31% in 1993 to 59% in 1998—the highest measured direct survival on record. Since

⁹⁰ Federal Caucus 2000b.

⁹¹ NMFS 2000e; USDOE/BPA 2001e, p. 2; Friesen, Thomas A., and David L. Ward 1999, 19:406-420.

⁹² "PIT" tags, or "Passive Integrated Transponder" tags, enable researchers to track individual fish. NMFS 2000c; NMFS 2000a.

1995, direct juvenile fish survival levels approach those levels observed in the 1960s⁹³ (before the Snake River dams were built).

Another example of judicial influence on resource management policy is the ongoing litigation concerning NMFS' listings of certain salmon populations in the Pacific Northwest as threatened and endangered under its ESU and hatchery salmon policies. (These policies are described in Problems in Defining and Applying Listings later in this section.) Application of these policies by NMFS in its listing decision for the Oregon Coast coho salmon ESU was challenged in a lawsuit filed in 1999 in the U.S. District Court for the District of Oregon. The suit challenged NMFS' 1998 final rule that listed only "naturally spawned" Oregon Coast coho salmon as threatened. In its final rule, NMFS had concluded that hatchery-spawned Oregon Coast coho salmon were considered part of the same ESU as the naturally spawned coho salmon. However, the hatchery-spawned salmon were not included in the listing by NMFS because NMFS did not consider these salmon to be "essential to recovery" of the ESU. In September 2001, Judge Michael Hogan ruled in *Alesea Valley Alliance v. Evans* that this approach to listing was arbitrary and capricious, and thus invalidated the NMFS' listing of the Oregon Coast coho salmon ESU.⁹⁴ Judge Hogan's decision also remanded the matter to NMFS for further consideration. However, various intervenors subsequently appealed Hogan's decision to the Ninth Circuit Court of Appeals, which has stayed the decision (and thus the invalidation of NMFS' listing) pending its ruling on the appeal.

While intervenors appealed the Hogan decision, NMFS did not. Instead, NMFS decided to conduct a public review of its hatchery salmon policy for how hatchery-spawned salmon factor into listing decisions. In July 2002, NMFS provided a pre-decisional working draft of its listing policy for review and comment to tribal and state natural resource agencies in the Region, the USFWS, and the U.S. Department of Justice (referred to by NMFS as "co-managers"). Once NMFS has received comments from the co-managers and made revisions to the draft, NMFS will formally propose and publish the policy as a notice in the *Federal Register*.⁹⁵ As of August 2002, NMFS intended to formally propose its listing policy by October 2002, and to complete the policy and publish it in the *Federal Register* as a final rule in April 2003.⁹⁶

In addition to reviewing its hatchery salmon listing policy, NMFS is in the process of reviewing listing decisions that were based in part on this policy. Immediately following the *Alesea* decision, NMFS indicated that interpretive issues raised by this decision had the potential to affect nearly all of the agency's West Coast salmon and steelhead listing determinations made to date.

In February 2002, NMFS officially concluded that the delisting petitions it had received in 2001 contained enough substantial scientific and commercial information to suggest that delisting may be warranted for 14 of the 15 petitioned Pacific salmon and steelhead

⁹³ NMFS 2000c; NMFS 2000a.

⁹⁴ 161 F. Supp. 2d 1154, 1161 (D. Or. 2001).

⁹⁵ Lohn, D. Robert 2002.

⁹⁶ NMFS 2002.

stocks currently listed as threatened or endangered under the ESA; thus, NMFS is in the process of conducting status reviews for these 14 stocks.⁹⁷ In addition, NMFS is reviewing the status of 10 other listed salmon and steelhead stocks, and will update the status of one candidate stock.⁹⁸ In December 2002, NMFS decided to also conduct status review updates for two additional listed salmon and steelhead stocks because it has been several years since the status of these ESUs has been updated.⁹⁹ As a result, NMFS is now reviewing its listing decisions for all 26 listed Pacific salmon and steelhead stocks. NMFS expects to propose updated listing determinations for these stocks in June 2003 and, following a public comment period, to make final updated listing determinations by June 2004.¹⁰⁰

Federal Indian and Indian Resource Policies

The judiciary played an important role in shaping Federal resource policy in a series of opinions in the Indian treaty right fishing cases, culminating with *U.S. v. Oregon* and *U.S. v. Washington*. Beginning with decisions in the early 20th century, courts found that the Columbia River treaty tribes had reserved rights, including the following:

- the right of access to usual and accustomed fishing stations,
- immunity from state license requirements,
- up to half of the harvestable surplus of fish,
- restriction on when tribal fishing could be curtailed by states for conservation purposes, and
- recognition and enforcement of tribal water rights to flows for preservation of tribal fisheries.

Buttressed with these holdings, the Federal government has taken the next steps to establish a policy that Indian treaty fishing rights should take precedence over other competing uses that adversely affect treaty fisheries.

Federal policy related to Native American fish and wildlife issues in the Columbia Basin was greatly clarified during the 1990s. This clarification became possible, in part, with the issuance of an Executive Order in 1994 that directed all agencies to establish government-to-government relationships with federally recognized tribes for the purpose of consulting on plans, projects, programs, and activities the agencies might make that could affect tribal trust resources.¹⁰¹

When BPA adopted its tribal policy in 1996,¹⁰² it was the first for which tribal participation had occurred prior to such adoption. Fundamental principles in the policy

⁹⁷ 67 Fed. Reg. 6215, 6216-17 (Feb. 11, 2002).

⁹⁸ 67 Fed. Reg. 6217 (Feb. 11, 2002).

⁹⁹ 67 Fed. Reg. 79898, 79899 (Dec. 31, 2002).

¹⁰⁰ NMFS 2002.

¹⁰¹ The White House 1994.

¹⁰² USDOE/BPA 1996b.

include the recognition of the unique character of each tribe, as a sovereign, and a commitment to government-to-government consultations to ensure consideration of tribal concerns before BPA takes actions that might affect tribal resources.

In 1997, the Departments of Interior and Commerce jointly issued a Secretarial Order on American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act.¹⁰³ In that order, the Departments recognized:

[T]hat Indian lands, whether held in trust by the United States for the use and benefit of Indians or owned exclusively by an Indian tribe, are not subject to the controls or restrictions set forth in Federal public land laws. Indian lands are not Federal public lands or part of the public domain

The Departments shall conduct government-to-government consultations to discuss the extent to which tribal resource management plans for tribal trust resources outside Indian lands can be incorporated into actions to address the conservation needs of listed species

At the earliest indication that the need for Federal conservation restrictions is being considered for any species, the Departments, acting in their trustee capacities, shall promptly notify all potentially affected tribes, and provide such technical, financial, or other assistance as may be appropriate, thereby assisting Indian tribes in identifying and implementing tribal conservation and other measures necessary to protect such species. In the event that the Departments determine that conservation restrictions are necessary in order to protect listed species, the Departments, in keeping with the trust responsibility and government-to-government relationships, shall consult with affected tribes and provide written notice to them of the intended restriction as far in advance as practicable. If the proposed conservation restriction is directed at a tribal activity that could raise the potential issue of direct (directed) take under the Act, then meaningful government-to-government consultation shall occur, in order to strive to harmonize the Federal trust responsibility to tribes, tribal sovereignty and the statutory missions of the Departments. In cases involving an activity that could raise the potential issue of an incidental take under the Act, such notice shall include an analysis and determination that all of the following conservation standards have been met: (i) the restriction is reasonable and necessary for conservation of the species at issue; (ii) the conservation purpose of the restriction cannot be achieved by reasonable regulation of non-Indian activities; (iii) the measure is the least restrictive alternative available to achieve the required conservation purpose; (iv) the restriction does not discriminate against Indian activities, either as stated or applied; and, (v) voluntary tribal measures are not adequate to achieve the necessary conservation purpose.

The last part of the directive quoted is called the *Conservation Necessity Principle Analysis*. Derived from judicial decisions in the *U.S. v. Oregon* and *U.S. v. Washington*

¹⁰³ USDO/USFWS 1997.

series of cases, the conservation principles outline how, when, and why the government may limit tribal treaty fisheries. Appreciating that the Basinwide Strategy Paper might include proposals that could affect these fisheries, NMFS performed a draft Conservation Necessity Principle Analysis on the Federal Conceptual Plan. The analysis addresses each listed stock. The Basinwide Strategy paper acknowledged that a conservation argument can be made for lowering or eliminating harvest of all but one of the listed ESUs in the Columbia and Snake rivers. However, it does not recommend this action because it is important to maintain at least some tribal harvest pursuant to treaties and the Federal trust obligation.¹⁰⁴

The Administration clarified its current policy with regard to the treaties and fisheries of the Columbia Basin tribes in a 1998 letter from NMFS that stated:

It is our policy that the recovery of salmonid populations must achieve two goals:

- 1) the recovery and delisting of salmonids listed under the provisions of the ESA;
- 2) the restoration of salmonid populations, over time, to a level to provide a sustainable harvest sufficient to allow for the meaningful exercise of tribal fishing rights. We see no conflict between the statutory goals of the ESA and the Federal trust responsibility to Indian tribes.¹⁰⁵

Harvest Policies

Under production-focused fisheries management, many runs of anadromous fish were purposefully harvested to extinction.¹⁰⁶ State and Federal fishery management agencies are now shifting from being production- and harvest-oriented to being more conservation-minded. As noted in Washington's Draft Wild Salmonid Policy, "We know that in order to be successful, the resource must be our exclusive client."¹⁰⁷ Initially, in its draft policy, Washington concluded:

We do not honestly believe that salmonid resource management can be successful in the future without recognizing our true client [wild salmonids], stopping deliberate overfishing, marking all hatchery-origin anadromous salmonids released in state waters, curbing high peak flood flows, establishing higher spawning escapement objectives, correcting fishery selectivity, and markedly improving our delivery of viable wild salmonids to the spawning grounds.¹⁰⁸

¹⁰⁴ NMFS 2000d, pp. 5-6.

¹⁰⁵ Garcia, Terry D. 1998.

¹⁰⁶ "Many wild chinook and coho salmon populations carry the nomenclature tag of "secondary protection." What this means in plain language is deliberate, planned overfishing designed to harvest co-mingled hatchery fish. The logical end point is genetic extinction of wild fish—the same result already achieved in fact for lower Columbia River coho salmon. In their case, heavy overfishing began in the early 1960's." State of Washington 1997, p. 3.

¹⁰⁷ State of Washington 1997, p. 3.

¹⁰⁸ State of Washington 1997, p. 7. The Washington Fish and Wildlife Commission adopted a final policy on December 5, 1997.

A conflict in current fisheries management is whether to manage for native or non-native species. With the creation of reservoirs on the Snake and Columbia rivers has come the introduction and adaptation of non-native fish, particularly walleye and bass. These exotics not only compete with salmonids: they prey upon them. Oregon, Washington, and Idaho all must resolve the policy dilemma presented by the need to improve conditions for anadromous fish and the public desire to retain these newly established fisheries that hinder recovery efforts.

Reflecting a willingness to consider a change in policy direction, NMFS has now required BPA and the other Action Agencies to explore alternative harvest technologies that would permit the selective catching of non-listed stocks while avoiding take of listed stocks.¹⁰⁹

Catching fish has done more than just reduce overall numbers. Large mesh sizes in nets may have eliminated the largest, strongest, most fecund members of many salmon races.¹¹⁰ Similarly, minimum length requirements for troll and sport fishers resulted in the largest fish being kept, leaving the smaller fish to reproduce.¹¹¹ Fish managers have begun to adopt more of a role of resource trustees or conservators, but the transition is incomplete. They are still subject to interest group pressure to fish where fishing, by some measures, should not occur. Even sport fisheries, where unmarked fish must be released, have significant hooking mortalities ranging from 14% up to nearly 30%.¹¹²

Pacific Salmon Treaty

Since 1985, the United States and Canada have had a treaty to conserve Pacific salmon in order to achieve optimum production and to divide the harvests so that each country reaps the benefits of its investment in salmon management. The effectiveness of this coordination to date is somewhat questionable. A recently re-negotiated treaty has been completed by the United States and Canada: it will shift harvest from quota-based fishing to "abundance"-based fishing. The abundance approach is intended to give more protection to weaker, naturally produced stocks than did the previous harvest agreement.

Hatchery Policies

Historically, hatcheries were inseparable from harvest. Until the last decade, hatcheries in the Pacific Northwest produced fish only for sport, commercial, and tribal harvest. More recently, hatcheries have become tools for conservation and supplementation.¹¹³ BPA implements a number of conservation hatchery programs, some of which (e.g., the

¹⁰⁹ NMFS 2000b, Section 9.6.3.

¹¹⁰ In 1980, Ricker found that the average size of Chinook salmon was decreasing and had been decreasing since at least 1930. He reported average weights as being less than or equal to half those weights documented 50 years prior. Ricker, W.E. 1980.

¹¹¹ State of Washington 1997, Appendix E, p. E-5.

¹¹² Pacific Fishery Management Council 2001.

¹¹³ Supplementation – Artificial propagation intended to reestablish a natural population or increase its abundance. (Federal Caucus 1999b, Glossary, p. 100.)

program for Snake River Sockeye Salmon) keep the genomes alive in stocks that are extinct in the wild.¹¹⁴

There are several clear movements in hatchery management: (1) greater mitigation for tribal trust and treaty resources, which has moved some lower Columbia River hatchery fish production to up-river locations; (2) greater concern with fish health protocols and management of genetic traits affected by hatcheries; and (3) less emphasis on production purely for harvest and more concern about preserving weak populations. However, the Region is still struggling about where and how to use hatcheries. Tribes, local governments, and industries tend to want wider use of hatchery fish in order to boost spawning in the wild,¹¹⁵ but state and Federal fish managers want to further limit the use of the surplus upriver hatchery fish because in some instances they may be the progeny of distant downriver genomes.¹¹⁶

In the Council's Program process, tribes continue seeking BPA implementation of mitigation through supplementation projects. The Nez Perce Hatchery, for instance, began construction in the summer of 2000. The Yakama Nation is seeking to expand its Yakima Fisheries Project to include permanent production facilities for coho, in addition to the facilities already existing for spring chinook. The Umatilla Tribes are lead proponents of the Northeastern Oregon Hatchery Project undergoing planning and NEPA review. Most state and Federal hatchery managers throughout the Basin are also now looking to BPA to help them implement changes to reduce the adverse effects their existing facilities have on listed species.

However, NMFS' Final FCRPS BiOp places BPA in a particularly difficult position regarding hatcheries. On the one hand, BPA cannot avoid jeopardizing the ESUs listed under the ESA without providing mitigation with conservation and supplementation hatcheries. On the other hand, NMFS believes that naturally spawning fish of hatchery origin can reduce the reproductive success of wild, naturally spawning fish. Thus, it is possible that the more BPA succeeds with supplementation hatcheries, the more it will reduce the reproductive success of ESA-listed fish. Technical and policy decisions are needed to resolve this inherent conflict between hatcheries and wild fish survival. Resolution of this conflict may also be driven by judicial interpretation of the ESA, as discussed in Judicial Impact on Natural Resource Policy earlier in this section and in the following subsection.

Problems in Defining and Applying Listings

The ESA allows listing of "distinct population segments" of vertebrates as well as named species and subspecies. However, the ESA provided no specific guidance for determining what constitutes a distinct population. For Pacific salmon, NMFS has determined that a population (or group of populations) will be considered "distinct" (and

¹¹⁴ A detailed history and current status of hatcheries, emphasizing their roles for mitigation and production, can be found in Federal Caucus 2000b, pp. 56-59, and in the associated Hatchery Appendix.

¹¹⁵ Northwest Fishletter 2000a.

¹¹⁶ Northwest Fishletter 1998.

hence eligible for protection) for purposes of the ESA if it represents an ESU of the biological species. A population must satisfy two criteria to be considered an ESU: it must be reproductively isolated and it must represent an "important component" in the evolutionary legacy of the species.¹¹⁷ Application of this concept is flexible. Where detailed information is available on a run of salmon, it may often be "split" into many stocks for management purposes; however, where information is lacking, a run may be comprised of several stocks that are "lumped" together. The stock concept, in theory, makes no allowance for the size of the actual local breeding population (also called a "metapopulation structure"), in which populations consist of locally reproducing groups connected by some gene flow within a larger geographic area.¹¹⁸

Between the local breeding population—such as the Red Fish Lake Sockeye—and the overall species—such as sockeye—is the realm in which the Region must make its policy choices because while no *species* of salmon is near extinction, many wild *populations* are nearly so.¹¹⁹ In essence, Pacific Northwest fisheries managers have taken a biologically cautious approach to ESA listings. Small populations of fish within a species have been listed for Federal protection when, under a broader definition, the overall species itself is in no danger of extinction.

In addition, there is considerable disagreement in the Region concerning how hatchery-spawned salmon should be considered in listing decisions for salmon. As discussed above, the ESA allows for the listing of any species, subspecies, or distinct population segment of a species as threatened or endangered, and NMFS has defined "distinct population segments" in terms of ESUs. In 1993, NMFS issued a policy for the consideration of hatchery-spawned salmon when making listing decisions for Pacific salmon ESUs.¹²⁰ This hatchery salmon policy provides that when hatchery-spawned salmon are part of the same ESU as naturally spawned salmon proposed for listing, the hatchery salmon are not to be included as part of the listed ESU, unless these salmon are considered essential to recovery of the ESU. This approach reflects NMFS' interpretation of the ESA as requiring NMFS to focus its recovery efforts on "natural populations" of species.

Not everyone in the Region agrees with NMFS' listing policies for the Pacific salmon. The controversy over these policies is perhaps best exemplified by two lawsuits filed by organizations that disagree with NMFS' approach to listing under the ESA. More specifically, these organizations have alleged that NMFS, when making listing decisions for individual ESUs, does not have the authority under the ESA to distinguish between hatchery-spawned salmon and naturally spawned salmon that are part of the same ESU.

One lawsuit, filed by the Alsea Valley Alliance, is discussed under Judicial Impact on Natural Resource Policy earlier in this section. As indicated in this earlier discussion,

¹¹⁷ Waples, R. 1991.

¹¹⁸ NRC 1996, pp. 70, 138-140.

¹¹⁹ Lackey, R.T. 1999a.

¹²⁰ NMFS 1993.

Judge Hogan's order in *Alesea* has resulted in NMFS revisiting its hatchery salmon policy, as well as approximately 20 listing decisions that were based in part on this policy and conducting status review updates for 24 of the 26 listed Pacific salmon and steelhead stocks (with NMFS recently deciding to also review the status of the remaining two listed stocks).¹²¹ In addition to the *Alesea* case, a complaint was filed in 1999 by Common Sense Salmon Recovery against NMFS in the U.S. District Court for the District of Columbia. This complaint alleges, among other things, that NMFS' listings by ESU violate both the ESA and the Administrative Procedures Act, and that NMFS' decision to exclude hatchery-spawned salmon from the listings violates the ESA.¹²² Final decisions in these cases may assist in resolving problems and controversies concerning the definition and application of salmon listings in the Region.

Problems in Working with Existing Water Policy

No resource is more critical in the West than water. The history of water use and development is, in many respects, the economic history of the West. In a significant respect, the settlement of the Columbia Basin did not end until 1993, when the state water agencies of Oregon, Washington, and Idaho closed the Basin's salmon streams to new water diversions.¹²³

The effect of water policy on the environment in the Pacific Northwest cannot be overstated. Prior appropriation, which is still the guiding principle of water law in Oregon, Washington, Idaho, and Montana, allows the first person who puts water to a beneficial use to then claim a right to that water as long as it continues to be used in the same time, place, and manner. Prior appropriation is the law regardless of whether new or subsequent beneficial uses of the same water might have greater social, economic, or cultural benefits. Consequently, traditional water uses and water law dating from the mid-19th century continue to dictate water law and policy today.

Water use and management policy is in flux. Many waters of the Pacific Northwest are over-appropriated—there are more rights to use water than there is water available to use. Tribes, such as the Nez Perce in Idaho, are suing to have their reserved water rights recognized and quantified. State courts are now adjudicating the rights of water users in two critical subbasins: the Yakima and the Snake river basins. Oregon, Washington, and Idaho are all operating under consent decrees with the EPA to establish TMDL levels for the thousands of water bodies throughout the Region that fail to meet CWA water quality standards. Economists and environmental organizations call for realigning water use policy more closely with economic value, but their efforts are still largely in the formative or experimental stages. While Oregon and Washington have now included instream flows for fish and wildlife as a statutory beneficial use, Idaho has not. The doctrine of prior appropriation still reigns in the Pacific Northwest, leaving those with the earliest recognized water rights largely in control of how that water will be used. Attempts by government entities to compel changes in water use by law are often

¹²¹ NMFS 2002.

¹²² Washington Farm Bureau Service Company Inc., Common Sense Salmon Recovery 1999.

¹²³ Volkman, J. 1997, p. 1.

countered with litigation and claims of unlawful takings that must be compensated for, as required by the Fifth Amendment of the United States Constitution.

Water management is primarily a matter of state jurisdiction. Nothing has yet brought the states of the Pacific Northwest together in a concerted effort to address water issues comprehensively. Consequently, at best, water issues are addressed on a subbasin level through court-administered adjudications or local planning efforts such as those seen on the Deschutes and Yakima rivers. At worst, water issues fester, falling into an abyss of multiple rights and overlapping jurisdictions such that no one entity, save the courts, can effectively resolve them. But even the courts can only address one basin or issue at a time, as their jurisdiction and the claims before them allow. There is no widely accepted forum for getting all interested parties in one place at the same time to consider improvements to create coordinated regional water policy.¹²⁴

Managing the Money Resource

Current Provisions

Under the provisions of the Council's Columbia River Basin Fish and Wildlife Program and the BiOps for the FCRPS, BPA funds a substantial portion of the fish and wildlife mitigation and recovery efforts in the Basin. BPA's funds—the ratepayers' funds—are the centerpiece of the world's largest, most expensive mitigation and recovery effort.

Before the passage of the Regional Act in 1980, BPA used its broad general funding authorities to fund over \$40 million in mitigation projects. Since the passage of the Act and its express provisions requiring BPA to mitigate fish and wildlife, BPA has incurred costs over \$6 billion.¹²⁵ During the six-year period from fiscal year 1996-2001, BPA's fish and wildlife costs—including direct program expenses, reimbursable expenses for other agencies, capital investment fixed expenses, and river operations costs—were, on average, about \$610 million annually or about \$3.7 billion. For the five-year period from fiscal year 2002-2006, BPA estimates its costs will be over several billion dollars.¹²⁶

As noted, these costs are not just direct expenditures such as those incurred through funding measures consistent with the Council's Program. BPA currently funds fish and wildlife activities under four categories:

¹²⁴ Governance issues are discussed in more detail in Chapter 6.

¹²⁵ Council 2002, p. 3. Of the \$6 billion in costs accrued from 1978-2001, \$2.17 billion was for power purchases in response to reduced hydropower generation; \$1.27 billion was in forgone revenues for required river operations to improve fish survival; \$1.02 billion was to implement the Council's Fish and Wildlife Program; \$957.7 million was for fixed expenses for debt service on capital investments at the dams; and, \$582.9 million was to reimburse the Federal Treasury for the power share of other Federal agency efforts primarily for fish passage improvements at Federal dams and Federal hatcheries.

¹²⁶ USDOE/BPA 2002c (actual amounts will fluctuate based on market prices).

Program	Expenses
(1) Integrated Program	Direct expenses (not including capital debt service) of Council Fish and Wildlife Program measures and actions under the NMFS and USFWS BiOps.
(2) Reimbursables	The money paid to the United States Treasury after-the-fact for fish and wildlife actions by other Federal agencies. Reimbursables include fish and wildlife expenses of other Federal agencies (Corps, Bureau, USFWS) that are to be repaid to the Treasury from power revenues. These expenses include O&M expenses assigned to power, and a portion of the Council's annual expenses.
(3) River Operations	Foregone revenues and increased power purchases that occur as a result of operating the Federal hydrosystem to enhance migration and habitat conditions for fish.
(4) Capital Investments	Interest, amortization, and depreciation costs of borrowing for capital improvements made on behalf of the fish and wildlife mitigation and recovery program. These costs are incurred by BPA, the Corps, and the Bureau associated with the hydroelectric system.

In 1996, the Department of the Army (for the Corps), the Department of Energy (for BPA), the Department of Interior (for USFWS and the Bureau) and the Commerce Department (for NMFS)—five Federal agencies involved in salmon and other fish and wildlife restoration activities in the Columbia River Basin—executed a *Memorandum of Agreement (MOA)*. The MOA represented an effort to balance the dramatically escalating costs of fish and wildlife restoration with the need to provide BPA with a degree of financial stability in a competitive energy market. It lasted only through 2001. The MOA also committed the Federal agencies to collaborate much more closely with the Region in developing Federal funding requests. It incorporated an annex in which the parties agreed to collaborate in Federal budget matters and in monitoring and evaluating fish and wildlife mitigation and recovery. Table 2.3-3 shows BPA's costs under the MOA from 1996 through 2001.

Table 2.3-3: MOA Fish and Wildlife Program Expenses, 1996–2001

MOA Fish and Wildlife Program Expenses, 1996–2001, Million \$						
	Year					
	1996	1997	1998	1999	2000	2001
Category						
Direct Program	68.5	82.2	104.9	108.2	108.2	101.1
Reimbursable	35.4	35.9	36.4	38.9	37.6	42.4
Expenses Assoc. with Capital Investments	73.1	76.3	74.1	76.1	77.2	77.1

MOA Fish and Wildlife Program Expenses, 1996–2001, Million \$						
Year						
Hydro Operations	83.3	110.2	120.0	251.3	337.0	1505.5
TOTAL	260.3	304.6	335.4	474.5	560.0	1726.1

Source: USDOE/BPA 2002c.

After the MOA expired, BPA issued a letter explaining how it would integrate funding for its fish and wildlife obligations for offsite actions, as described in the Program and the BiOps. The letter clarified that BPA's spending estimates were for planning purposes during fiscal years 2002 through 2006. It showed that, with the integration of off-site ESA actions and the direct Council program funding, BPA adopted a planning level substantially higher than the previous period covered by the MOA. This amount was consistent with the funding range assumed in the power rate case and with the Fish and Wildlife Funding Principles (Appendix A) that projected an annual average of \$139 million in accruals for purposes of setting BPA's revenue requirement. On a planning basis, BPA estimated an annual average of \$36 million—up from \$27 million in the previous rate period—of funding for future capital investments funded directly through BPA borrowing for offsite mitigation and recovery actions. Under its direct funding agreements with the Corps, Bureau, and the USFWS (for its Lower Snake River Compensation Plan hatcheries), BPA will cover the hydroelectric share of operations and maintenance and other non-capital expenditures for fish and wildlife-related activities that Congress previously funded with appropriations and that BPA then reimbursed. BPA will also continue to repay the hydroelectric share of capital expenditures for past fish and wildlife investments by the Corps and the Bureau and their future capital investments for fish and wildlife made with appropriations.¹²⁷

BPA is continually working to collectively and collaboratively demonstrate to all interested parties in the Region that ratepayers' funds are being efficiently and effectively used to benefit the Region's fish and wildlife. Recently, BPA has been working closely with the Council to prioritize projects in the integrated program to ensure that spending for expense accruals in FY 2003 do not exceed \$139 million and accruals throughout the remainder of the rate period, through FY 2006, are at \$139 million or below. Prioritizing program spending is important if Bonneville is to continue to fully meet its obligations to fish and wildlife, especially those needed to meet the requirements of the various biological opinions that apply to Bonneville and preserve previous important investments of the Fish and Wildlife Program.

Funding these costs is made increasingly difficult as BPA incurs net costs from fish mitigation and recovery operations as the operations either: (1) change the timing of energy production within the year, or (2) reduce the total annual energy production from the Federal hydroelectric projects. It has been estimated that the BiOps have resulted in a loss of about 1000 MW or 10% of the capability of the system.¹²⁸ The analyses estimated

¹²⁷ USDOE/BPA 2001g.

¹²⁸ USDOE/BPA 2000b.

the 50-year annual average fish operation cost of the 1998 BiOp to be about \$180 million. This cost was based on a flat market price of \$20/MWhr.¹²⁹ However, prices typically fluctuate as markets change. For example, the 2000 BiOp estimates costs of over \$330 million based on a market with prices of \$39/MWhr.¹³⁰ Figure 2-3 shows monthly average spot prices in regional power markets over a recent 6-year period. The price over the long term is expected to be lower than recent highs, but much higher than the 1998 price.

Actual costs in any future year will also depend on hydrologic conditions. Typically in lower water years, the net costs are due primarily to purchases of energy required to offset the loss of generating capability as water is stored. In higher water years, the net costs are the result of revenues foregone, because the nonfirm energy could not be sold.

BPA tracks the monetary cost of purchasing replacement power and electric power losses resulting from implementation of the Council's Fish and Wildlife Program. The Act requires BPA to recoup the amounts in excess of the power share of mitigation costs. Relative to the conditions before the Act, foregone revenues resulting from fish operations that reduce energy production represent an additional cost to ratepayers. Also, BPA may need to raise its rates later to cover costs. Furthermore, reduced revenues lessen BPA's ability to pay its debt, maintain reserves, and fund public benefits such as fish and wildlife mitigation and energy conservation programs. Foregone revenues have environmental costs as well: as less hydroelectric energy is available from the FCRPS, utilities must obtain their energy from other resources, most likely gas-fired combustion turbines. These resources have environmental impacts such as depletion of non-renewable fuels and air pollution (see map Figure 2.6 at the end of this chapter and Appendix E).

BPA is an unusual Federal agency in that it typically receives no annual appropriations from Congress. Instead, Congress created the BPA Fund within the United States Treasury and gave BPA borrowing authority. This borrowing authority is a sort of credit card based on an indefinite revolving appropriation that lets BPA borrow from the Treasury, repay the debt with interest, and borrow against the balance again. BPA deposits the revenues from its power marketing activities into the Fund. BPA collects these funds from its customers—the ratepayers. BPA uses its revenue from ratepayers to repay the Treasury—the taxpayers—for the nation's financing of the construction and operation of the FCRPS and other capital programs such as transmission and energy conservation programs. Where this EIS refers to ratepayer dollars, it means the money generated by BPA through its power marketing activities. Where it refers to taxpayer dollars, it means dollars appropriated by Congress that will not ultimately be repaid to the Treasury by BPA: i.e., a cost borne by the taxpayers.

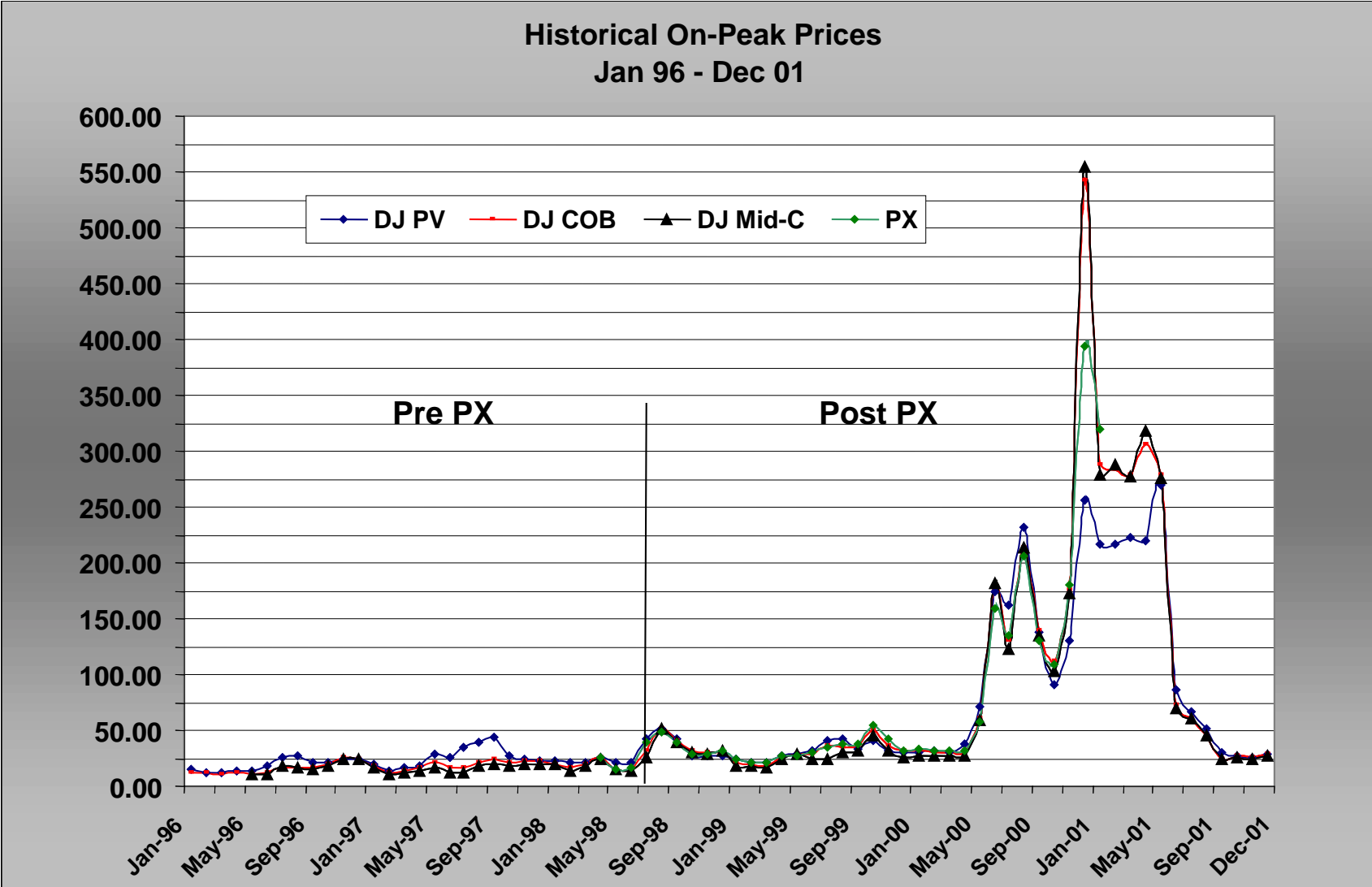
Fish and Wildlife Program costs paid by ratepayers and hydropower losses are not the only fish and wildlife funding in the Region. Other fish and wildlife mitigation and

¹²⁹ USDOE/BPA 2000b.

¹³⁰ USDOE/BPA 2000b.

recovery costs are paid by Federal taxpayers. Some of these fish and wildlife costs are difficult to estimate because the Federal programs from agencies such as EPA, the Corps, and the Bureau include purposes other than fish and wildlife. Still, informal studies have found that these other Federal costs may range into hundreds of millions of dollars annually. Additional costs are paid by state and local taxpayers, and state and local funds are provided by lottery revenues, hunting and fishing licenses, user fees, and other sources.

Figure 2-3: Monthly Average Spot Market On-Peak Prices, January 1996 to December 2001, Four Markets



Regulatory costs are paid by businesses and their customers, and additional losses are incurred by uses of public and private resources such as grazing and forestry, when use is restricted to help fish and wildlife. Still more costs are paid by tribes and by citizens as monetary contributions or as the value of time and resources contributed. The extent of these costs is unknown.

Challenges to Funding

For many years, the rates for BPA hydropower were modest in comparison to those for other sources. Still, hydropower revenues were sufficient to repay the Federal debt from building the dams. Revenues have increased over time with demand, but so has the share of revenue allocated to purposes other than repayment. Especially, fish and wildlife costs have increased dramatically.

In the past, BPA was able to increase firm power rates to cover cost increases. Customers may not have welcomed rate increases, but the cost of BPA power even with rate increases was well below the cost of power from other suppliers. BPA's rate increases, therefore, did not significantly affect BPA power sales (see Maximum Sustainable Revenue (MSR) definition, below). More recently, however, a more competitive market has emerged for electric power, and non-BPA suppliers have begun to offer power products at prices comparable to BPA's rates.

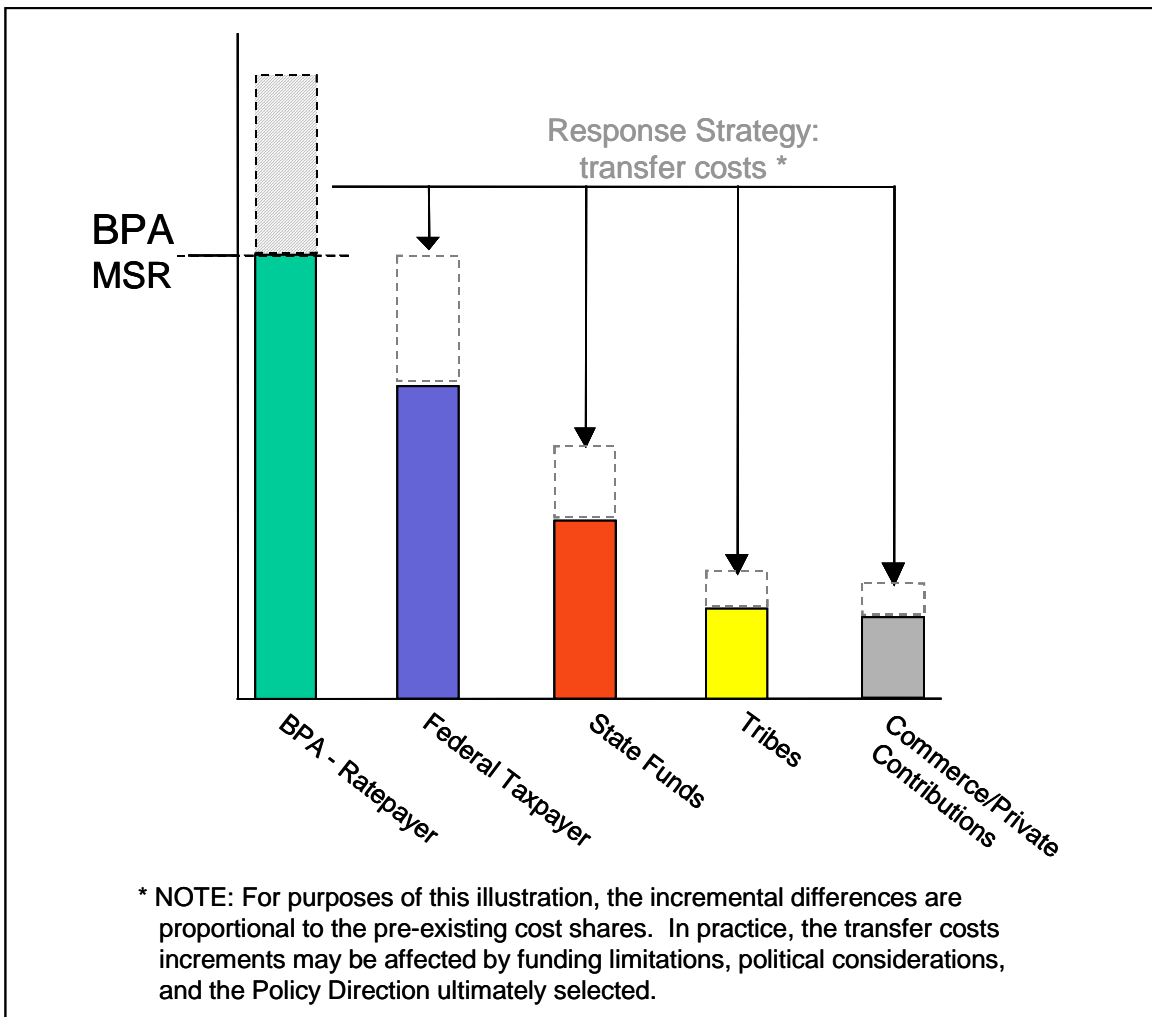
In the BPA Business Plan EIS (DOE/EIS-0183, Sec. 2.6.1 and 4.4.1.2)¹³¹, BPA explained how a highly competitive power market affects its rates. BPA was concerned that its rates, increased to cover costs of fish and wildlife and other public benefit programs, would become noncompetitive. If this were to occur, the agency would find it difficult to meet all of its power, financial, and environmental responsibilities. BPA would be forced to implement one of its potential Response Strategies to continue meeting its obligations. These response strategies generally fall into three categories: to increase revenues, reduce costs, or transfer costs. Since BPA would already be at MSR, increasing revenues would be difficult. In addition, BPA had been cost-cutting over the past several years, so reducing costs much further would have adverse consequences.

Maximum Sustainable Revenue (MSR). *When BPA's rates are close to the cost of alternative power supplies, there is a point at which an increase in BPA rates will not increase revenues. This is because the potential increase in revenues from the higher rate is affected by load loss as customers look elsewhere for cheaper power or a higher degree of certainty. The maximum sustainable revenue (MSR) occurs when the percent increase in BPA rates equals the percent reduction in quantity sold. The BPA rate at which MSR occurs and the amount of revenue at MSR are both positively related to power market conditions. If the market price for power drops below BPA's firm power rate, BPA will lose loads, revenues will decline, and BPA must reduce its rates to maximize revenue.*

¹³¹ USDOE/BPA 1995a.

BPA works to ensure that fish and wildlife funds are spent efficiently and costs are controlled. Still, fish and wildlife costs are expected to increase. Therefore, and depending on future power market conditions, some of the additional fish and wildlife costs may need to be transferred to others. Figure 2-4 illustrates this situation.

Figure 2-4: Illustration of a BPA Response Strategy When Reaching Maximum Sustainable Revenues (MSR)



In addition, BPA is concerned about its customers' *perceptions* of BPA's costs. In numerous forums, customers have said that if BPA's responsibilities lead to unpredictable rates, they will find other power supplies. The uncertainty regarding BPA's rates occurred partially because BPA's ultimate responsibility for fish and wildlife funding is not quantified. Without an end-point, the MSR problem becomes more likely.

BPA revenues, wholesale power prices, and growing demand also affect BPA's ability to pay fish and wildlife costs. Starting in October 2001, BPA's total commitments to firm

loads exceeded the firm output of the FCRPS. To meet these loads, BPA is augmenting low-cost hydro with power purchases from the market. Because the cost of hydropower is consistently less than the cost of power from other sources, BPA's average cost is likely to be substantially lower than the prices of power from alternative suppliers. In fact, because BPA's low-cost hydro brings down the average cost of BPA's firm power, the higher the market price goes, the more attractive BPA's averaged cost power will become. If customers have a choice as to whether to take power from BPA, the higher the market price, the higher BPA's loads will be.

In recent years, the risk of driving BPA customers to other sellers is less than it was when the concept of Maximum Sustainable Revenues was first introduced. A more immediate concern is market volatility, which threatens the stability of the market and the financial health of participating buyers and sellers. As studies for BPA's 2001-2006 rate case have shown, volatility in the price of purchased power can dramatically alter BPA's financial prospects, from accumulating significant reserve funds to completely depleting previously accumulated reserves. If BPA's financial reserves become depleted, BPA might be unable to make its annual Treasury payment in full or on time, or to meet other financial obligations (including fish and wildlife implementation costs). Recent agreements with customers provide innovative terms that allow rate adjustments twice a year, based on BPA's actual costs of power purchased to serve firm loads.

Deregulation, conditions in California and the western states, and uncertainty regarding the response of power producers and consumers add another layer of uncertainty to BPA's revenues and ability to cover costs. Capacity shortages and increased volatility in West Coast electric power markets from the summer of 2000 through the summer of 2001 resulted in unprecedented price levels throughout the western United States. In California, high wholesale power prices, in conflict with statutory limits on retail prices, left Investor-Owned Utilities (IOUs) with billions of dollars in unrecovered costs. These deficits led to defaults by those IOUs on payments due the California Power Exchange (PX) and the California Independent System Operator (ISO), which in turn were unable to make full payments to power marketers, including BPA. Since the summer of 2001, the combined effects of reduced demand, increased generation, higher streamflows, and mild weather have brought prices down to pre-crisis levels. Ironically, lower-than-expected market prices are also problematic, because they reduce the revenue BPA can receive from sales of surplus power (bringing maximum sustainable revenues down), and therefore increase uncertainty about whether BPA can cover its costs.

The lack of creditworthy buyers to purchase power for California loads during the market crisis in later 2000 and early 2001 amplified the financial and operational crisis. The State of California intervened to authorize the California Department of Water Resources (CDWR) to purchase power on behalf of the insolvent IOUs starting in January 2001. Short- and long-term purchases by CDWR secured power supplies for California consumers, but at the same time created billions of dollars in power costs that ratepayers or taxpayers must ultimately pay. During the winter of 2000-2001, one of the driest winter periods on record, BPA was called upon to provide power to California. As a result, when the weather was coldest in the Pacific Northwest, under the terms of the

Biological Opinion, requirements for Columbia River flows or elevations of FCRPS hydro projects were modified. To the extent that these modifications conflicted with achieving the goals of fish and wildlife implementation, they were a consequence of market conditions arising from the breakdown of the California restructured electric power market. Due to continuing concerns over creditworthiness, BPA has been reluctant to market power to the California ISO.

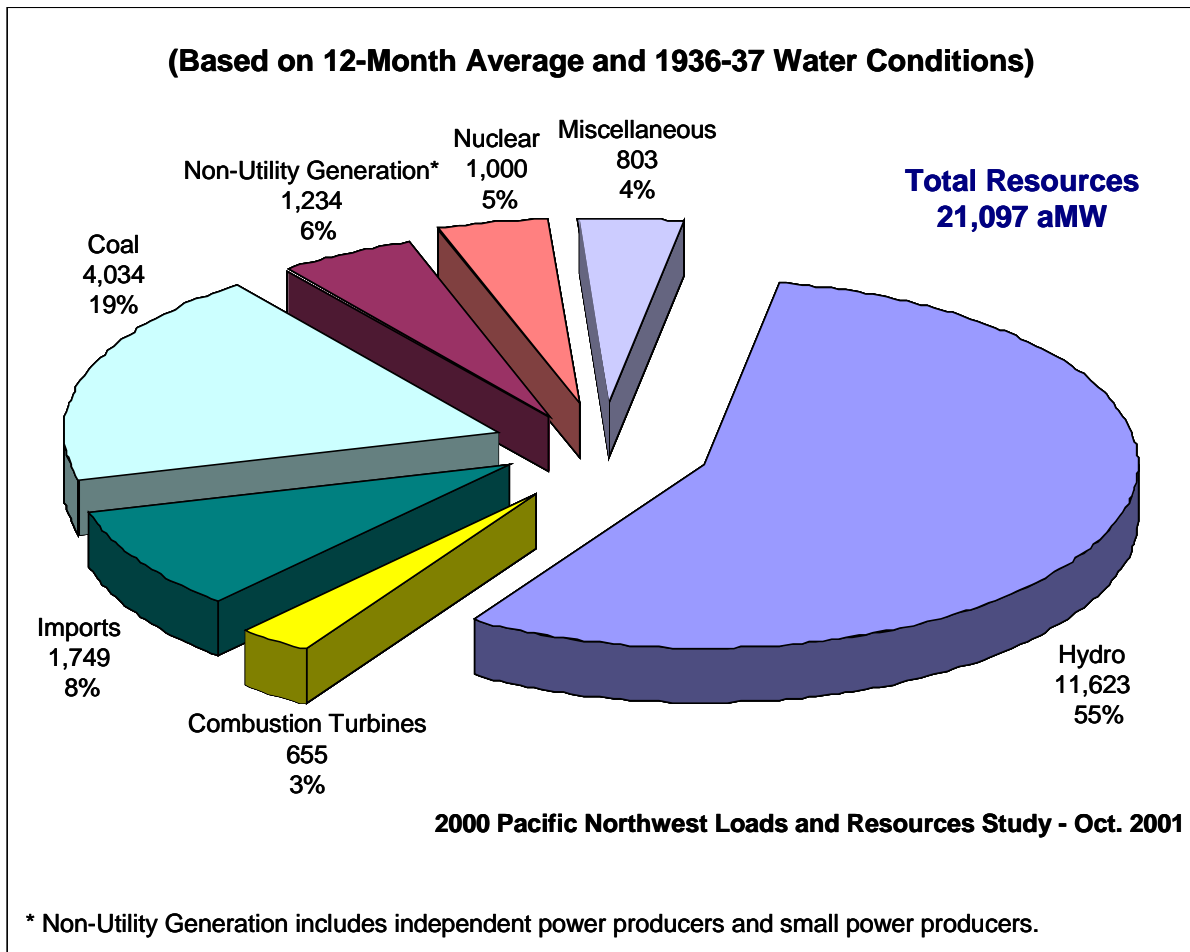
In summary: extreme high or low prices for power may impair BPA's ability to manage the FCRPS for fish and wildlife or finance implementation of mitigation and recovery actions. Price volatility adds uncertainty about BPA's financial health. Extreme power demands or shortages may lead to modifications of fish and wildlife operations. Unprecedented conditions arising from generation shortages and high prices in California created new risks and uncertainties for BPA and the FCRPS, but converse conditions of normal flows and low prices may also threaten BPA's financial stability.

How did a regional power supply deficit appear to materialize overnight in 2000 and 2001? Since the early 1990s, growth in demand averaged 1% annually, without any significant increase in generation or transmission capacity. Pending deregulation dampened infrastructure investment both by utilities, which saw uncertain future loads, and by independent developers, who didn't know when they could begin competing for retail customers. Also, between October 1994 and September 1999, the Pacific Northwest experienced water conditions that were 26% higher than average of the last 61 years on record, masking the gap between available power supply and growing demand. In fall/winter 2000, water conditions abruptly reversed, and the year 2001 was the second driest water year on record. The Region's heavy reliance on hydropower and the dearth of generation became all too apparent. Figure 2-5 shows how much of the Region's firm resources are from hydropower.

Early in 2001, BPA declared several power emergencies when the agency was unable to purchase enough power to meet demand. Water normally stored for spring fish migration was used for power. On March 29, 2001, the Acting BPA Administrator sent a letter to the Region about the extreme conditions facing the agency: a near-record low water year, a tight West Coast power supply, and an extreme market. In April 2001, extraordinary weather and market conditions forced BPA to declare a power system emergency under the terms of the 2000 Biological Opinion. That emergency was called based on the Council's estimates of power system reliability problems for spring and summer of 2001 and the impact of spill for fish passage on West Coast prices and reliability. There was simply not enough water available to meet both regional power needs and fish spill.¹³² BPA, working with other Federal agencies, drafted principles that described the circumstances for emergency FCRPS power operations through 2001, as well as actions that must be taken before declaring an emergency. These principles were shared with the Region. As a result of the extreme conditions in 2001, BPA is developing a dry-year strategy to support decisions when precipitation is low and prices are high.

¹³² USDOE/BPA 2001f.

**Figure 2-5: Projected Regional Firm Resources
 Operating Year 2001-2002**



Even though in 2002, there was nearly average precipitation and streamflows, the surplus power for BPA to market was limited by the increased hydroelectric supply and falling prices, which again reduced BPA's anticipated revenues. This is just another demonstration of how the water conditions and market prices can influence BPA's ability to generate revenues to cover costs.

Lastly, just as BPA's MSR ultimately limits its ability to collect revenues, other funding sources such as those from Federal taxpayer appropriations, tribal contributions, and other commercial and private contributions have similar limits on their ability to acquire such funds. This also impacts the fish and wildlife mitigation and recovery effort in the Region.

2.3.2.4 Initiatives to Modify the Current State

Despite the burgeoning environmental movement that began in the second half of the twentieth century, the statutes passed and regulations enacted, the programs undertaken,

and the mitigation hatcheries built and operating, many fish and wildlife species have continued to decline in the Pacific Northwest. Some are in danger of extinction and the number of listed species continues to increase. At the same time, programs have multiplied and authorities have overlapped. Socioeconomic objectives may compete with those focused on the natural world, of which humans are a part.

On the plus side, in today's political environment, economic and environmental effects are considered together, and the public is actively engaged in government decision-making processes. Today's policy environment contains a complex of overlapping state, local, Federal, tribal, private, interest group, and environmental interests and agendas. Each entity has its research, opinions, and priorities. But there are three problems:

- There is no clear and agreed-upon scientific answer regarding what set of actions the Region should take to protect and enhance fish and wildlife while preserving human uses.
- Priorities must be set because there is limited money available to fund what measures we can agree on.
- We must have a comprehensive approach, not one that narrowly limits itself to a focus on the hydro system and its operations.

Several major regional processes have or are developing their own alternatives to assist in species mitigation and recovery efforts in the Region: "The Framework,"¹³³ the Federal Caucus' Basinwide Strategy paper, the Council's Program, BiOps or Habitat Conservation Plans on the FCRPS, plus several formal plans from various regional entities. However, these different processes are not fully coordinated.

Federal Caucus and Basinwide Salmon Recovery Strategy.

Nine Federal agencies have joined together as a Federal Caucus to address those recovery options for endangered fish that simultaneously consider the needs of other aquatic species. These agencies include BPA, NMFS, USFWS, the Bureau, the Corps, BIA, USFS, BLM, and EPA. The intent is to develop a response strategy that can guide the recovery of Columbia Basin salmon.

The Federal Caucus used these goals and objectives, modified based on comments from tribal governments and the public, to develop the Basinwide Strategy.¹³⁴

Goals

- **Conserve Species.** Avoid extinction and foster long-term survival and recovery of Columbia Basin salmon and steelhead and other aquatic species.
- **Conserve Ecosystems.** Conserve the ecosystems upon which salmon and steelhead depend, including watershed health.

¹³³ A process no longer active.

¹³⁴ Federal Caucus 2000b.

- **Assure Tribal Fishing Rights and Provide Non-Tribal Fishing Opportunities.** Restore salmon and steelhead populations over time to a level that provides a sustainable harvest sufficient to provide for the meaningful exercise of tribal fishing rights and, where possible, provide non-tribal fishing opportunities.
- **Balance the Needs of Other Species.** Ensure that salmon and steelhead conservation measures are balanced with the needs of other native fish and wildlife species.
- **Minimize Adverse Effects on Humans.** Implement salmon and steelhead conservation measures in ways that minimize their adverse socio-economic and other human effects.
- **Protect Historic Properties.** Consistent with the requirements of the National Historic Preservation Act and other applicable laws, assure that effects of recovery measures on historic properties are identified and addressed in consultation with all interested and affected parties.
- **Consider Resources of Cultural Importance to Tribes.** In implementing recovery measures, seek to preserve resources important to maintaining the traditional culture of Basin tribes.

Biological Objectives

- Maintain and improve upon the current distribution of fish and aquatic species, and halt declining population trends within 5-10 years.
- Establish increasing trends in naturally sustained fish populations in each subregion accessible to the fish and for each ESU within 25 years.
- Restore distribution of fish and other aquatic species within their native range within 25 years (where feasible).
- Conserve genetic diversity and allow natural patterns of genetic exchange to persist.

Ecological Objectives

- Prevent further degradation of tributary, mainstem, and estuary habitat conditions and water quality.
- Protect existing high-quality habitats.
- Restore habitats on a priority basis.

Water Quality Objective

- In the long term, attain state and tribal water quality standards in all critical habitats in the Columbia River and Snake River basins (see map Figure 2.7 at the end of this chapter).

Socio-Economic Objectives

- Select those actions to restore and enhance fish and their habitat that achieve the biological and ecological objectives at the least cost.

- Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives.
- Seek adequate funding and implementation for strategies and actions.
- Coordinate restoration efforts to avoid inefficiency and unnecessary costs.
- Restore salmon and steelhead to population levels that will support treaty and non-treaty harvest.
- Select actions that consider or take into account tribal socio-economic or cultural concerns.

The agencies believe that their recommendations are the combination most likely to meet these goals and objectives. The actions reflect the best scientific understanding of what is necessary to conserve the species and their ecosystems. The Strategy contemplates maintaining tribal fishing opportunities in the near term, and expanding them over time. The Strategy recognizes the needs of other at-risk fish, wildlife and plant species within the Basin. The Strategy also seeks to provide a measure of social and economic certainty by seeking maximum benefit from the available resources, with clearly established implementation and monitoring processes.

The Federal agencies entered into a Memorandum of Understanding (MOU) in December 2001 to formalize their commitment to coordinate their implementation, funding, and monitoring of the Strategy and to ensure common approaches and priorities for the recovery of listed fish. Specifically the MOU commits Federal agencies to:

- establish an expanded Federal Caucus;
- establish a Habitat Team;
- consistently apply ESA, CWA, other relevant statutes and tribal trust and treaty responsibilities as they relate to the conservation of Columbia Basin fish;
- establish priorities for implementation;
- coordinate budget development and expenditures;
- coordinate with related efforts of state, tribal and local governments; and
- work with the states, tribes and the Council to develop a comprehensive basinwide monitoring program.

The NMFS 2000 FCRPS Biological Opinion

The NMFS 2000 Federal Columbia River Power System Biological Opinion (FCRPS BiOp) documents interagency consultations pursuant to Section 7(a)(2) of the ESA.¹³⁵ The consultations considered 14 projects—dams, powerhouses, and associated reservoirs—in the FCRPS, and 19 Bureau projects in the Columbia Basin. The consultation considered whether the configuration, operation, and maintenance of these

¹³⁵ NMFS 2000b.

facilities were likely to jeopardize the continued existence of 12 salmon and steelhead listed under the ESA.

In its 2000 BiOp, NMFS used the five-step approach to apply ESA Section 7(a)(2) standards developed in the 1995 FCRPS BiOp for Pacific salmon:

- (1) define biological requirements and current status;
- (2) evaluate the relevance of the environmental baseline to the species' status;
- (3) determine effects of proposed or continued actions on the listed species;
- (4) determine whether the species can be expected to survive with an adequate potential for recovery; and
- (5) when an action is expected to jeopardize the continued existence of a species or modify its critical habitat, develop reasonable and prudent alternatives.

The jeopardy analysis framework, including a jeopardy standard and metrics and criteria useful for assessing the jeopardy standard, are discussed. NMFS uses a standardized criterion of a 5-percent probability of absolute extinction in assessing whether each species has a high likelihood of survival under the proposed action. (Absolute extinction means that no more than one fish returns over the number of years in a generation.) Recovery metrics are also discussed, and recovery population levels are provided.

The action agencies proposed to continue current FCRPS operations that implement the 1995 Reasonable and Prudent Alternative. NMFS concluded that this proposed operation and configuration of the FCRPS and Bureau projects are likely to jeopardize the continued existence of 8 of the 12 ESUs considered; the no-jeopardy findings are for the Lower Columbia and Upper Willamette Chinook Salmon and Steelhead trout.

The Reasonable and Prudent Alternative identified actions that, when combined with other ongoing and anticipated measures outlined in the Basinwide Strategy, are likely to ensure a high likelihood of survival with a moderate-to-high likelihood of recovery. Proposed hydrosystem actions include enhanced spill and spillway improvements, improved flow management, physical improvements to passage facilities, increased use of barges and reduced use of trucks for summer migrants, and continued spill at collector projects.

A separate BiOp documents a similar consultation process for bull trout and Kootenai River white sturgeon.¹³⁶ The USFWS finds that the proposed action will not jeopardize bull trout, but that it will jeopardize the Kootenai River white sturgeon. The Reasonable and Prudent Alternative would modify operations at Libby Dam.

The Basinwide Strategy is related to the BiOp in several ways. First, it provides an overall, conceptual recovery strategy for aquatic species affected by the FCRPS. Second, it shows how actions called for in the BiOp fit with other related recovery initiatives.

¹³⁶ USDO/USFWS 2000.

Third, it provides a tool for engaging the public. Fourth, it provides a forum for Federal agencies to plan and coordinate their activities. The Action Agencies have already released their initial plans and have continued working on other plans, as discussed in Section 2.3.2.1 above.

BPA's Fish and Wildlife Policy Manual

In November 2001, BPA issued its first Fish and Wildlife Policy Manual for BPA Fish and Wildlife management and project managers to rely on, when contracting to perform mitigation and recovery actions.¹³⁷ The manual outlines the principles guiding BPA's implementation of all of its fish and wildlife contracting.

BPA's progress towards meeting its mitigation and recovery responsibilities is measured in part by contract performance: that is what drives this Policy. Failure of a BPA Fish and Wildlife Contractor to perform will adversely affect potential future contract awards.

The *Fish & Wildlife Project Manager Process and Procedure Desk Manual* (Desk Manual) for Project Managers and Contracting Officer's Technical Representatives (COTRs) is a companion to the Fish and Wildlife manual. It provides internal step-by-step procedures and detailed processes, from initial program and project development to project closeout. The development, distribution, and use of these documents help make implementation of the Program and BiOps more consistent, cost-effective, and transparent.

Other Regional Plans

Each state in the Columbia River Basin administers the allocation of water resources within its borders. In the past, each state's economy depended on natural resources, with intensive resource extraction and new irrigation development facilitated by Federal land and water resource policies.

Water resource development has slowed in recent years. Most arable lands have already been developed, the increasingly diversified regional economy has decreased demand, and there are increased environmental protections. Growth in new businesses, primarily in the technology sector, is creating urbanization pressures and increased demands for buildable land, electricity (see map Figures 2.6 and 2.15 at the end of this chapter illustrating non-hydro generation and the major transmission and gas pipeline routes), water supplies, waste-disposal sites, and other infrastructure. Economic diversification has contributed to population growth and movement in all four states, a trend likely to continue for the next few decades (see map Figure 2.12 at the end of this chapter). Such population trends will result in greater overall and localized demands for electricity, water, and buildable land in the action area; will affect water quality directly and indirectly; and will increase the need for transportation (for an illustration of major transportation routes see map Figure 2.16 at the end of this chapter), communication, and other infrastructure. The impacts associated with these economic and population

¹³⁷ USDOE/BPA 2001c.

demands will affect habitat features such as water quality and quantity (see map Figure 2.7 at the end of this chapter) and land habitat, which are important to the survival and recovery of the listed species. The overall effect on land, air, and water resources will be negative, unless carefully planned for and mitigated.

NMFS cooperates with the state water resource management agencies in assessing water resource needs in the Columbia River Basin. Through restrictions in new water developments, vigorous water markets may develop to allow existing developed supplies to be applied to the highest and best use. Interested parties have applied substantial pressure, including ongoing litigation, to the state water resource management agencies to reduce or eliminate restrictions on water development. It is, therefore, impossible to predict the outcomes of these efforts with any reasonable certainty.

The Region has several other major plans related to fish and wildlife mitigation and recovery efforts that this EIS incorporates by reference. These plans represent a formal set of actions reflecting more localized social values than the legal parameters. The effect of these plans can also inhibit or enhance implementation of any FWIP EIS Policy Direction, but they too can be changed to reflect changing values. These plans include the Spirit of the Salmon (CRITFC, 1996), the Governors' Recommendation for the Protection and Restoration of Fish in the Columbia River Basin, the Council's Fish and Wildlife Program (Phase I amendments October 2000; Council, 2000c), the Interior Columbia Basin Ecosystem Management Project (USDA/USFS and USDO/BLM, 2000), the Northwest Forest Plan (USDO/USFWS and BLM, 1994), and the Final Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS (Corps, 2002).

Council's Fish and Wildlife Program (including Framework)

As noted in Chapter 1, the Forum (with representatives from the 4 Northwest states, 11 of the Columbia Basin tribes, and the Federal agencies involved in the FCRPS) is designed to coordinate the regional fish and wildlife policies of its members. The Forum's Multi-Species Framework workgroup was tasked with addressing fish and wildlife recovery and mitigation from a multi-species perspective and preparing a report on the process.

In October 1998, the Framework Project invited interested parties to submit "concept papers" describing general approaches to fish and wildlife recovery efforts in the Columbia River Basin. From more than two dozen concept papers in hand, the project managers distilled 108 individual fish and wildlife recovery strategies. These were further distilled into seven alternatives designed to represent an array of approaches, from managing the Columbia River for peak benefit for fish and wildlife to managing it for economic benefit. These alternatives were considered in the development of Policy Direction alternatives in this EIS. For more information, see, Northwest Power Planning Council, "The Year of The Decision"¹³⁸ and Chapter 4 and Appendix D of this EIS.

¹³⁸ Federal Caucus 2000b.

Western Governors' Association

The Western Governors' Association (WGA) has endorsed Enlibra, an evolving set of new principles for a balanced approach to environmental and natural resource management. These principles emphasize greater participation and collaboration in decisionmaking, focus on outcomes rather than just programs, and recognize the need for a variety of tools beyond regulation. The Governors believe that adoption and use of these principles by state and Federal agencies, local governments, businesses and individuals can help the West successfully deal with increasingly complex environmental problems. These principles have proven effective in resolving debates and there are numerous examples of the Enlibra principles at work within the Western states. The Oregon Plan for Salmon and Watershed Restoration is one such example.

State Plans

The four Northwest states are represented through the Council and have participated in the Council's Multi-Species Framework process. The governors of the Region have also prepared a statement entitled "Recommendations of Governors of Idaho, Montana, Oregon, and Washington for the Protection and Restoration of Fish in the Columbia River Basin,"¹³⁹ which outlines their preferred strategy for recovery efforts.

The Governors' recommendations include the following general actions:

(1) Habitat Reforms

- a) Designate priority watersheds for salmon and steelhead.
- b) Provide local watershed planning assistance and develop the priority plans by October 1, 2002, and the plans for all Columbia River Basin watersheds by 2005.
- c) Integrate Federal, state, and regional planning processes with the Council's amended Fish and Wildlife Program.
- d) Cooperate with Federal, tribal, and local governments to implement the National Estuary Program for the lower Columbia River estuary, including creation of salmon sanctuaries.

(2) Harvest Reforms

- a) Research the use of more selective fishing techniques and a license buyback program.
- b) Increase harvest selectivity through restrictions of harvest rates, gear, and timing for commercial and non-Treaty sport fisheries, consistent with ensuring survival of the species when combined with other recovery actions.
- c) Establish terminal fisheries below Bonneville Dam and in zone 6.
- d) Strengthen state law enforcement programs and coordinate them with habitat strategies to aid specific watersheds.

¹³⁹ Governors, Pacific Northwest States 2000.

- e) Increase fishing opportunities for species that prey on, and compete with, salmon for food.

(3) Hatchery Reforms

- a) Implement reforms recommended in the Council's 1999 Artificial Production Review Report to congress.
- b) Support the Region's fish managers and the tribes' development of a comprehensive supplementation plan that includes intensive monitoring and evaluation.
- c) Mark hatchery fish that pose threats to listed fish, consistent with the Pacific Salmon Treaty.

(4) Funding and Accountability

- a) Seek funding assistance for existing activities designed to improve ecosystem health and fish and wildlife health and protection.
- b) Work regionally to create a standardized and accessible information system to document regional recovery progress.

Idaho, Montana, Oregon, and Washington each set rules and regulate the harvest of fish and wildlife through the sale of fishing and hunting licenses. State departments of fish and wildlife also maintain programs designed to conserve endangered species and their habitat. In addition to these programs and those that the states operate through the Council's Fish and Wildlife Program, several states have adopted individual plans and programs for fish and wildlife mitigation and recovery.

The **State of Idaho** Department of Fish and Game (IDFG) has released its report on "Idaho's Anadromous Fish Stocks: Their Status and Recovery Options."¹⁴⁰ This report examined the three recovery options that NMFS is considering for Idaho's salmon and steelhead: (1) status quo smolt barging and flow augmentation; (2) improved smolt barging and additional flow augmentation; and (3) natural river in the lower Snake River between Lewiston and Pasco and existing or reduced flow augmentation. IDFG staff recommended that "the natural river option is the best biological choice for recovering salmon and steelhead in Idaho." The State of Idaho and IDFG Commission have adopted a "normative river standard ... [that] requires phasing out smolt transportation and allowing smolts to migrate naturally in the river as river conditions improve."¹⁴¹ Documents outlining wildlife impacts and the goals and objectives of the Idaho mitigation program include The Idaho Department of Fish and Game Policy Plan and Strategic Plan.

The state of Idaho has created an Office of Species Conservation to work on subbasin planning and to coordinate the efforts of all state offices addressing natural resource

¹⁴⁰ The report on Idaho's anadromous fish stocks was completed May 1, 1998. A second printing was released June 8, 1998. IDFG 1998.

¹⁴¹ IDFG 1998, Conclusion p. 1.

issues. The legislation establishing the Office of Species Conservation states that the Office shall oversee implementation of Federal recovery plan; coordinate state departments and divisions related to endangered, threatened, and petitioned species; provide input and comment related to endangered species; and provide an ombudsman for the citizens of Idaho harmed or hindered by regulations related to ESA. The state actions targeted by this office include the following:

- (1) continue diversion screening, in cooperation with BPA and the Bureau;
- (2) improve flow augmentation for fish passage through state programs;
- (3) implement the Forest Practices Act to maintain forest tree species, soil, air, and water resources and provide a habitat for wildlife and aquatic life;
- (4) complete cumulative watershed effects assessments on more than 100 watersheds to support watershed planning; and
- (5) require 30-foot buffers along Class II streams.

The **State of Oregon** has created "The Oregon Plan," which emphasizes coho salmon in coastal river basins. The goal of the plan is to restore salmon and trout populations and fisheries "to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits."¹⁴² The Oregon Plan involves the following: (1) coordination of effort by all parties, (2) development of action plans with relevance and ownership at the local level, (3) monitoring progress, and (4) making appropriate corrective changes in the future.

The Oregon Plan includes the following programs designed to benefit salmon and watershed health:

- Oregon Department of Agriculture water quality management plans;
- Oregon Department of Environmental Quality development of TMDLs in targeted basins; implementation of water quality standards;
- Oregon Watershed Enhancement Board funding programs for watershed enhancement programs, and land and water acquisitions;
- ODFW and Oregon Water Resources Department (OWRD) programs to enhance flow restoration;
- OWRD programs to diminish over-appropriation of water sources;
- ODFW and Oregon Department of Transportation programs to improve fish passage; culvert improvements/replacements;
- Oregon Department of Forestry state forest habitat improvement policies and the Board of Forestry pending rules addressing forestry effects on water quality and riparian areas;

¹⁴² Oregon Executive Order No. EO 99-01 1999.

- Oregon Division of State Lands and Oregon Parks Department programs to improve habitat health on state-owned lands;
- Department of Geology and Mineral Industries program to reduce sediment runoff from mine sites; and
- state agencies funding local and private habitat initiatives; technical assistance for establishing riparian corridors; and TMDLs.

The **State of Washington** has published its "Statewide Strategy to Recover Salmon."¹⁴³ The goal of the plan is to "restore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely."¹⁴⁴ The Statewide Strategy focuses on salmon, but also emphasizes the need to maintain an adequate and clean water supply that sustains people, fish and wildlife. The Governor's Salmon Recovery Office has identified seven "salmon recovery regions" where state and local governments, tribes, business groups, and citizens work together to monitor habitat conditions, collect data, and implement habitat restoration projects appropriate to the regional environment and local needs.

Washington's Department of Fish and Wildlife (WDFW) and tribal managers have been implementing the Wild Stock Recovery Initiative since 1992. The managers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The plans also concentrate on harvest and hatchery actions, as well as including comprehensive hatchery planning.

Washington State closed the mainstem Columbia River to new water rights appropriations in 1995, but is now in the process of reopening it. State representatives have asked BPA and other interested entities in the Basin to develop a new water management program, called the Columbia River Regional Initiative, to meet the needs of a growing population and healthy economy, while at the same time meeting the needs of fish and healthy watersheds.¹⁴⁵ Applications for new water withdrawals are being denied, based on the need to address ESA issues. The state has acquired "trust water rights" under two statutes, one passed in 1989 (Chapter 90.38 RCW for the Yakima Basin), and the other in 1991 (Chapter 90.42 RCW for the remainder of the state). The state recently convened a Joint Executive Water Policy Group to develop new water legislation focusing on instream flows, relinquishment policies, water for growing communities, and funding for water infrastructure.¹⁴⁶ Washington State has been seeking to process new water rights from the mainstem Columbia and Snake rivers to meet growing water needs. The new permits would include "appropriate conditions to protect fish and require efficient use of water."¹⁴⁷

¹⁴³ State of Washington 1999.

¹⁴⁴ Extensive information on Washington's salmon recovery efforts is available at <http://www.wa.gov/wdfw/recovery.htm>.

¹⁴⁵ Fitzsimmons, Tom 2001.

¹⁴⁶ State of Washington 2002.

¹⁴⁷ Locke, Gary 2001.

The Watershed Planning Act, passed in 1998, encourages voluntary planning by local governments, citizens, and tribes for water supply and use, water quality, and habitat at the Water Resource Inventory Area or multi-Water Resource Inventory Area level. Grants are made available to conduct assessments of water resources and to develop goals and objectives for future water resources management. The Salmon Recovery Funding Act established a board to localize salmon funding. The Board will deliver funds for salmon recovery projects and activities based on a science-driven, competitive process.

Washington's Forests and Fish Report¹⁴⁸ contains recommendations for the development and implementation of rules, statutes, and programs to develop biologically sound and economically practical solutions that would improve and protect riparian habitat on non-Federal forest lands in the State of Washington. The Forest Practices Rules (Title 222 Washington Administrative Code) give direction on how to implement the Forest Practices Act.¹⁴⁹ These rules apply to non-Federal, forested lands within the state of Washington, and afford protection for forest soils, fisheries, wildlife, water quality and quantity, air quality, recreation, and scenic beauty, while maintaining a viable forest products industry. Through the NEPA processes on actions that may significantly effect the environment, Federal agencies will explain whether they are consistent with these rules.

The Washington legislature may amend the Shoreline Management Act, giving local governments options for complying with endangered species requirements in marine areas. The state is also establishing the Lower Columbia Fish Recovery Board to begin drafting recovery plans for the lower Columbia region. The future impacts of the Board's efforts will depend on legislative and fiscal support. The Washington Department of Transportation is considering changing its construction and maintenance programs to diminish effects on stream areas and to improve fish passage. The program may qualify for a limit under NMFS' 4(d) rule to conserve listed species.

The state of Washington is under a court order to develop TMDL management plans on each of its 303(d) water quality-listed streams. It has developed a schedule that is updated yearly; the schedule outlines the priority and timing of TMDL plan development.

Tribal Plans

In 1996, the Nez Perce, Umatilla, Warm Springs and Yakama Nation tribes¹⁵⁰ composed a joint restoration plan for anadromous fish in the Columbia River Basin. This plan, called Wy-Kan-Ush-Mi Wa-Kish-Wit, or "Spirit of the Salmon":

"... provides a framework for restoring anadromous, or sea-going, fish stocks, specifically salmon, Pacific lamprey (eels), and white sturgeon in upriver areas above Bonneville Dam. The plan's geographic scope extends wherever these fish migrate

¹⁴⁸ Washington State Department of Natural Resources (WDNR) 1999.

¹⁴⁹ Revised Code of Washington 76.09.

¹⁵⁰ These four tribes, which comprise the Columbia River Inter-Tribal Fish Commission, have Treaty rights to harvest Columbia Basin anadromous fish.

and throughout the Columbia River Basin wherever activities occur that directly affect them."¹⁵¹

The plan's objectives are to halt the decline of salmon, lamprey, and sturgeon populations above Bonneville Dam within seven years; to rebuild salmon populations to annual run sizes of four million above Bonneville Dam within 25 years in a manner that supports tribal ceremonial, subsistence and commercial harvests; and to increase lamprey and sturgeon to naturally sustaining levels within 25 years in a manner that supports tribal harvests. To achieve these objectives, the plan emphasizes strategies and principles that rely on natural production and healthy river systems.

The first volume of the two-volume plan sets out 13 scientific hypotheses and the recommended actions associated with each, along with 10 institutional recommendations. The second volume contains subbasin-by-subbasin return goals and the watershed restoration actions that must be undertaken to achieve them.

The technical recommendations, which are aimed at increasing survival at each stage of the salmon's life cycle, are presented as scientific hypotheses that summarize various restoration problems. Organized by salmon life cycle stages, each hypothesis proposes near- and long-term actions, identifies expected results, and names the institutional and decisional processes required to carry out the recommended actions. The plan's technical recommendations cover hydro operations on the mainstem Columbia and Snake rivers; habitat protection and rehabilitation in the Basin above Bonneville Dam, in the Columbia estuary and in the Pacific ocean; fish production and hatchery reforms, and in-river and ocean harvests.

The Nez Perce, Warm Spring, Umatilla, and Yakama tribal governments officially approved Wy-Kan-Ush-Mi Wa-Kish-Wit in January and February 1996. The tribes are now seeking to implement salmon restoration in conjunction with the Basin's other sovereigns—the states, other tribes and the Federal government—and in cooperation with their neighbors throughout the Basin's local watersheds and other citizens of the Northwest.¹⁵²

Tribal plans also rest in part on the ongoing results of *U.S. v. Oregon*, discussed in Chapter 1 and in Section 2.3.2.3 of this chapter. This case, begun in the 1968 by the Columbia River treaty tribes and the United States against Oregon, and (eventually) Washington and Idaho, supports the tribes' treaty-secured fishing rights. Under it, the tribes ultimately won recognition of their right to an even split of the harvestable fish between treaty and non-treaty fisheries and acceptance as co-managers of the fishery. The Columbia River Fish Management Plan addresses issues such as the allocation of state and tribal harvests, fishing seasons, hatchery production, hatchery locations, and disposition of surplus returning adult salmonids of hatchery origins. The last plan expired in 1998 and has not yet been renegotiated.

¹⁵¹ CRITFC 1996, p 3.

¹⁵² CRITFC 1996, p 3.

In addition, several of the Basin's thirteen federally recognized tribes have been developing, as part of the Multi-Species Framework process, a statement entitled "The Tribal Vision for the Columbia River and How to Achieve It." This document emphasizes the following key elements of the tribes' philosophical approach to fish and wildlife mitigation and recovery:

"Tribal cultures, economies, religions, and ways of life throughout the Columbia River Basin are endangered no less than our air, water, fish, wildlife, plants and other resources—they depend on them, and cannot exist in their absence."¹⁵³

"The tribal vision for the future:

- is one in which people return to a more balanced and harmonious relationship with the environment
- is one where people, fish, wildlife, plants and other natural and cultural resources are once again biologically healthy and self-sustaining
- [includes] a healthy Columbia River Basin ecosystem also characterized by clean air and clean water
- not only supports viable and genetically diverse fish and wildlife resources that provide direct benefits to society, through harvest and improved physical health of tribal and non-tribal members, but also nourishes the spirit
- [is one in which] tribal sovereignty, treaty rights and trust responsibility are honored, respected, and fulfilled."¹⁵⁴

Strategies for achieving this vision include the following:

- Emphasize healthy rivers and watersheds with abundant and diverse species assemblages and their management, maintenance and restoration, with particular attention to ecosystem diversity, productivity and stability.
- Emphasize natural production provided by such rivers and watersheds.
- Reintroduce and restore anadromous fish to the rivers and streams that historically supported them, in numbers sufficient to provide for the needs of the ecosystem and people, in perpetuity.¹⁵⁵

Non-Governmental Organization (NGO) Plans

There are dozens, possibly hundreds, of non-governmental organizations (NGOs) and individuals with plans and projects to aid in the mitigation and recovery of fish and wildlife affected not only by the FCRPS, but also by all the causes of habitat decimation, declining species diversity, and overall population declines. These groups address resident fish, anadromous fish, and wildlife. Given the number and diversity of NGOs, as well as their often-transitory nature, BPA cannot qualify or quantify the effects of their

¹⁵³ CRITFC 1999, pp. 2-3.

¹⁵⁴ CRITFC 1999, p. 3.

¹⁵⁵ CRITFC 1999, p. 5.

efforts. See Appendix D for some of the diverse viewpoints on fish and wildlife recovery.

Independent Science Advisory Board (ISAB) Review

On August 22, 2001, the ISAB issued their Review of Salmon Recovery Strategies for the Columbia River Basin. The Review examined the four Northwest states Governors' Plan, the Council's 2000 Fish and Wildlife Program, the NMFS 2000 BiOp, and the Basinwide Recovery Strategy. In summary, the ISAB stated the following:

Taken together, the four papers represent a realistic assessment of the problems facing salmon recovery in the Columbia River Basin. There is consistency in many of the kinds of recovery actions proposed in the documents, and the scientific bases for these actions are generally sound. However, the strategies as articulated in the papers usually lack details about how various recovery actions would be implemented (with the possible exception of actions related to mainstem passage) and as a consequence we were uncertain that the actions proposed in them will actually lead to salmon recovery. There is no doubt that the proposed strategies would result in some beneficial results for salmon, which is encouraging, but the status of many of the stocks has become very grave. Recovery documents containing *explicit and quantified details* are needed so that their sufficiency can be evaluated. We believe the four documents, collectively, fall short of providing this detail.¹⁵⁶

2.3.2.5 Back to the Beginning: The Policy Decisions Change Over Time

Policy decisions, like the environment they address, are dynamic and change over time. The intent of this EIS is to show the many policy choices and their consequences. There will, however, be no one right choice for all agencies or constituents.

"Society weighs policy choices in the context of prevailing values and preferences. Even with identical scientific information and the identical conditions of stocks, a salmon policy position from the end of the nineteenth century doubtless would be different than a current policy on salmon...."

The search for the scientifically optimal policy solution will be futile because of changing values and preferences."¹⁵⁷

As evidenced by the example of the Department of the Interior positions shown below, policies change, even within a single entity.

¹⁵⁶ ISAB 2001, p. iii.

¹⁵⁷ Lackey, R. T. 1996b.

Department of the Interior, 1946

"At the outset [the Department of the Interior] acknowledges that the decision must be made by Congress, with the thoughtful attention to the sentiment of the people of the region. The Department agrees that interests of the Columbia River fisheries should not be allowed indefinitely to retard full development of the other resources of the river. [The Department] concludes moreover that the overall benefits to the Pacific Northwest from ... development of the Snake and the Columbia are such that the present salmon run must, if necessary, be sacrificed. This means to the Department that the Government's efforts should be directed toward ameliorating the effect of an ultimate, and inevitable full development of the river's resources upon the immediately injured interests and not toward a vain attempt to hold still the hands of the clock."¹⁵⁸

Department of the Interior, 1999

"It is clear in our assessment that [drawdown of the four Lower Snake River dams] would provide many more benefits to fish and wildlife than the other alternatives.... Also, we believe [drawdown] would best increase survival of juvenile anadromous fish [I]t is the only alternative that addresses restoration of natural or near natural riverine conditions which would produce a myriad of positive influences on natural processes and fish and wildlife. Therefore, based on our biological evaluation of the [Corps of Engineers' Lower Snake River Feasibility Study Draft EIS], the U.S. Fish and Wildlife Service concludes that the benefits to fish and wildlife from [drawdown] exceed the benefits provided by the other alternatives."¹⁵⁹

Such examples serve as a reminder that policies are temporal and transient. An agency's policy choice today may be the source of problems future generations try desperately to solve. Given the multitude of variables, interests, and the impossibility of keeping current on all the potential effects from a policy decision, this EIS can only inform what decisions are made. It cannot predetermine what decisions should be made, who should make them, or how they should be implemented.

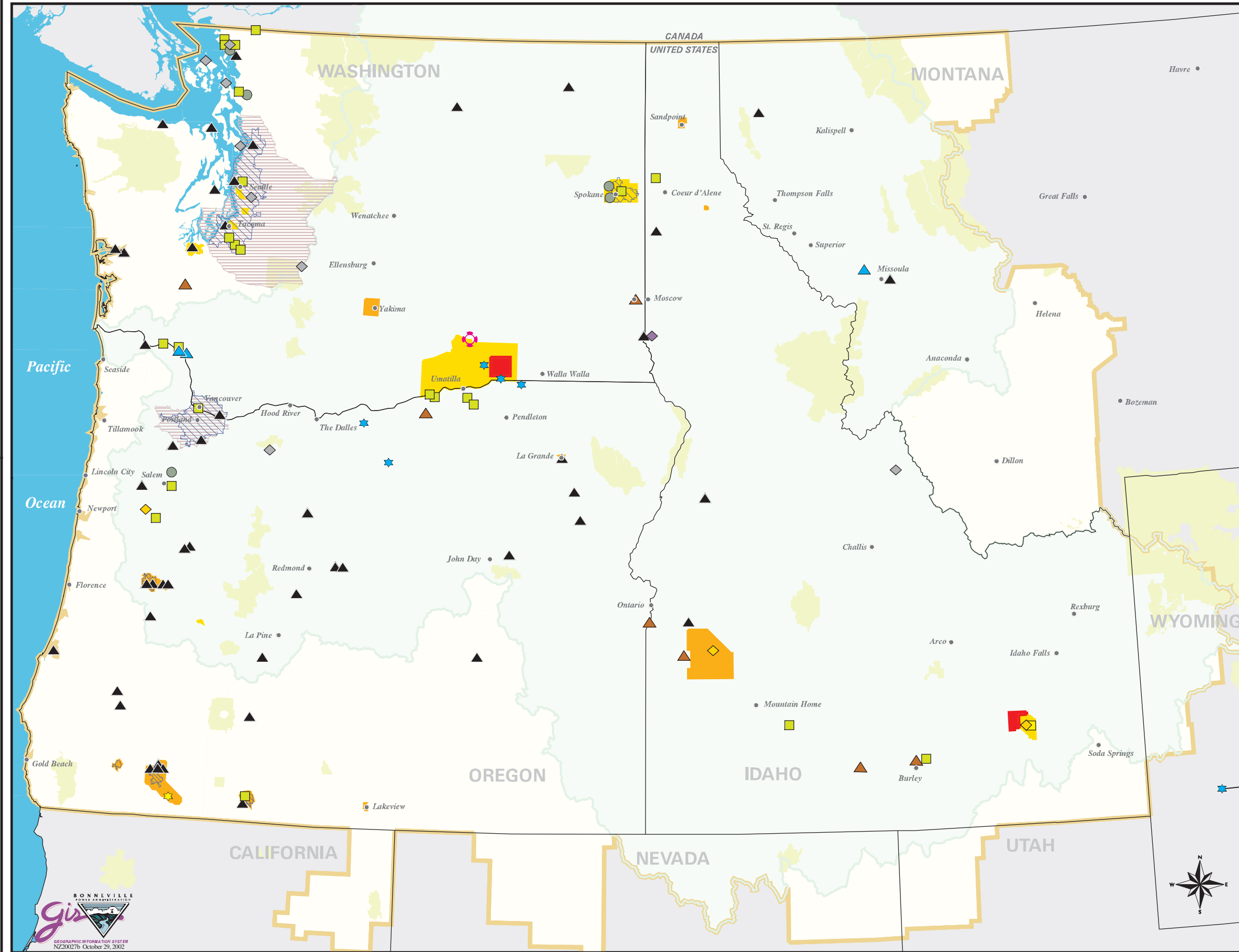
➔ **Chapter 3 describes and compares the alternative Policy Directions assembled from the many regional processes currently working to address the uncoordinated and inefficient Status Quo Policy Direction.**

¹⁵⁸ Bessey, R.F. 1947.

¹⁵⁹ Corps 2002b, at Appendix M, p. ES-2.

Figure 2.6

Air Quality and Non-Hydro Generation



Legend

- Columbia River Basin
- BPA Service Area
- PM10 (particulate matter less than 10 micrometers)**
 - Maintenance
 - Moderate
 - Serious
- CO (carbon monoxide)**
 - Maintenance
 - Moderate
- O3 (ozone)**
 - Maintenance
- Federal Class I Area
- Thermal Plants (primary fuel type)**
 - Coal
 - Oil
 - Gas
 - Biomass*
 - Nuclear
 - Municipal Solid Waste
 - Black Liquor
 - Raw Sulfur
 - Biogas / Methane
 - Multiple types
- Renewable Plants (primary fuel type)**
 - Solar
 - Wind

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: Non - Attainment Areas from EPA - Region 10, Class I Federal Areas from 40 CFR Sec. 81.400 et seq. (2001), BPA Regional GIS Database, 2002.

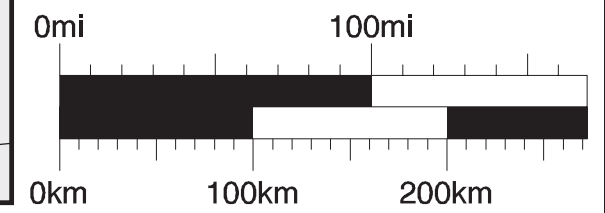


Figure 2.7

Water Quality Impaired Rivers - Section 303(d) - Clean Water Act

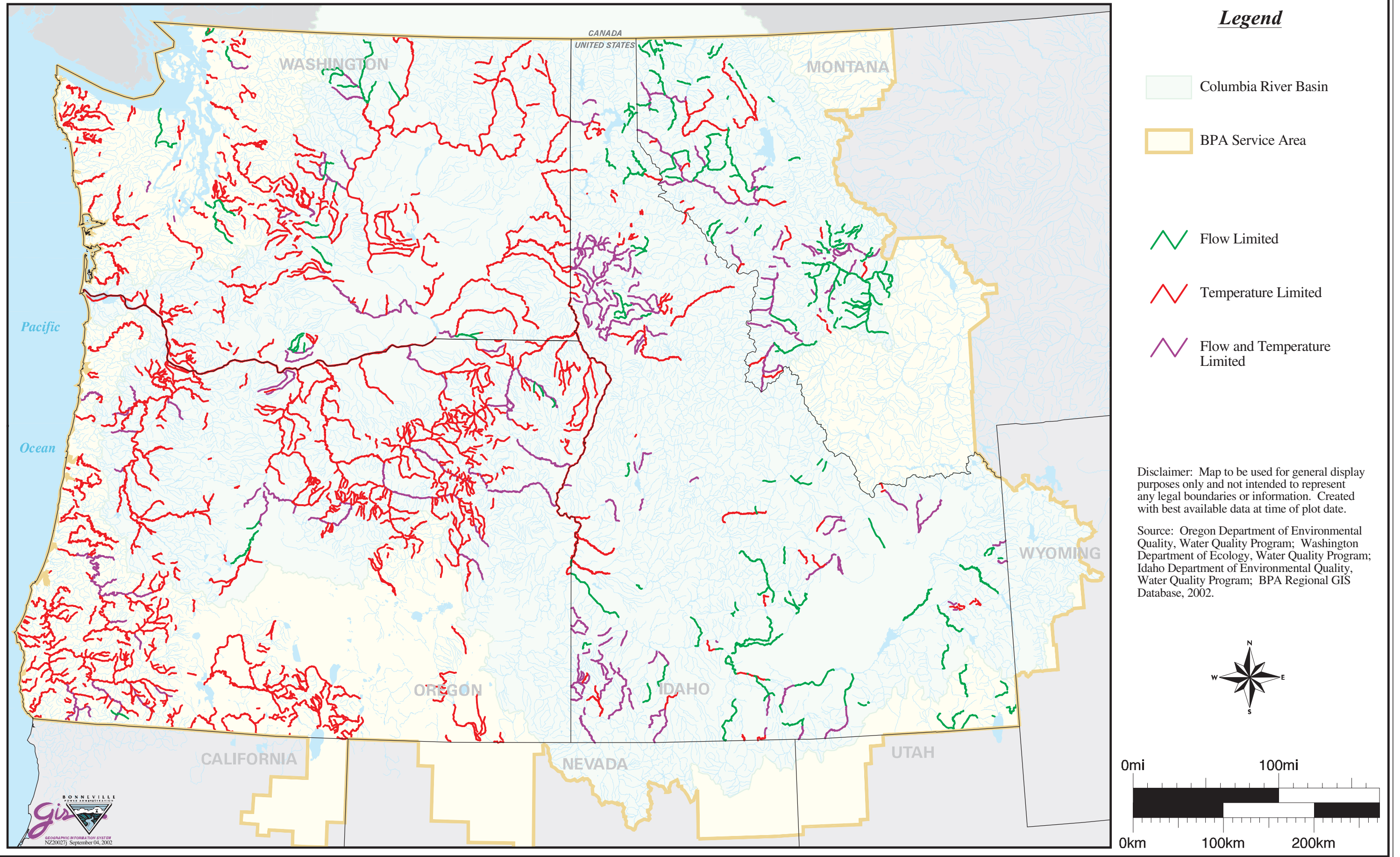
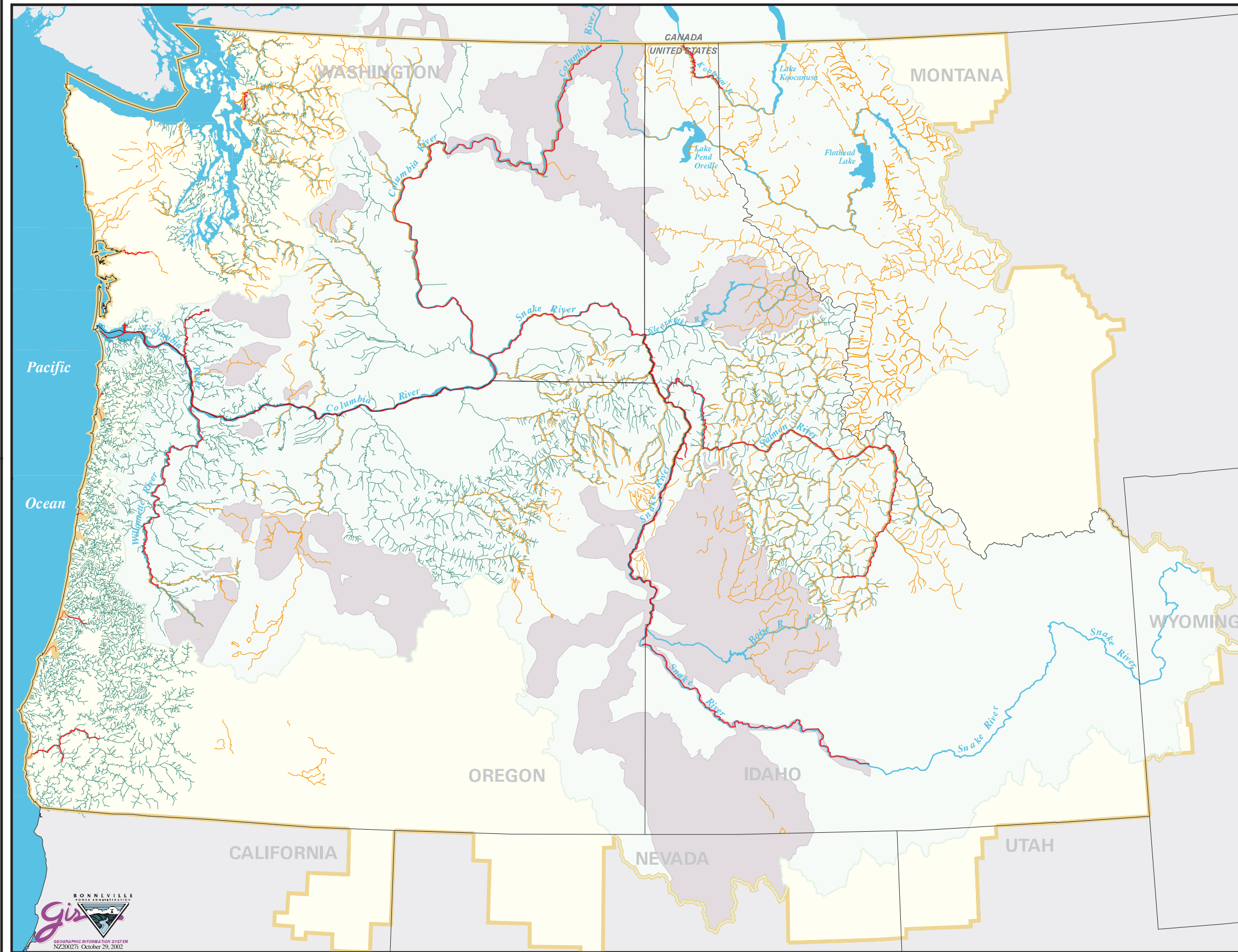


Figure 2.8

Listed Anadromous and Resident Fish Distribution



Legend

Columbia River Basin

BPA Service Area

Historic Range

Anadromous Fish Extinct

Present Range

Listed Anadromous Fish Species

Listed Resident Fish - Bull Trout

Listed Anadromous & Resident Fish - Sturgeon

Note: Fish distribution is generalized and actual historic and present ranges may differ.

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: Oregon Department of Fish and Wildlife; Washington Department of Fish and Wildlife; Idaho Fish and Game; Montana, Fish, Wildlife and Parks; StreamNet; BPA Regional GIS Database, 2002.

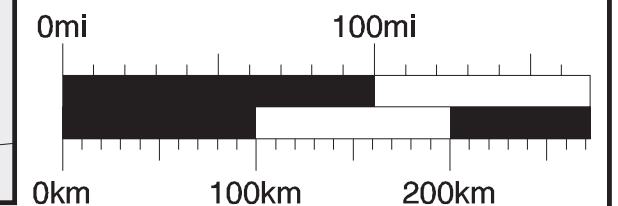


Figure 2.9

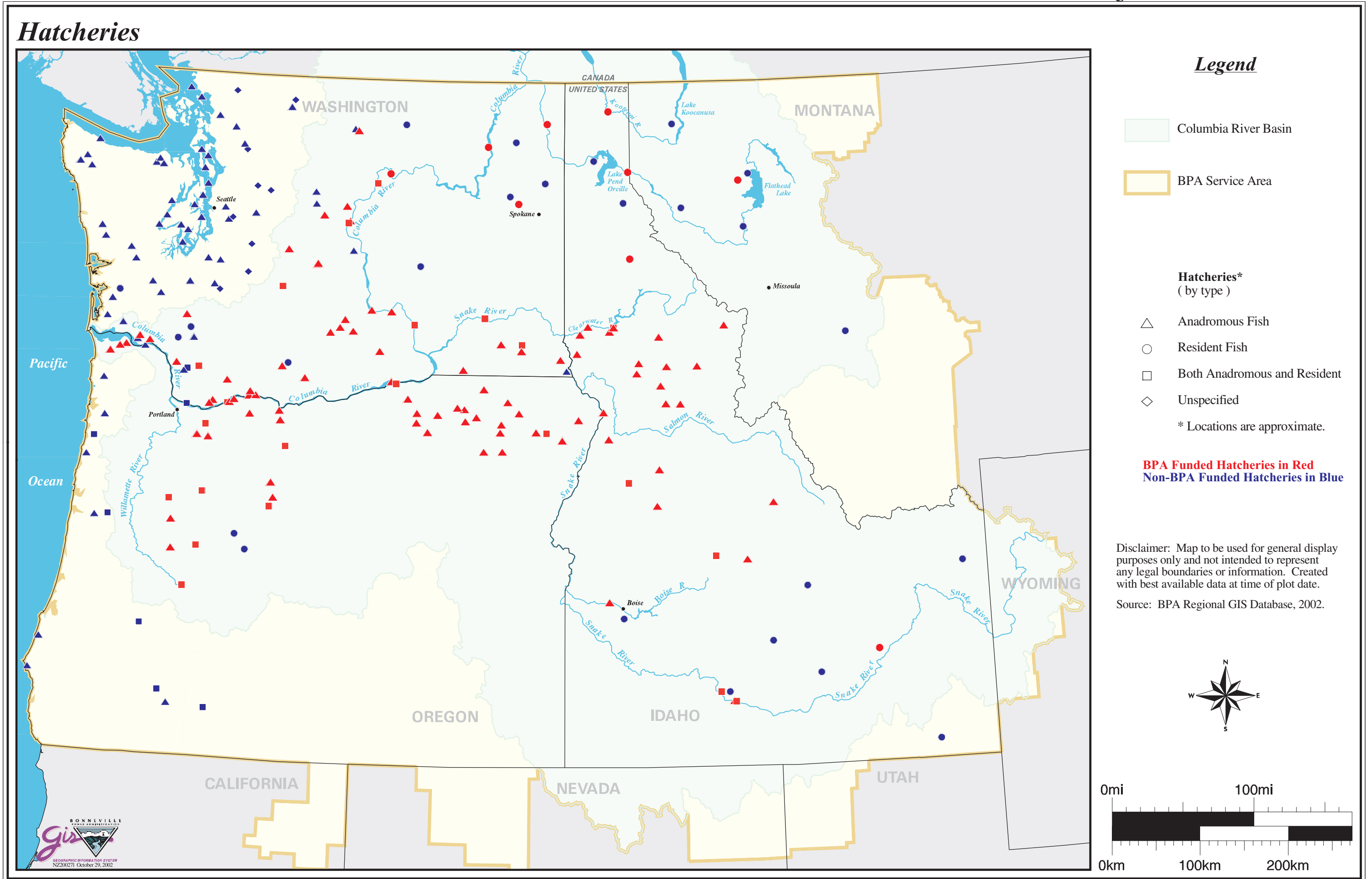
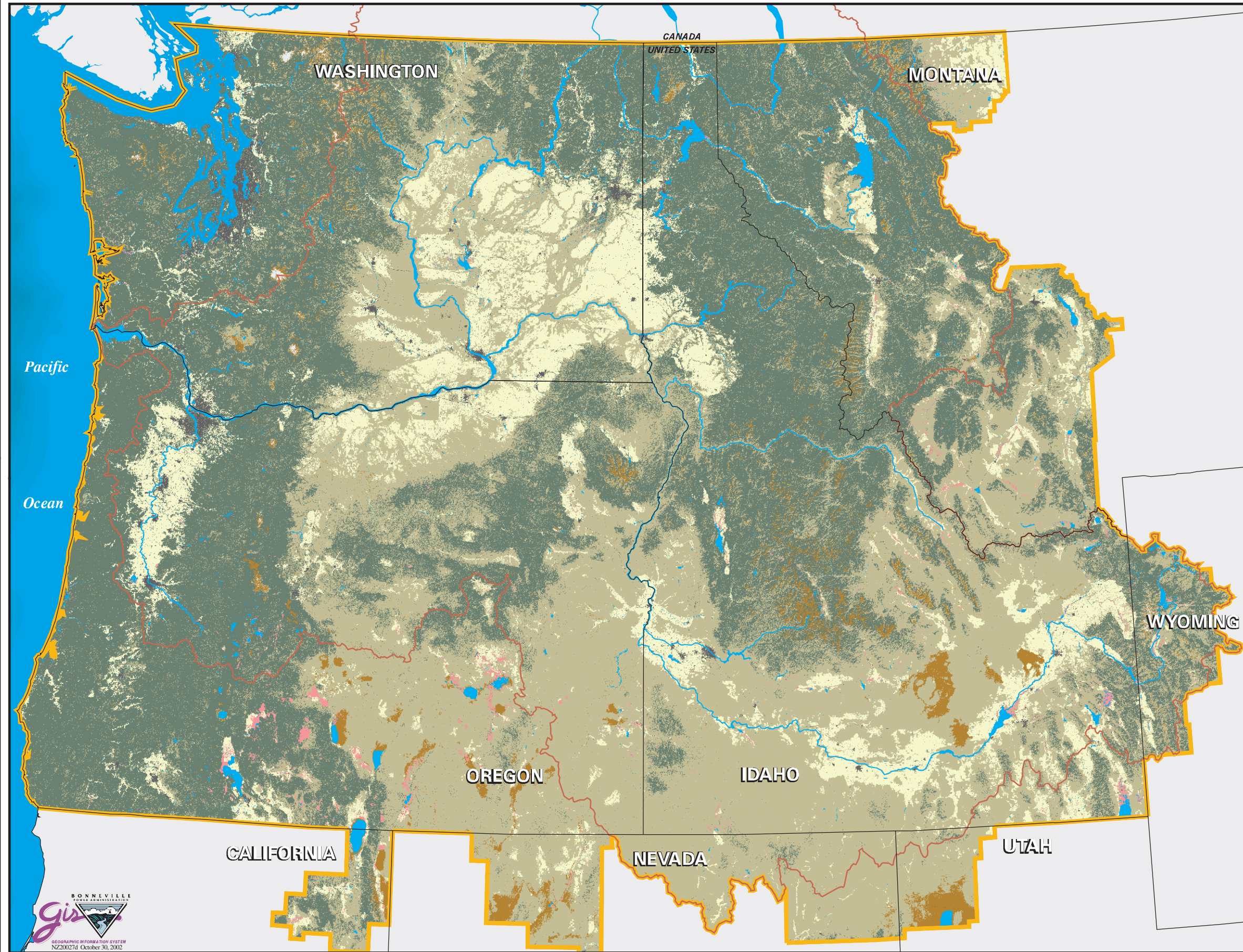




Figure 2.10





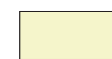

Land Use for the Pacific Northwest



Legend

-  Columbia River Basin
-  BPA Service Area Boundary

Land Use

-  Residential and Commercial
-  Bare Lands and Mining Areas
-  Forest Lands
-  Shrublands, Grasslands and Transitional Lands
-  Agricultural Lands
-  Wetlands

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: Land Use data from US Geological Survey; BPA Regional GIS Database, 2002.

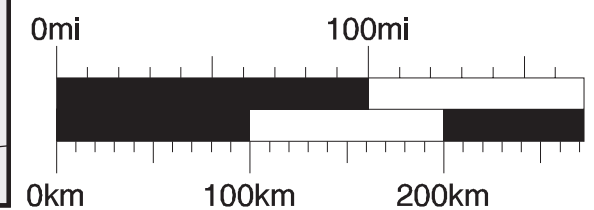
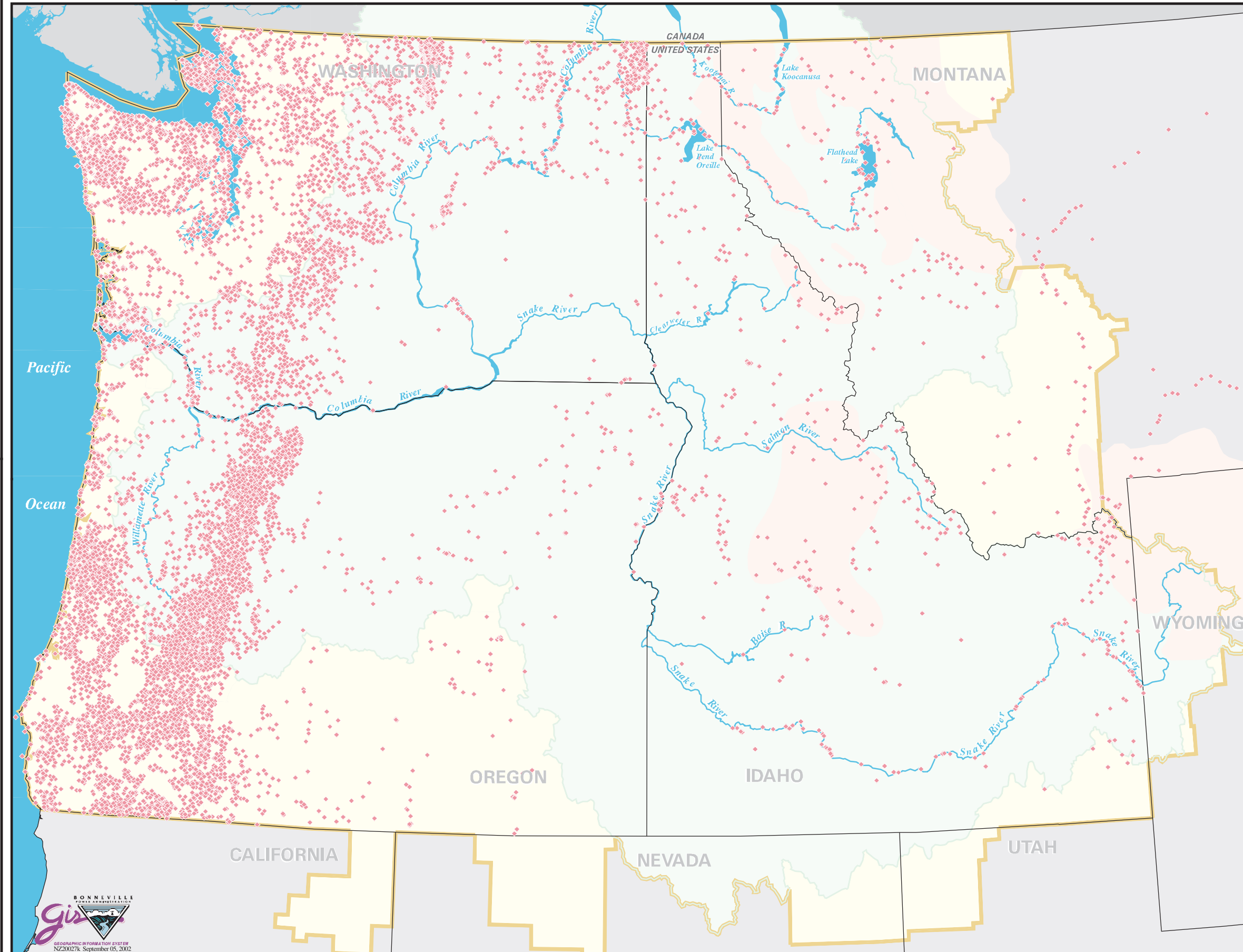


Figure 2.11

Listed Wildlife



Legend

- Columbia River Basin
- BPA Service Area
- Federally Listed Threatened or Endangered Animal Species Territory
- Note: Some species may have broad roaming ranges.
- Federally Listed Threatened or Endangered Wildlife Observation

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: Idaho Conservation Data Center; Montana Natural Heritage Program; Oregon Natural Heritage Program; Washington Department of Fish & Wildlife; BPA Regional GIS Database, 2002.

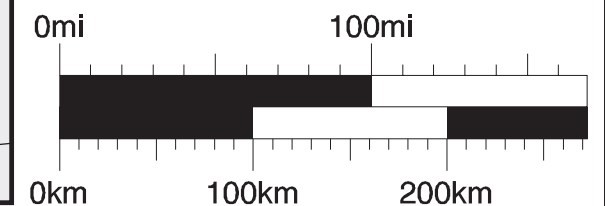
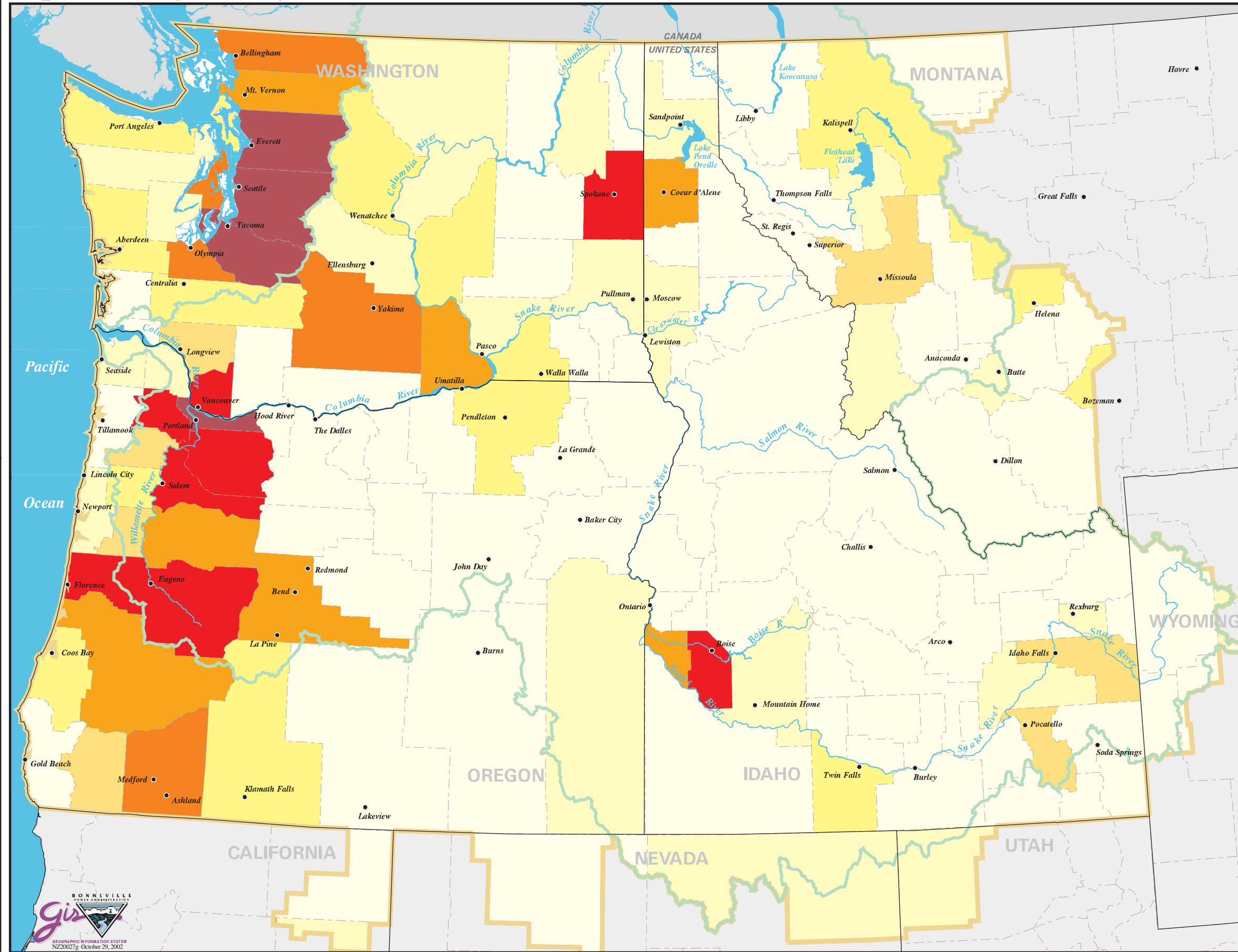




Figure 2.12









Population by County



Legend

-  Columbia River Basin
-  BPA Service Area Boundary

POPULATION BY COUNTY (2000 totals)

	< 24,999
	25,000 - 49,999
	50,000 - 74,999
	75,000 - 99,999
	100,000 - 149,999
	150,000 - 249,999
	250,000 - 499,999
	> 500,000

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: US Census Bureau, 2000 Census of Population, Public Law 94-171; BPA Regional GIS Database, 2002.

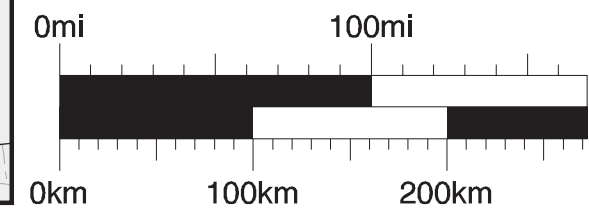
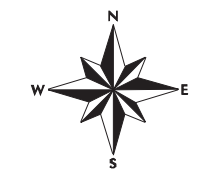
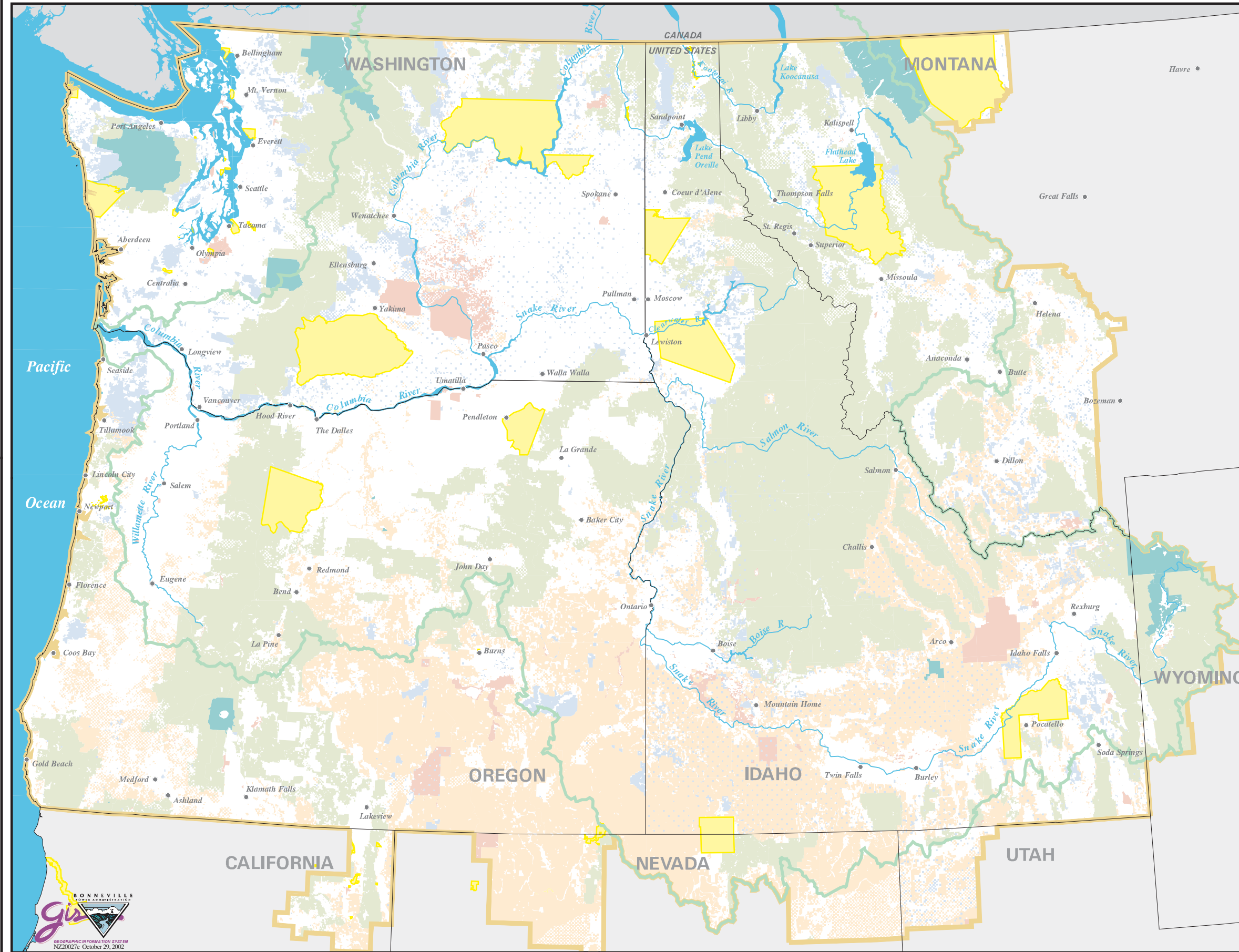




Figure 2.13







Land Ownership



Legend

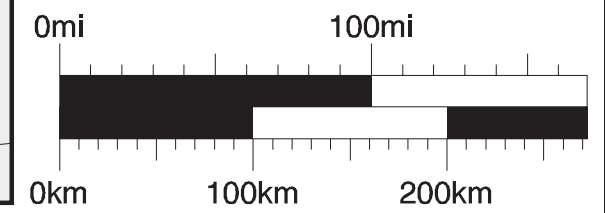
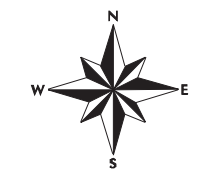
-  Columbia River Basin
-  BPA Service Area Boundary

Land Ownership

-  Forest Service
-  BLM
-  National Park Service
-  Other Federal Lands
-  State Lands
-  Tribal Lands

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

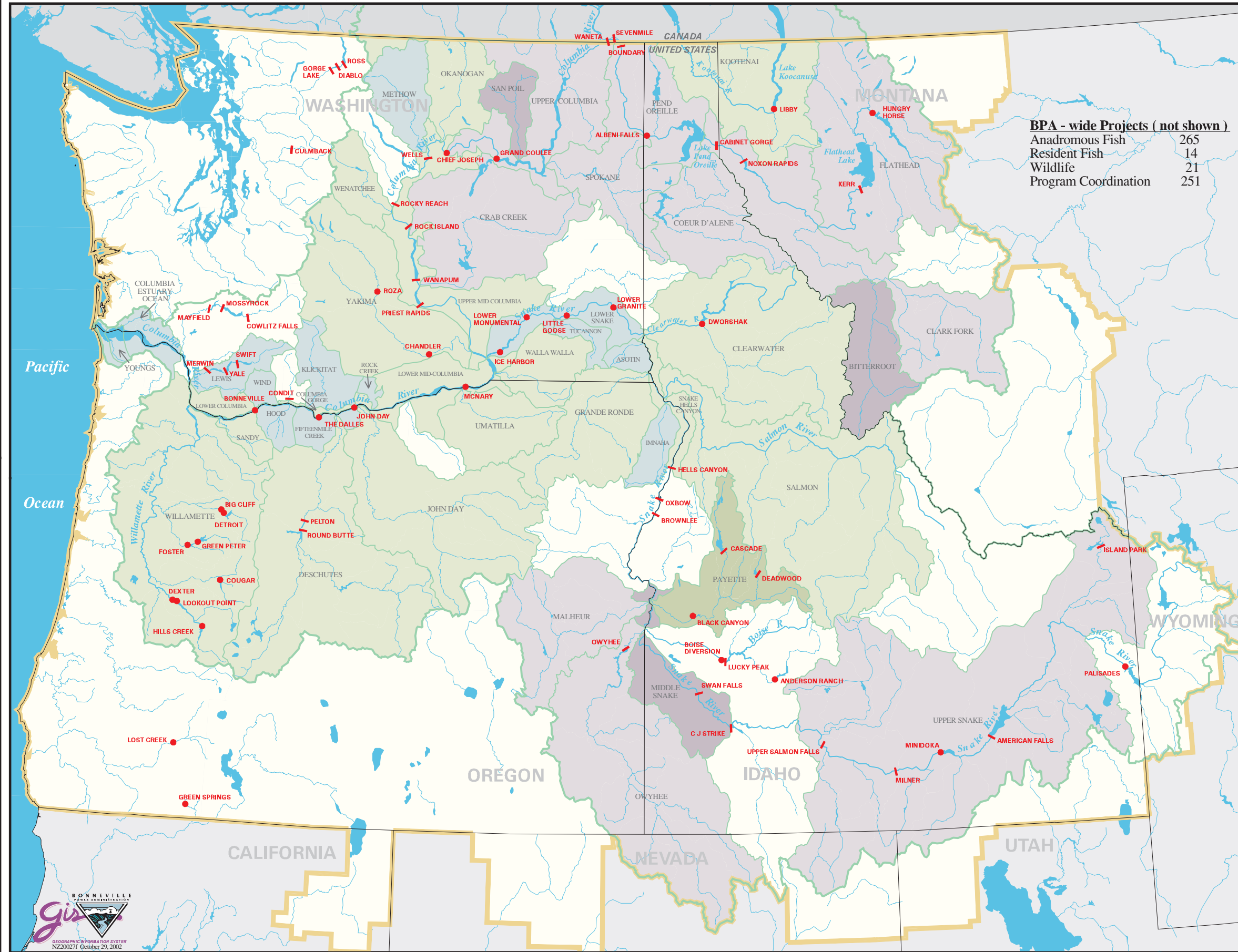
Source: Interior Columbia Ecosystem Management Project (ICBEMP); Montana State Library Natural Resource Information System; BPA Regional GIS Database, 2002.



Geographic Information System
NZ20027e October 29, 2002

Figure 2.14

BPA Fish & Wildlife Projects by Subbasin / Hydro Sites



BPA - wide Projects (not shown)

Anadromous Fish	265
Resident Fish	14
Wildlife	21
Program Coordination	251

Legend

- Columbia River Basin
- BPA Service Area

Projects by Type

- Anadromous Fish
- Resident Fish
- Wildlife
- Resident Fish & Wildlife
- Multiple Types (Anadromous Fish, Resident Fish, Wildlife and Program Coordination)

- Non - Federal Hydro Site
- Federal Hydro Site

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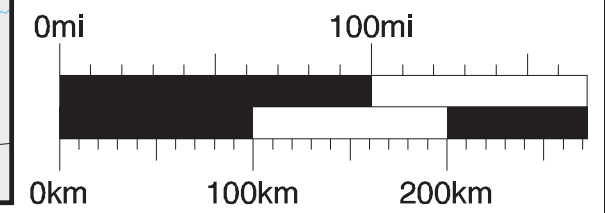
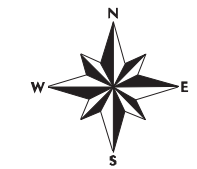
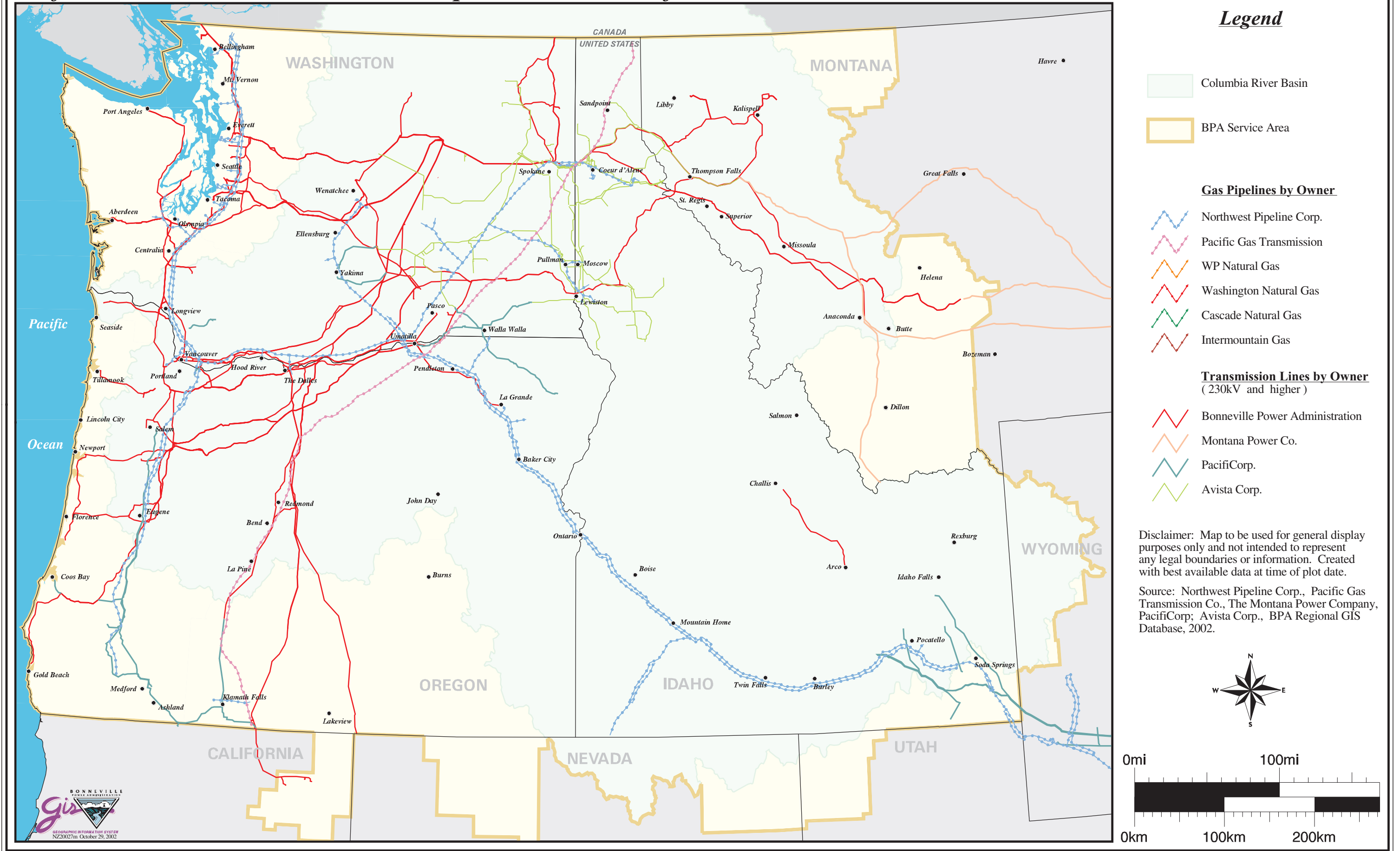


Figure 2.15

Major Transmission Lines and Gas Pipelines in the Pacific Northwest



Legend

- Columbia River Basin
- BPA Service Area

Gas Pipelines by Owner

- Northwest Pipeline Corp.
- Pacific Gas Transmission
- WP Natural Gas
- Washington Natural Gas
- Cascade Natural Gas
- Intermountain Gas

Transmission Lines by Owner (230kV and higher)

- Bonneville Power Administration
- Montana Power Co.
- PacifiCorp.
- Avista Corp.

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.

Source: Northwest Pipeline Corp., Pacific Gas Transmission Co., The Montana Power Company, PacifiCorp; Avista Corp., BPA Regional GIS Database, 2002.

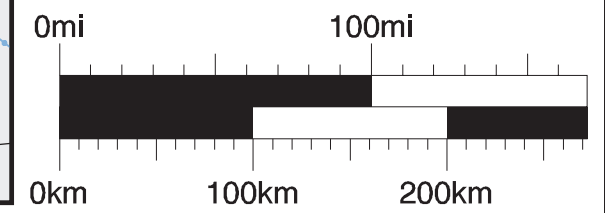
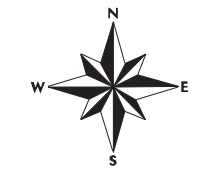
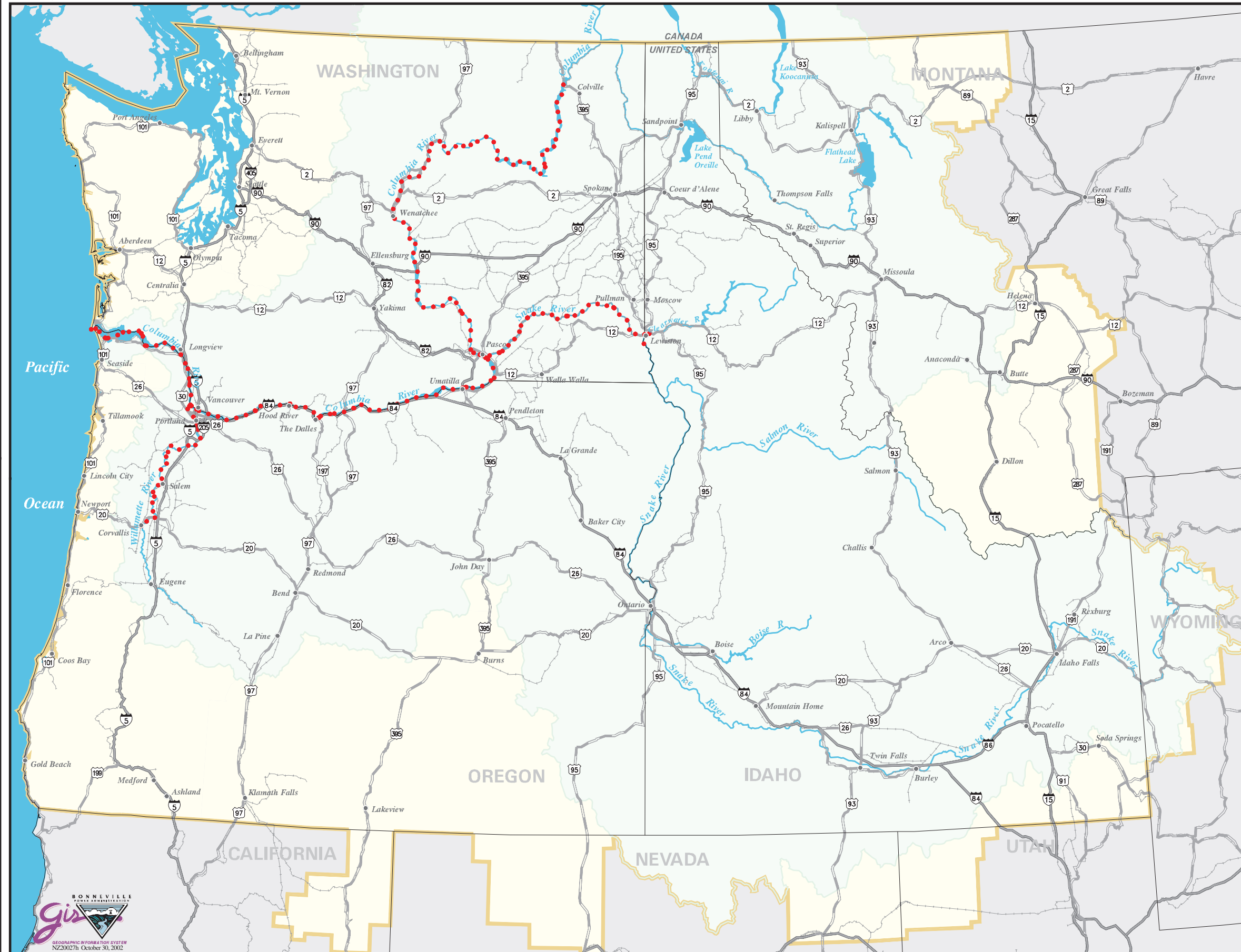


Figure 2.16

Major Transportation Routes



Legend

- Columbia River Basin
- BPA Service Area
- U.S. Highway
- Interstate Highway
- Railroad
- Navigable Channels for Commerce

Disclaimer: Map to be used for general display purposes only and not intended to represent any legal boundaries or information. Created with best available data at time of plot date.
Source: Navigable channels from US Geological Survey; BPA Regional GIS Database, 2002.

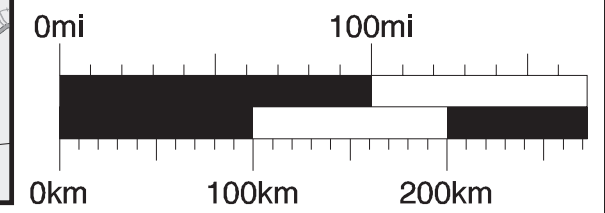
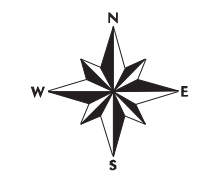
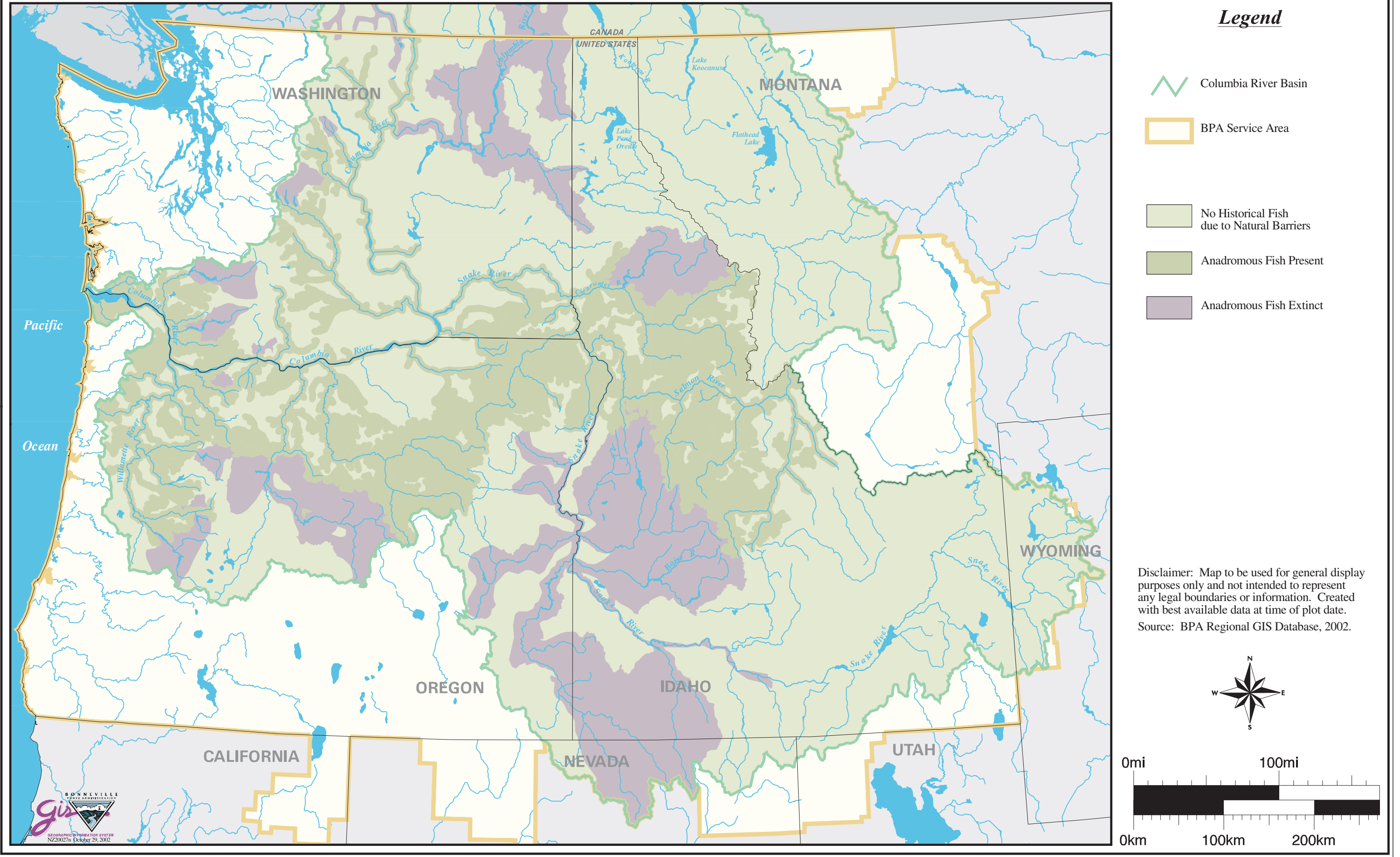


Figure 2.17

Present and Historic Range of Anadromous Fish in the Columbia River Basin (approximate)



Preparation for

CHAPTER 1
Purpose and
Need for
Action

CHAPTER 2
Policy
History

Implementing a
Decision

Comparison of Alternatives

Chapter 3
**Comparison of
Alternatives**

Chapter 4
**Implementation
and Responses
to Change**

for Implementing a Decision

Chapter 3

*Defining and
Deciding on the
Alternatives*

*Description of the
Policy Direction
Alternatives*

*Comparing the
Policy Directions*

*Tailoring a Policy
Direction*

*Section 3A:
Preferred Alternative
(PA 2002)*

Assessing the
Environmental
Conditions

CHAPTER 5
Affected
Environment
and
Environmental
Consequences

for Making a
Decision

Choices for Managing

CHAPTER 6
Governance

the Fish & Wildlife
Mitigation & Recovery
Efforts

CHAPTER 3 – COMPARISON OF ALTERNATIVES

- **Explains how the five basic Policy Direction alternatives were developed** and how decisions on those alternatives can be made.
 - **Identifies the key regional issues** that help to determine the scope of any Policy Direction.
 - **Describes and compares the Policy Directions (including the BPA Preferred Alternative—PA 2002) as to intent and effect.** These Policy Directions are based on the many options that have been or continue to be discussed in the ongoing processes within the BPA service territory and Columbia River Basin. The Policy Directions are compared against the Status Quo (No Action). The comparison for the overall Policy Directions is based on the more detailed discussion and analysis in Chapter 5 (Environmental Consequences) and, for PA 2002, in Section 3A at the end of this Chapter.
 - **Provides ways for the public and the decisionmaker to modify, extend, or create new Policy Directions** to meet particular needs or desired ends, and to determine potential environmental consequences of those changes.
-

***Refresher:** The items below are summarized from Chapters 1 and 2 to provide an easy reference for the reader as he or she moves through this important chapter.*

- (1) Many Northwest residents appear to support the concept of diverse and healthy populations of fish and wildlife and other valued natural resources. However, regional decisionmakers have been unable to reach agreement on a plan that protects the environment, meets the other needs of the Region, and under which they can all act consistently to implement its measures.*
- (2) Conflicting laws and legal mandates have caused inconsistencies in the efforts to take actions to protect and enhance fish and wildlife in the Region. The resulting mitigation and recovery policy has not been as coordinated and consistent as BPA needs.*
- (3) A unified planning approach is needed, but it is not yet clear what it should or will look like now and in the future. Many different approaches are possible. The resolution lies in (1) a broad regional acceptance of a comprehensive, consistent, and workable plan, and (2) a regional acceptance of the fact that this plan may need to be altered or modified over time.*
- (4) Several regional plans and processes, either completed or ongoing, have been designed to address fish and wildlife mitigation and recovery efforts. These include the following:*
 - *the Federal Caucus and the Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy (Basinwide Strategy), which helps guide*

- those Federal actions and interactions with state, tribes, and local governments that relate to anadromous fish;*
- *NMFS and USFWS Biological Opinions (BiOps) for fish and wildlife issued under the ESA);*
 - *salmon (and other species) plans that were crafted by the four Northwest states and several of the Region's Native American tribes;*
 - *Governors' Plans such as the document produced by the Governors of Idaho, Montana, Oregon, and Washington ("Recommendations for the Protection and Restoration of Fish in the Columbia River Basin"¹) which advocates a healthy, functioning ecosystem while preserving a sound economy in the Pacific Northwest;*
 - *the Council's completed Multi-Species Framework and ongoing Fish and Wildlife Program Amendment Process, both of which focus on long-term river management options and conservation of multiple species; and*
 - *BiOp Implementation Plans: Given the 10-year duration of the NMFS and USFWS BiOps and the over 200 specific actions that they call for, the Action Agencies—the Corps, Bureau, and BPA—annually prepare 1 and 5-year Implementation Plans. As part of the public process for these Plans, the Action Agencies are proposing to annually conduct a series of workshops with regional entities in an effort to include broad input into their Implementation Plans. The Implementation Plans include actions that have already received or will receive environmental review before they are implemented.*

An illustration of the scope of several of these plans and processes as they relate to each other and to this EIS is shown in Figure 1-3. BPA, as well as other Federal, State, and local entities, is responsible for funding certain fish and wildlife mitigation actions and recovery efforts that are determined by regional policy decisions.

- (6) *BPA is preparing this EIS now because (a) many species and stocks of fish and species of wildlife are already considered by many in the Region to be in poor condition; (b) BPA wants to be ready to implement current and future fish and wildlife mitigation and recovery efforts without delay as a Policy Direction is chosen or changed; and (c) irrespective of efforts to achieve a unified plan, BPA has an ongoing obligation to fund appropriate fish and wildlife mitigation and recovery measures. This document provides the necessary NEPA documentation to inform policy-makers and the public of the potential consequences of these choices.*
- (7) *Now, and in the future, BPA must be prepared to answer specific questions about its actions, compare them against the regional policy decisions, and then determine whether the proposed actions are consistent with the regional Policy Direction being implemented. BPA will proceed with its mission to implement and fund its portion of the fish and wildlife mitigation and recovery effort when it has fully examined these considerations.*

¹ Governors, Pacific Northwest States 2000.

(8) *The Federal Caucus, Council, tribal and state plans, and other related processes will help BPA to make such decisions. However, these processes did not provide environmental documentation or public process for the full range of alternatives as required by law (NEPA). Selection of a Policy Direction to begin implementing actions will lead to environmental consequences that must be evaluated and to potential mitigation for adverse effects that must be considered. This document intends to provide NEPA coverage for a broad range of possible Policy Directions and related implementing actions.*

3.1 DEFINING AND DECIDING ON THE ALTERNATIVES

- **This section describes how the many regional processes and ideas on fish and wildlife mitigation and recovery were considered, how a range of alternatives was defined, and how a qualitative or "relationship" analysis (not specific calculations) was used to help compare the alternatives in terms of environmental consequences.**

The alternatives in this EIS are framed as *Policy Directions*: unified regional planning approaches that focus on different themes. Themes are characterized by commonly held philosophies, values, and key issues. The descriptions of the different themes reflect BPA's attempt to capture the major differences underlying the many approaches throughout the Region for fish and wildlife policy. *None of the individual Policy Directions are intended to represent any particular group's, organization's, or individual's position, and none represent BPA's specific position as to fish and wildlife mitigation and recovery.* However, the descriptions do provide a means to evaluate the environmental consequences of moving toward one of the Policy Directions. (The Policy Direction approach that existed before 2002 represents the No Action, or Status Quo, which is not a unified planning approach but which serves as the baseline for comparative analysis).

Policy Direction: *the overarching theme that guides and shapes the decisions made by governments, agencies, or other public bodies regarding fish and wildlife mitigation and recovery efforts, applied through a series of actions that form an implementing plan.*

Each Policy Direction represents a shift toward one of the themes with more actions and increased intensity of actions taken consistent with that theme. The exact actions taken under each Policy Direction, and the precise intensity of those actions, are generally not established at this time. Rather, existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated. Actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate. Sample Implementation Actions for each of the Policy Directions are shown in Volume 3.

There are ethical, political, environmental, legal, and scientific implications and trade-offs involved in selecting a particular Policy Direction for fish and wildlife mitigation and recovery. Many questions must be considered: How expensive will our energy be? Where will we be able to live, work and play? Who will have the right to fish? What will happen to our jobs? Science can help evaluate the consequences of different Policy Directions—but resource management issues are ultimately issues of law, policy, and public choice. The question is: how best to arrive at that choice?

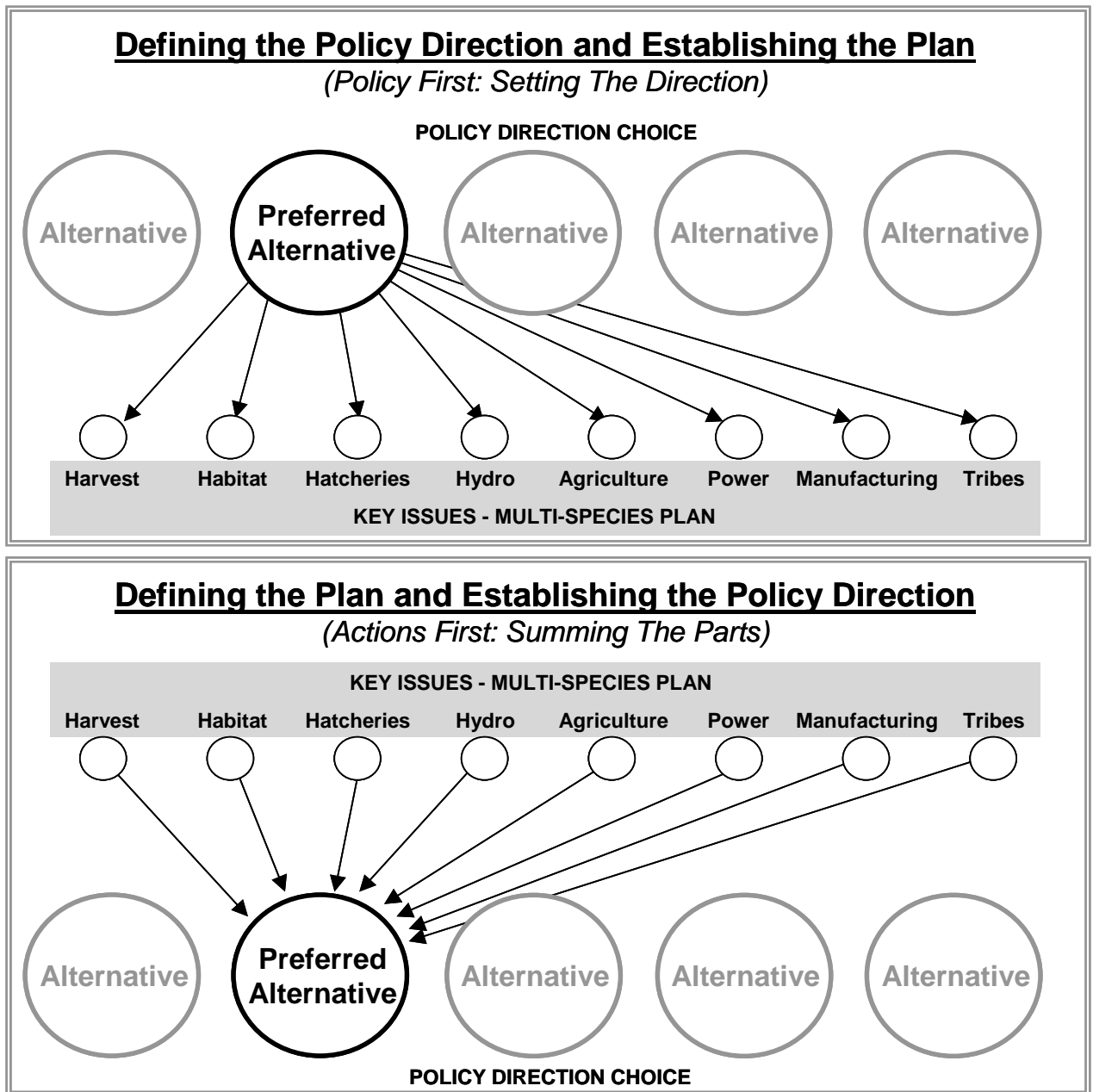
It is important to bear in mind that there is no one "best" Policy Direction. "Best" is a value judgment, ultimately a matter of personal preference. However, one may evaluate whether certain actions are more or less likely to bring about certain ends. For instance, if a goal is to improve habitat for fish, then keeping human and livestock activity away from a section of riverbank will help stabilize riparian vegetation, will slow erosion into the stream, and will improve the quality of the water. On the other hand, if the goal is to improve the well-being of people in the Region, there may be unavoidable trade-offs among groups of people that cannot be reconciled on the basis of factual information alone. Some factual matters can be evaluated where personal values cannot. This EIS tries to emphasize factual matters, while revealing the trade-offs between different resources.

There are certain laws that an alternative must comply with to be viable. These laws include the ESA, the Regional Act, and the CWA. However, this is a forward-looking policy-level EIS. As such, BPA has not limited the analysis to existing conditions or legal authorities. Through scoping, we found many suggestions for alternatives that would require BPA (or others) to receive new legal authority for implementation. If scoping or comments on the Draft EIS provided suggestions for an alternative that reflected a reasonable, focused, clearly articulated rationale, then we incorporated either that alternative or its actions into this EIS. Consequently, not all of the alternatives examined are within BPA's current authority to implement. However, this could change if, over time, the applicable laws were to change.

3.1.1 Defining Regional Public Policy

There are two basic ways to define a regional Policy Direction for fish and wildlife mitigation and recovery efforts: begin with a policy and define the actions to carry it out (policy first: setting the direction) or define the actions and then decide what policy they imply (actions first: summing the parts). Figure 3-1 shows how both would work.

Figure 3-1: Different Ways to Establish Policy Direction



- Define the Policy First:** One may choose to define the policy first (set the direction), and then use that policy as guidance in setting up an implementation plan of actions to carry it out. This approach would be more likely to achieve consistency among different activities because everyone has to reach agreement on the Policy Direction *first*. Individual groups would have more control over their programs and decisions and the freedom to implement their own action plans as long as those plans were consistent with the overall Policy Direction selected. Only in those less frequent cases when specific group actions come into conflict, would coordination with other regional groups be necessary. This coordination

would be done to avoid conflicts and achieve consistency in policy implementation.

- **Define the Actions First:** One may choose to develop a set plan of actions, and then sum up its "parts" to arrive at the Policy Direction. This approach might appear more flexible in terms of accommodating individual efforts now underway. However, it would not have the necessary coordination up front to assure consistency. Groups could tie up a lot of time trying to coordinate very specific, individual decisions; they might end in unresolved conflicts over implementation because so many people with different authorities and perspectives are involved at the action plan level. In fact, the implementing actions could end up at cross-purposes.

This EIS uses the "policy-first" approach because a coherent, unifying policy is needed to avoid inconsistent sets of actions. Also, the policy-first approach allows the reader to review the large number of possible implementing action plans through a reasonable and manageable number of Policy Directions.

We recognize that regional decisionmakers may not be able to agree upon a unified planning approach—they may instead choose to implement actions independently. By comparing the Region's implementation actions with the Sample Implementation Actions (see Volume 3), the Administrator and others may determine *which* of the Policy Directions (or combination of Policy Directions) the regional actions most closely resemble. The "relationship analysis" used in this EIS (see Section 3.1.6, below) will permit the BPA Administrator to evaluate that Policy Direction and understand the overall environmental consequences of funding and implementing it before determining whether it is the most appropriate Policy Direction for BPA. Once a determination has been made, BPA can implement a consistent, comprehensive, long-term fish and wildlife mitigation and recovery program.

This FWIP EIS evaluates the broadest possible range of alternatives. Such an approach also anticipates changes over time and extends the usefulness of the EIS. This EIS provides the flexibility to respond to changes in the natural, social, and economic environments, and provides by modifying, extending, or creating new Policy Directions. This EIS also provides for the assessment of the environmental effects of those Policy Directions. (See Chapter 4.)

3.1.2 Source for the Alternatives

To help define the alternative Policy Directions in this EIS, many regional processes were evaluated. We closely studied the proposals submitted (see Section 1.3.3 and Appendix D) by all the major participants (Section 1.3.1), reviewed the many ongoing and recently completed processes (Section 1.3.2), and identified the key issues (Table 3.1-1), then grouped ideas together by their overall theme. "Sorting" the proposals in this way makes it easier to understand how the different regional processes fit together. Although each regional proposal may represent a unique set of actions, each can be

categorized as falling generally under one or more of the major Policy Direction(s) for fish and wildlife mitigation and recovery (see Appendix I).

Key Issues identify resources and human activities of concern that need to be addressed in considering both actions and environmental consequences. They help to identify both the implementation actions that could be taken under each of the Policy Direction alternatives described in Section 3.2 and the environmental consequences that may result.

The Key Issues determine the questions being addressed by the processes and the shape of the Policy Direction alternatives, including the Preferred Alternative (PA 2002). They were first identified during one of the initial regional processes in November 1998. The Multi-Species Framework held a three-day workshop, convening numerous groups from throughout the Region to consider fish and wildlife mitigation and recovery. Participants included representatives from the tribes and state and Federal governments, as well as from commercial interests, private interests, and environmental groups. These participants identified numerous key issues as critical for resolution.

As the Framework process continued and the Federal Caucus was formed, more key issues surfaced and the categories were combined and refined. Over 40 key regional issues are listed in the table below, divided by area of focus. The issues have been numbered for convenient cross-reference with Volume 3 (Sample Implementation Action Tables).

This EIS is intended to guide BPA's implementation and funding of fish and wildlife mitigation and recovery efforts. Therefore, the actions listed in the Sample Implementation Action Tables focus on fish and wildlife. However, these tables also highlight issues unique to commercial groups and tribes. Like Federal and state agencies, commercial interests may take actions in fish and wildlife mitigation and recovery, but they must reconcile these efforts with the need to respond to market constraints and pressures. Thus, commercial interests face issues not shared by other participants in fish and wildlife recovery and mitigation efforts. The Region's tribes also take actions in fish and wildlife recovery and mitigation, and participate in commercial activities where they face the same economic pressures as non-tribal commercial interests. In addition, tribes ascribe a spiritual significance to fish and wildlife that must be factored into policy decisions by Federal and state agencies and commercial interests. Tribal concerns about culture, history, health, and sovereignty are directly connected to the condition of the Region's fish and wildlife—a relationship unique to tribes and one that may generate actions not undertaken by other groups.

Table 3.1-1: Key Regional Issues

Key Regional Issues		
1 Habitat	4 Hydro	7 Transportation
1-1 Anadromous Fish	4-1 Dam Modifications and Facilities	7-1 Navigation and Barging
1-2 Resident Fish	4-2 Hydro Operations	7-2 Trucking, Railroads and Infrastructure
1-3 Introduced Species	4-3 Spill	8 Agriculture
1-4 Wildlife	4-4 Flow	8-1 Irrigation
1-5 Predators of Anadromous Fish	4-5 Reservoir Levels	8-2 Pesticides and Agricultural Practices
1-6 Watersheds	4-6 Water Quality	8-3 Grazing
1-7 Tributaries	4-7 Juvenile Fish Passage and Transportation	8-4 Forestry
1-8 Mainstem Columbia	4-8 Adult Fish Passage	9 Commercial Harvest
1-9 Reservoirs	4-9 Flood Control	10 Residential and Commercial Development
1-10 Estuaries and Ocean	5 Power	11 Recreation
1-11 Water Quality	5-1 Existing Generation	12 Tribes
2 Harvest	5-2 New Energy Resources	12-1 Tribal Harvest
2-1 Anadromous Fish	5-3 Transmission Reliability	12-2 Tradition, Culture, Spirituality
2-2 Resident Fish	6 Industry	
2-3 Wildlife	6-1 Industrial Development	
3 Hatcheries	6-2 Aluminum and Chemical	
3-1 Anadromous Fish	6-3 Mining	
3-2 Resident Fish	6-4 Pulp and Paper	

3.1.3 Correlating the Alternatives and the Regional Processes

The work of reviewing and extracting from the regional processes and key issues resulted in defining the Status Quo and identifying five basic Policy Direction alternatives along the entire spectrum of potential Policy Directions. Such a wide range would ensure a thorough analysis of BPA's fish and wildlife obligations, and would permit BPA and others to act quickly in implementing the necessary actions for fish and wildlife mitigation and recovery in the Region.

Two tests of the usefulness of the range of Policy Directions defined for this EIS are their **comprehensiveness** and **flexibility**.

The alternatives are comprehensive. The Council's Multi-Species Framework alternatives and Concept Papers, the Federal Caucus' Conceptual Plan and Basinwide Strategy, the 2000 Amendments to the Council's Fish and Wildlife Program, the Federal Caucus Options, the 2000 Biological Opinions, the System Operation Review, the Corps'

Lower Snake River Juvenile Salmon Migration Feasibility Study and FEIS, the Governors' Recommendations, and the tribal and regional plans form an essential and comprehensive database of information and ideas that was used to define the range of Policy Direction alternatives for this EIS. Additionally, the hundreds of Sample Implementation Actions that accompany each Policy Direction were assembled directly from the many proposals, programs, and plans generated by regional processes. Volume 3 shows the types of actions that might be taken under each of the Policy Directions in this EIS.

The alternatives are flexible. The Policy Directions and Sample Implementation Actions were designed to be broad enough to accommodate current and future efforts for fish and wildlife mitigation and recovery within the Columbia River Basin (including the BPA service territory). They were also designed to cover a wide spectrum of issues.

Other ways to approach the analysis could have been selected. However, given the broad range of possible alternatives and the huge volume of information, we believe that the selected approach and the associated analysis are the most understandable, practical, and reasonable means to accomplish the task.

Figure 3-2 illustrates the general grouping of several major regional proposals under each of the five base Policy Direction alternatives. Note that some proposals may fit under more than one Policy Direction. For more detail on the "shorthand" references in the figure, please see Appendices D and I.

3.1.4 Integrating BPA's Decisionmaking Process with the Regional Processes

As noted above, data and information from a wide range of regional plans and processes have been integrated into this analysis and have helped to define the range of Policy Directions in this EIS. Ultimately, BPA must decide which alternative will guide its implementation and funding of fish and wildlife mitigation and recovery efforts now and in the future. However, these decisions are not made in a vacuum. Comments and guidance from other Federal and state agencies, tribes, interest groups, and the general public are critical to this process. (Figure 3-3 shows how BPA's decisionmaking is integrated into regional processes.) A fundamental purpose for selecting from the Policy Directions is to promote coordinated, efficient, and consistent fish and wildlife mitigation and recovery efforts by considering potential actions in relationship to an overarching policy over time. See Section 3A below for BPA's identification and discussion of its current Preferred Alternative Policy Direction (PA 2002).

Figure 3-2: Illustration of Major Regional Processes and Policy Directions

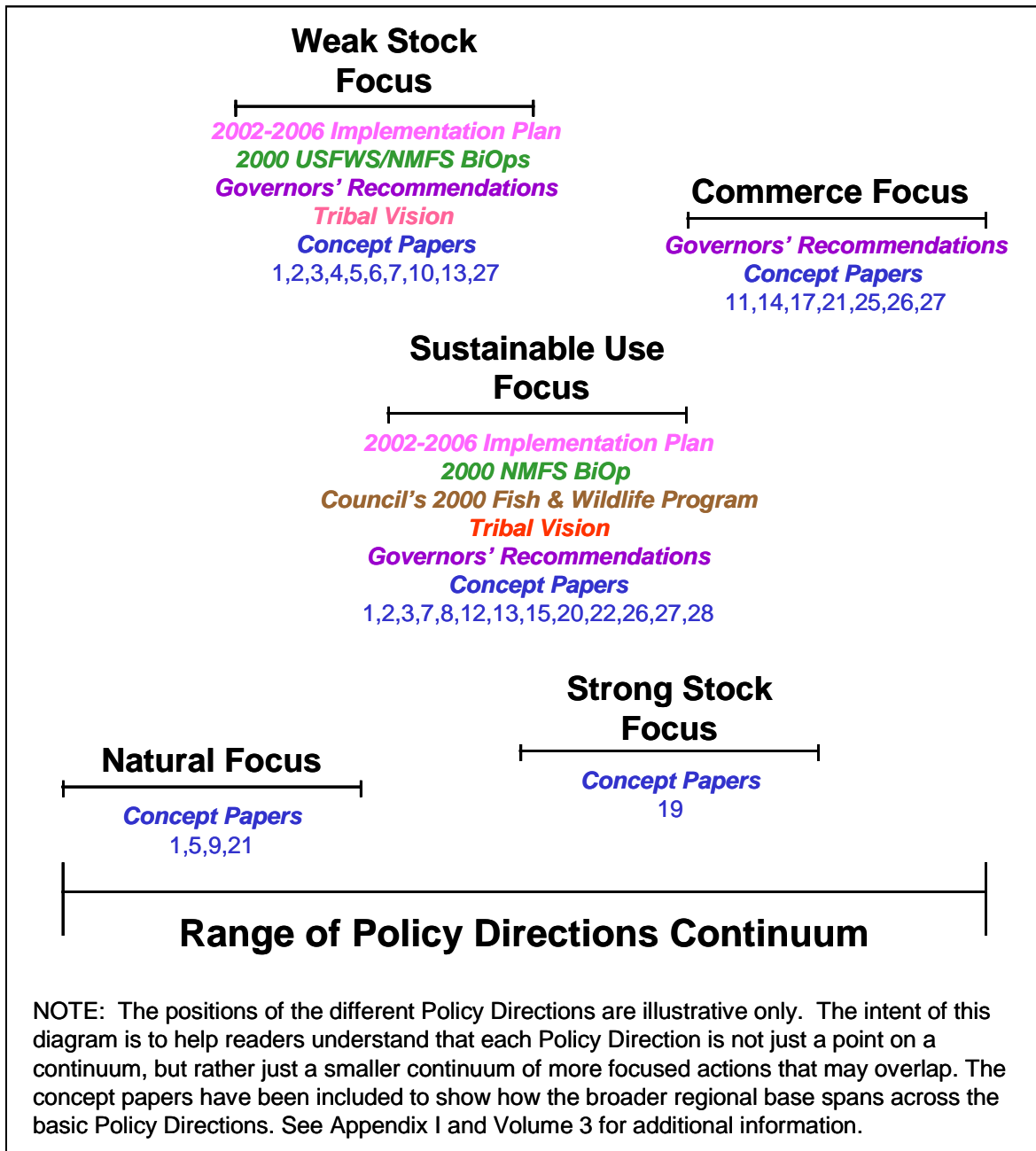
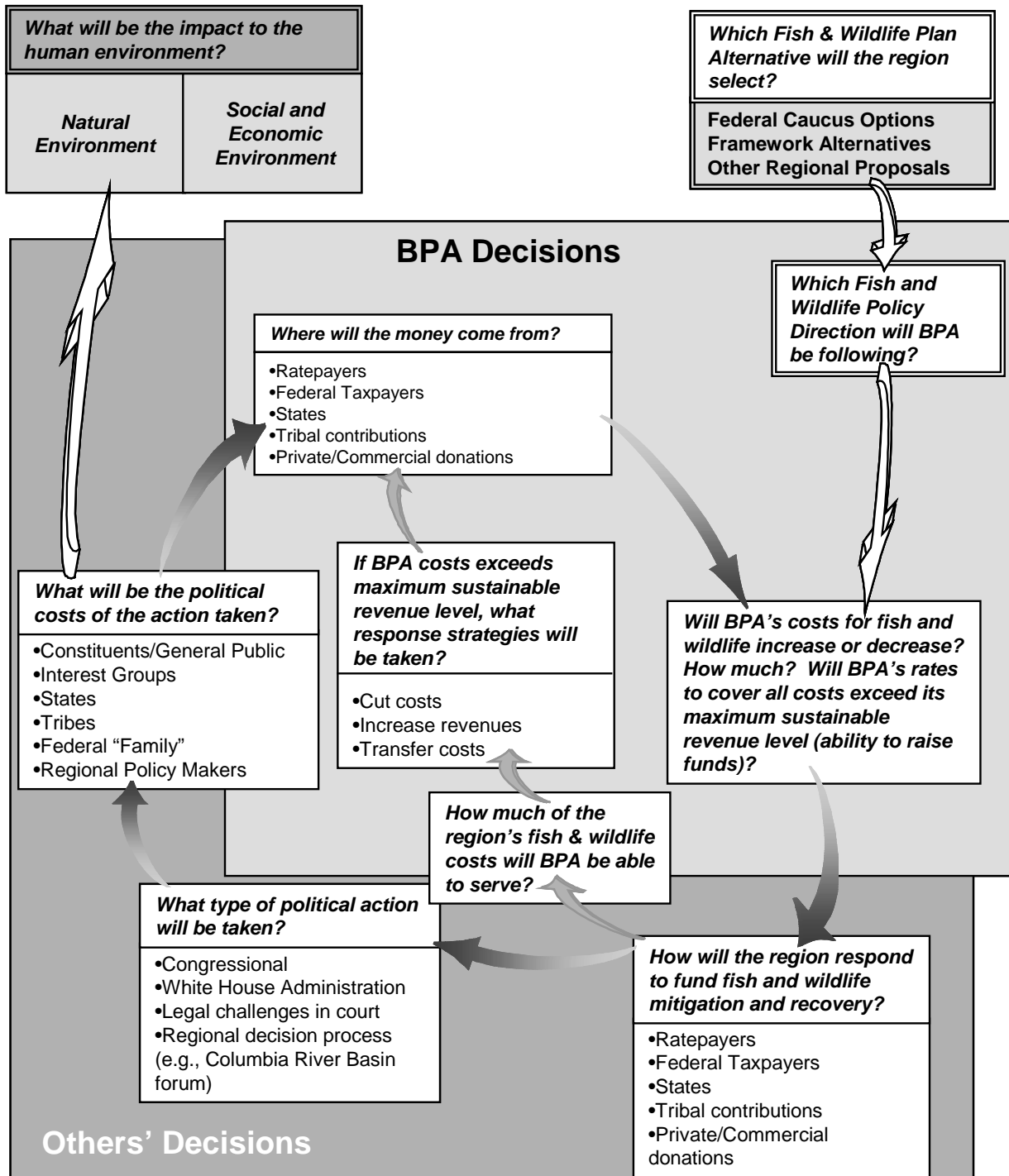


Figure 3-3: Understanding the Integration of BPA Decisions with Regional Policy and Decisionmaking



3.1.5 From Definition to Comparison

There are many ways to characterize and compare alternative Policy Directions. The goal is to be able to compare the environmental consequences associated with each Policy Direction (see Chapter 5), and to see how well each alternative fulfills the purposes (see Chapter 1). Figure 3-4 shows how we went through each step, from analyzing the regional ideas, to generating the alternative Policy Directions, to comparing and evaluating the Policy Directions (reading left to right):

- First, we developed the Status Quo and the five basic alternative Policy Direction themes from the key issues and numerous proposals from the regional processes, such as the Multi-Species Framework Alternatives and the Federal Caucus Strategies (see Table 3.1-1 and Section 3.1.2). From this synthesis, descriptions of the various philosophies behind the Policy Directions were developed to help define and guide the understanding of each theme (Section 3.2).
- Then, from these many regional proposals, we developed a set of Sample Implementation Actions that were consistent with the theme for each Policy Direction (see Volume 3).
- Next, we assessed both the philosophies of the alternative Policy Directions and the Sample Implementation Actions to determine the environmental consequences that might result from the implementation of a Policy Direction. We compared each Policy Direction against Status Quo. Chapter 5 contains the analyses that show how the natural, social, and economic environments would be affected under each alternative Policy Direction.
- This Chapter contains a condensed summary of environmental consequences, consolidated to help decisionmakers readily compare effects and likely outcomes for each Policy Direction. This summary is in the form of a comparative analysis table presented in Section 3.3.2.
- Finally, after considering the entire record to date, including the completed and ongoing fish and wildlife mitigation and recovery processes in the Region, the public comments on the DEIS, and the actions being taken by others in 2002, BPA has developed a preferred alternative (PA 2002). PA 2002 is a synthesis of elements from the five basic alternatives presented in the DEIS and is within the range of alternatives analyzed. PA 2002 demonstrates (see Section 3A, at the end of this Chapter) how the information throughout this EIS and in Appendix I (Build Your Own Alternative) can be applied now and in the future to assess the environmental consequences of innumerable alternatives.

This methodology will also be used by the BPA Administrator to evaluate the environmental consequences of current and future proposals, just as it allows others to develop their own proposed combination of Policy Directions and determine the associated environmental consequences. By assembling and condensing the information in this manner, decisionmakers can more readily compare effects and likely outcomes/consequences.

3.1.6 Relationship Analysis: The Methodology Behind the Decision

Implementing and funding any of the alternative Policy Directions has environmental consequences. Before a choice can be made among the alternatives (now or in the future), it is important to understand how those consequences are characterized. This EIS uses a qualitative or "relationship analysis" to provide the decisionmaker with the necessary background to make a choice among Policy Directions. The relationship analysis is characterized by qualitative description of actions and effects rather than numerical analysis. Relationship analysis focuses on understanding the interplay of the factors that may be used in models, rather than trying to choose actual numbers for each factor and relying on the specific numerical outcomes to dictate the decision.

In fish and wildlife mitigation and recovery efforts, where there are still many biological and political uncertainties and unknowns, it is better to be generally correct. Relationship analysis is the best choice in this circumstance. Experience has shown that quantitative analysis suggests a precision that can be misleading. Scales and intensity may vary, future environmental and economic conditions are unpredictable, and quantitative models have unknown errors and assumptions. This is why BPA's EIS is focusing broadly on the more dependable *interactions between people and their environment*. A relationship analysis is less precise, but it operates at a level that more reliably and accurately indicates future effects when reviewing regionwide policy.

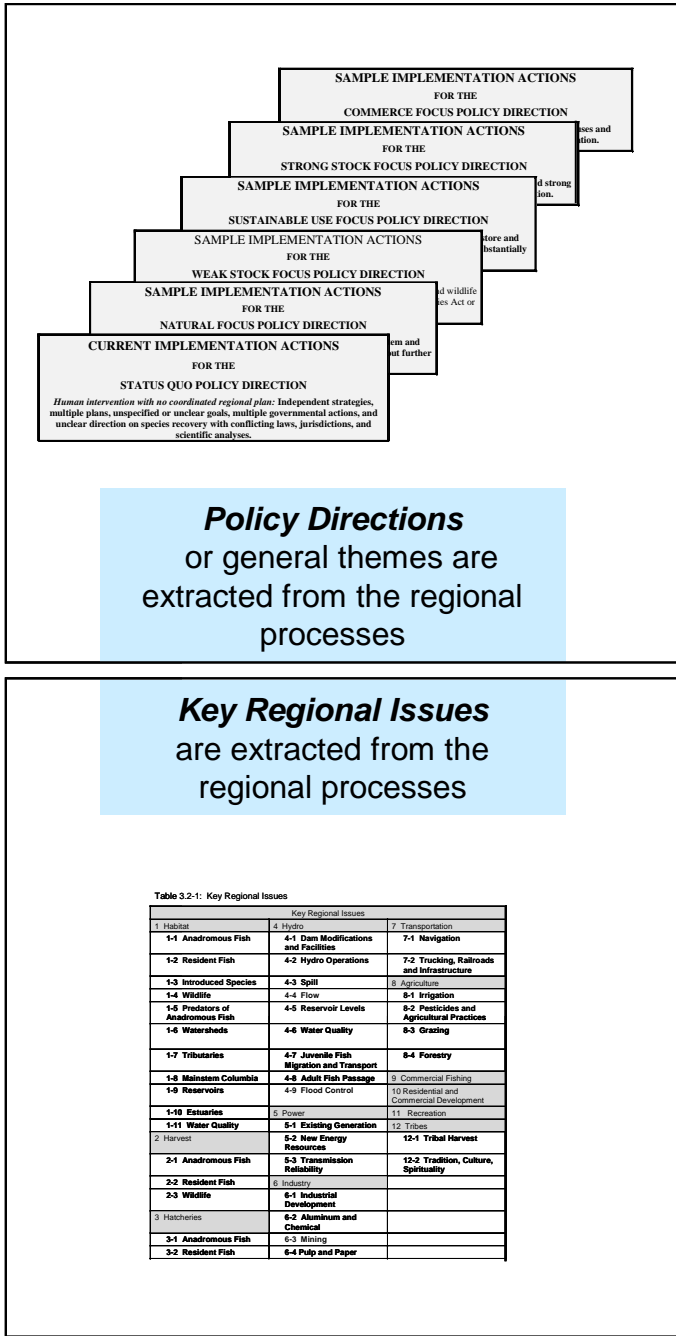
For this policy-level analysis, the extensive regional database of fish and wildlife mitigation and recovery actions has been used to establish the relationships between actions and effects. Once established, these relationships can be used as a foundation to understand the possible effects associated with actions in a broad spectrum of fish and wildlife Policy Directions, and can serve to aid in future fish and wildlife decisions for BPA, other decisionmakers, and the public. In fact, when specific actions are considered under the chosen Policy Direction, it will be possible to look at the more specific analysis and link them directly back to the broader relationship analysis. (See Figure 1-6.)

3.2 DESCRIPTION OF THE POLICY DIRECTION ALTERNATIVES

- **This section describes the Status Quo and the alternative Policy Directions, the philosophies behind them, and their likely components (focuses).**

This EIS examines a broad range of Policy Directions. The Policy Directions are based completely on ideas set forth in regional processes on fish and wildlife mitigation and recovery efforts, and encompass the range of possible actions assessed within regional processes over the last 10 years. All regional concepts have been considered, even where some may prove infeasible under current law, impractical for other reasons, or appear to be less effective.

Figure 3-4: Development of Environmental Consequences



SAMPLE IMPLEMENTATION ACTIONS TABLES

SAMPLE IMPLEMENTATION ACTIONS TABLES

CURRENT IMPLEMENTATION ACTIONS FOR THE STATUS QUO POLICY DIRECTION
 Human intervention with no coordinated regional plan. Independent strategies, multiple plans, unspecified or unclear goals, multiple governmental actions, and unclear direction on species recovery with conflicting laws, jurisdictions, and scientific analyses.

HABITAT
 Under the Northwest Power Act, Bonneville is required to protect, mitigate and enhance the fish and wildlife affected by the development and operation of the federal fish passage projects on the Columbia River and its tributaries. The agency is obligated to provide treatment for fish and wildlife that is equitable with other project purposes. Bonneville must take into account, to the extent fully practicable, the Fish and Wildlife Program that the Northwest Power Planning Council adopts and recommends. Tribal, state, and federal fish and wildlife resources agencies, local governments, universities, watershed councils, and individuals recommend the Fish and Wildlife Program actions.

The budget for the Program (about \$127 million annually) is divided into three general categories: anadromous fish projects (approximately 70 percent of the budget); resident fish and wildlife projects (about 15 percent of the annual budget); and anadromous fish habitat work (about 15 percent of the budget).

Projects funded by the Program address the array of possible mitigation actions, including:

- Research projects, marking and tagging projects, monitoring and evaluation projects, and projects that develop new technology needed for monitoring and evaluation.
- A wide array of habitat improvement projects, including screening water diversions, replacing temporary riprap with alternative fish friendly structures, lining projects, water development projects, vegetative plantings and stream control, and environmental monitoring and evaluation projects.
- Land and water acquisitions, conservation easements, maintain passage improvements, predator control actions, facilities' construction and operations and maintenance (O&M) actions, and watershed coordination.
- Special provisions are applied for the protection and management of critical habitat supporting species listed under the ESA.
- Enforcement of existing laws that provide for the protection of fish and wildlife and their habitat.

While different federal agencies administer different lands, and federal lands are subject to multiple mandates and demands, the fact that they are owned by a single entity means that federal lands can be more amenable to integrated habitat management. Particularly since 1995, when the Northwest Forest Plan was adopted, federal agencies have taken important steps toward a common vision of land management. Habitat management increasingly addresses landscape- and watershed-level approaches that address broad ecosystem issues in the Basin, including the decline of salmon and other species; poor forest health leading to catastrophic fires; and the expansion of noxious weeds on degraded landscapes.

The Tribal view point encourages the need to take actions that restore habitat to levels that support not only the listing of species under the ESA, but also the maintenance of sustainable, harvestable fish runs and wildlife throughout widespread areas of the basin.

On nonfederal lands, there are a number of federal and state programs that either regulate activities or are aimed at restoring habitat. There are also federal and state programs that provide incentives, particularly funding and technical assistance, to help land and water users protect and restore aquatic and terrestrial habitat.

Sample implementation actions are given for each of the Key Issues to illustrate the Policy Direction theme. See Volume 3.

Figure 3-4: Development of Environmental Consequences (cont.)

Sample Implementation Actions to
**ENVIRONMENTAL
CONSEQUENCES**
TABLE

Environmental Consequences

Table 5.3-1B: Air Effects across the Policy Directions (Detail)

	EFFECT AREA: AIR (POLLUTION) More pollution = worse
Existing Conditions	Existing conditions of concern are mostly by-products of combustion engines used for transportation and thermal resources (e.g., coal and combustion turbines) used for power generation. Elements of major concern are carbon monoxide (CO), carbon dioxide (CO ₂), nitrogen (NO _x), particulate matter (PM ₁₀), and sulfur dioxide (SO ₂).
POLICY DIRECTION	
Status Quo	Relative to existing air conditions, the Status Quo Policy Direction is expected to include some increase in air pollutants associated with additional economic growth. The increase will be dampened by existing pollution abatement programs and technological improvements. New combustion turbines will be built to meet demand, causing air emissions to increase some in the long term.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Requires a large increase in replacement of hydropower from breaching or drawdown of up to six dams, mainly from new combustion turbines and prolonging use of existing coal facilities over Status Quo. Air pollutants would increase substantially under this Policy Direction. Increased coal generation would increase PM ₁₀ , CO, CO ₂ , SO _x and NO _x emissions. Additional combustion turbine plants would add to these emissions, just at a much lower rate per unit of energy. In addition, emissions would increase considerably from the new truck and train traffic needed to replace current barging. Dam deconstruction would result in more airborne particulate matter, and as reservoirs empty, dust would rise from newly exposed land. As new vegetation then covers the land, dust would decrease, so those effects would be temporary.
Weak Stock Focus	There would be a sizable increase in replacement of hydropower depending on how many dams are breached (from 0 to 4 dams). The replacement power would noticeably increase air emissions from new combustion turbines and prolonged use of existing coal facilities over Status Quo. Increased coal generation increase PM ₁₀ , CO, CO ₂ , SO _x and NO _x emissions. Additional combustion turbine plants would add to these emissions, just at a much lower rate per unit of energy. Emissions would also increase from the increased truck/train traffic replacing barging. Deconstruction would result in more particulate matter, and as reservoirs empty, dust would rise from newly exposed land. As new vegetation then covers the land, dust would decrease, so those effects would be temporary.
Sustained Use Focus	Air emissions may increase from operation changes, causing the need for additional combustion turbines to replace any lost peaking capability. The long-term change in air emissions could be sizable if breaching or drawdown increases the need for replacement hydropower and prolonged operation of existing thermal resources. With breaching or drawdown, effects would be like those of Weak Stock Focus.
Strong Stock Focus	Restricts hydro operations less than under Status Quo; delays the need for replacement power and related air emissions.
Commerce Focus	Maximizes use of existing hydro system, indefinitely delays the need for replacement resources beyond Status Quo. Regional commercial competitiveness, however, could attract new industry, increasing PM ₁₀ and CO ₂ air emissions slightly. Overall, air emissions are likely less than under Status Quo.

Policy Directions

The environmental consequences of implementing the alternative Policy Directions are compared to the Status Quo. See Chapter 5, Section 5.3.

**COMPARISON
TABLE**
Policy Directions

Effect Category	S Q	N F	W S	S U	S S	C F
NATURAL ENVIRONMENT						
Air Quality						
Land Habitat Upland						
Riparian/Wetland						
Water Habitat: Nitrogen Saturation						
Non-thermal Pollution						
Sedimentation						
Temperature/Discharged Ore						
Instream Water Quality						
Amount River Habitat						
Reservoir Habitat						
Fish & Wildlife: Anadromous Fish**						
Resident Fish						
Native Wildlife						
Non-Native Species						
SOCIAL and ECONOMIC ENVIRONMENT						
Commerce						
Commercial Interests						
Recreation (including fishing & boating)						
Economic Development						
Tribes: Fishing Harvest						
Health, Spirituality, & Tradition						
Costs and Funding						
Cultural/Historical Resources						
Aesthetics						

Environmental Consequences

See Chapter 3 for the summarized version and Chapter 5 for the detailed breakdown and explanations.

Each Policy Direction represents a shift toward a theme. The exact actions taken under each Policy Direction, and the intensity of those actions, are generally not established at this time. However, actions consistent with a theme could be taken, and sample implementing actions are provided in Volume 3. Existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated.

Actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate. (For a more detailed description of sample implementation actions for the Policy Directions, see Volume 3.)

The five basic Policy Direction alternatives are:

- **Natural Focus**
- **Weak Stock Focus**
- **Sustainable Use Focus**
- **Strong Stock Focus**
- **Commerce Focus**

There is also a baseline alternative against which to compare Policy Directions:

Status Quo (*no action*)

This EIS additionally identifies and analyzes a preferred alternative Policy Direction from within the range of alternative Policy Directions:

PA 2002 (*preferred alternative*)

The BPA Preferred Policy Direction is named **Preferred Alternative 2002** (PA 2002) in recognition that the "preferred" Policy Direction may change over time. Like the other alternatives, it is also composed of ideas and actions currently under consideration within the Region. It is made up of components of these five basic Policy Direction alternatives defined in this EIS, and falls within that defined range. PA 2002 is described in detail in Section 3A, at the end of this Chapter.

As noted previously, each of the Policy Directions summarized below is based on a concept for fish and wildlife policy developed or proposed by some process in the Region. None of the Policy Directions is intended to represent a value judgment by BPA or any particular group's values. The Policy Directions are intended for guidance only, and the quotations used to characterize them are not meant to indicate the views or opinions of their success. Individual readers may assert the values they find the Policy Directions represent for them.

Before going further, it is important to understand the distinction between *Status Quo* and the existing conditions.

Status Quo represents a continuation of the policy direction that the Region appeared to be following before 2002. The **current implementation actions** represent a snapshot view of those **actions** being taken to implement *Status Quo*.

Existing environmental conditions are defined as the state of:

- 1) *physical environmental elements such as air, land, and water; and*
- 2) *social and economic elements, such as cultural resources, commerce and funding.* (See also Section 5.1.)

In Chapter 5, the Status Quo policy direction is defined *relative to existing environmental conditions* for the complete list of effect categories. This description reveals how conditions are expected to change if no action is taken to alter existing policies. The likely changes are heavily influenced by population growth and land use practices.

While BPA considered *all* concepts presented by the regional community, in general, three basic models emerged:

- A focus on **preserving nature**, wildness, and wild creatures, setting aside areas for preservation where ecosystems will function in their natural states with little or no human intervention. The natural world is to be protected from human actions.
- A focus on **relationships between human beings and fish and wildlife** in the natural world. Humans are but one part of the integrated whole of nature and are responsible for maintaining appropriate, reciprocal relationships with fish and wildlife. These relationships emphasize a long-term connection to place and the use of natural resources to meet subsistence and spiritual needs.
- A focus on **harnessing nature** and using natural resources to meet human wants and needs. Humans can and should improve on nature, to maximize productivity, efficiency, and economic gain. The "conservation" movement of the 1930s exemplified this view: to conserve resources meant to use them; not using resources meant wasting them.

Each of the Policy Directions includes some assumptions about future conditions that are held in common with the other Policy Directions. Most of these common assumptions are existing conditions that are expected to continue in the future. Some important common assumptions are:

- Internal and external pressures for population growth and urbanization will continue unless specifically changed by an alternative. (For example, a policy that discouraged new construction might reduce urban expansion.)
- BPA's roles in marketing Federal hydropower and funding and implementing fish and wildlife programs will continue unless changed or affected by an alternative.

- All Policy Directions seek to attain their goals at the least cost practical. This statement should not be taken to mean that the goals themselves are necessarily economical or cost-efficient.

3.2.1 Status Quo Policy Direction (and Existing Conditions)

The Status Quo Alternative (and the continuation of the associated implementation actions) represents the "no action" alternative—not changing the ad-hoc approach to fish and wildlife policy that existed prior to 2002. Analysis of a "Status Quo" alternative is required by NEPA. For this EIS, the Status Quo serves as the baseline for comparison with the Policy Direction alternatives.

Additionally, the Status Quo Alternative includes reasonably expected future changes consistent with this ad-hoc approach.² Increasing population, economic growth, and additional urbanization are assumed, based on existing trends.

Description: Uses human intervention to mitigate the perceived problems facing fish and wildlife populations and to aid their recovery, with *no unified or single regional plan*. Independent strategies, multiple plans, different and sometimes conflicting goals, multiple governmental actions, and unclear expectations tend to result in a complicated and confusing mixture of many policy themes.

Focuses on modifying *hydro* system operations and increasing *hatchery* production to recover ESA-listed stocks of anadromous fish for increased harvest. The BPA mitigation and recovery funding efforts over the past decade bear this out in the substantially greater funding allocated to anadromous fish compared to that for resident fish and wildlife. Status Quo recognizes the past trade-offs between fish and wildlife and human activity and economic benefits.

Emphasis:

- Replaces (through purchases and enhancement of quality lands) terrestrial habitat for wildlife that was lost to hydro development.
- Protects and enhances habitat for anadromous and resident fish.
- Continues mixed-stock fisheries, with increased harvest opportunities only when abundance is high.
- Operates hatcheries primarily for mitigation and to support anadromous and resident fish populations for harvest.
- Operates hydro system and modifies dams for anadromous fish, especially ESA-listed stocks (e.g., through flow augmentation, spill, passage improvements, and transportation of juveniles).

² "Reasonably expected" means our best attempt to characterize a continuation of Status Quo considering the controversy and uncertainties about the science, politics, and regional values connected with fish and wildlife mitigation and recovery.

- Sustains commercial activity by preserving the hydrosystem electricity benefits of low-cost power and providing predictable fish and wildlife mitigation and recovery funding.
- Limits tribal harvest because of the need to protect weak stocks.

3.2.2 Natural Focus

Description: Under a unified regional planning approach, emphasizes *removing the past major human "interventions"* in the ecosystem and allowing the existing fish and wildlife to return to a natural balance without further major human intervention (*let nature heal itself*).

Focuses on protecting *habitat* and controlling *hydro* operations to reestablish ecological processes. Gives priority to wild fish and ecosystem protection by placing preservation of habitat quality ahead of economic activity. "Effort and money now spent to maintain relatively constant conditions to benefit economic needs would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development."³

The Philosophy Behind the Direction:

*"Wilderness is not for us at all. We should allow it to exist out of respect for the intrinsic values of the rest of nature and particularly for the life forms dependant on wild habitats."*⁴

Under this alternative, the first priority is to protect areas considered pristine, especially those areas untouched by previous human development. The value of "wildness" and wild creatures is not directed at any species in particular. Rather, a high value is placed on ecosystems that function *without human interference*, whatever species they may contain. Second, for those ecosystems already altered by human activities, efforts would focus on minimizing further degradation by limiting any human activities deemed environmentally destructive. Restoration would emphasize regeneration via natural processes. Third, in exceptional cases where an ecosystem has been so changed that natural regeneration is unlikely, humans might intervene to enhance the most essential elements needed for natural functioning. This Direction particularly focuses on removing those elements that have significantly altered the natural functioning of ecosystems: for instance, by breaching dams. This Direction includes "massive changes in the number and lifestyle of [humans], changes that society shows little willingness to seriously consider, much less implement."⁵

Differences from Status Quo Implementation Actions:

- Protects quality fish and wildlife habitat and allows ecological processes to proceed unimpaired by human intervention.

³ Council 2000c, p. 15.

⁴ Nash, Roderick 2001, p.388.

⁵ Lackey, R.T. 2000, p. 1.

- Decreases harvest of fish and wildlife until wild populations are stable.
- Discontinues all hatchery production.
- Removes six dams: McNary, John Day, Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases commercial activity through limiting use of natural resources.
- Limits tribal harvest until listed fish and wildlife populations are recovered.

3.2.3 Weak Stock Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to promote recovery* of weak species of fish and wildlife that are listed or proposed for listing under the Endangered Species Act or other legal protections.

Focuses on actively protecting and enhancing *habitat* and controlling *hydro* operations to enhance survival of ESA-listed fish stocks and wildlife species at all lifecycle stages. Gives priority to restoring quality habitat for weak stocks over economic activity.

The Philosophy Behind the Direction:

*"Extinction is not an option."*⁶

This alternative emphasizes an intensive approach to prevent the extinction of legally protected fish and wildlife populations. The priority would be on saving the weakest populations first. Reasons for preserving species might range from "existence value" to moral imperative to potential beneficial uses of species to humans.⁷ In passing the ESA, Congress attached aesthetic, ecological, educational, recreational, and scientific value to the diverse environments of the nation, seeking to conserve and recover both endangered and threatened species and the ecosystems on which they depend. The ultimate goal is to "recover" species so they no longer need protection under the ESA. The ESA is the primary driver behind this Policy Direction and, because the focus is on the implementation and enforcement of this law, this Policy Direction is likely to entail more emphasis on continued regulation.⁸

Differences from Status Quo Implementation Actions:

- Protects and enhances more habitat, giving a priority to listed fish stocks and wildlife species.
- Decreases overall harvest to protect weak stocks/populations.
- Manages hatcheries for weak stocks (using methods commonly associated with conservation hatcheries).

⁶ State of Washington 1999.

⁷ Rohlf, Daniel J. 1989, pp. 12-17.

⁸ USDO/USFWS 1998a.

- Removes four dams: Lower Granite, Lower Monumental, Little Goose, and Ice Harbor. Further limits hydro operations to benefit weak stocks.
- Decreases commercial activity that affects weak stocks/populations.
- Further reduces tribal harvest of weak stocks to assist fish and wildlife population recovery.

3.2.4 Sustainable Use Focus

Description: Under a unified regional planning approach, emphasizes *human intervention as part of the goal to rebuild and maintain* sustainable fish and wildlife populations to promote expanded harvest and recreation opportunities. (*Sustainable* is defined as the continued use of a resource at a stable rate over the long term.)

Focuses on increasing *hatchery* production, modifying *hydro* operations, and enhancing and managing *habitat* to increase harvest opportunities. Gives priority to harvest over other economic activity. Applies available resources to maintain and expand harvest opportunities. Emphasizes human management of targeted fish stocks and wildlife species and their habitats to balance intrinsic, recreational, and commercial value.

The Philosophy Behind the Direction:

*"Conservation is a state of harmony between men and land."*⁹

*"Conservation holds that it is about as important to see that the people in general get the benefit of our natural resources as to see that there shall be natural resources left."*¹⁰

This Policy Direction emphasizes the expansion of opportunities to harvest fish and wildlife resources. Humans have rights to use natural resources to meet sustenance, spiritual, and economic needs. But humans also have an obligation to ensure that those resources are self-sustaining, and therefore should intervene at all stages in the life cycles of fish and wildlife to help those populations rebuild and maintain themselves in perpetuity.¹¹

Differences from Status Quo Implementation Actions:

- Enhances and manages habitat to improve production and maintain harvestable levels of fish and wildlife.
- Increases harvest of wild and hatchery fish stocks and wildlife populations.
- Increases hatchery production (using methods commonly associated with supplementation hatcheries).
- Modifies hydro operations for fish and wildlife.

⁹ Leopold, Aldo 1949, p. 207.

¹⁰ Pinchot, Gifford 1910, p. 81.

¹¹ CRITFC 1996.

- Decreases commercial activity where it limits fish and wildlife production for harvest.
- Increases tribal opportunities for fish and wildlife harvest.

3.2.5 Strong Stock Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to avoid declines* of strong fish stocks and strong wildlife populations preventing weakened populations that require legal protection.

Focuses on maintaining *habitat* to sustain strong fish stocks and strong wildlife populations. Avoids harm to currently strong stocks/populations by giving priority to maintaining their habitat and restricting further degradation over economic activity and new development.

The Philosophy Behind the Direction:

"It is time to apply 'triage' techniques, i.e., face up to what are likely irreversible declines in some runs in order to direct resources to those runs where the odds for long-term survival are better with adequate help."¹²

The focus here is on maintaining healthy fish stocks and wildlife populations within a stable ecosystem. Program priorities would be based on the effectiveness of stock/population maintenance (as opposed to recovery). Costly efforts to recover populations that are so depleted that they cannot or likely will not be recovered should be abandoned. "Clearly, chances for survival of various runs of salmon are not equal. Many of the runs have winked out, and the genetic make-up of the fish in those runs is forever lost. Other runs continue in what appears to be an inexorable death spiral in spite of 'best' (i.e., politically acceptable) efforts. Some runs are in reasonably good shape, and may well survive with appropriate management actions. The perceived inflexibility in the ESA precludes the use of techniques to assign limited resources to those runs that have the best chance of maintenance and recovery, while ignoring those that are likely doomed."¹³

Differences from Status Quo Implementation Actions:

- Maintains habitat to support both strong fish stocks and wildlife populations.
- Increases overall harvest without weakening strong stocks/populations.
- Maintains or reforms existing hatcheries to support strong stocks.
- Decreases restrictions on hydro operations not affecting strong stocks/populations.

¹² Thomas, Jack Ward, Dr. 2000, p. 5.

¹³ Thomas, Jack Ward, Dr. 2000, p. 4. See generally Michael, John H., pp. 235-239.

- Increases commercial activity that does not affect strong stocks/populations, while abandoning socially disruptive and economically costly weak-stock recovery efforts.
- Increases tribal harvest that does not weaken strong stocks/populations.

3.2.6 Commerce Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to enhance the economic value* of river uses and allocates a portion of the revenues to fund fish and wildlife mitigation.

Focuses on increasing *hatchery* production and improving *hydro* operations to support the commercial values of the river. Gives priority to the economic efficiencies of Basin activities, applying increased revenues toward funding fish and wildlife mitigation programs. This mitigation can be carried out by funding any of the other available resources of habitat, harvest, hatcheries, or hydro that do not directly affect economic efficiency.

The Philosophy Behind the Direction:

*"Endangered species has divided the country on an issue that seemingly pits growth (and jobs) vs. the environment. This does not have to be the case. Protecting endangered species can be integrated with economic growth, turning a win-lose or lose-lose situation into one where everyone benefits. This can be accomplished by using economic incentives to promote conservation. ... Although the costs incurred by these incentives may be high in some cases, they will be highly cost-effective. The current 'at any cost' strategy is only marginally effective, and can actually harm species in some circumstances."*¹⁴

This Policy Direction emphasizes economic efficiency in choosing a recovery strategy. Money is a scarce resource and a major component in any mitigation and recovery plan, and should be spent only when costs are justified by benefits. This Direction represents an approach to fish and wildlife conservation that decreases government regulation and emphasizes voluntary actions, financial incentives, and market mechanisms to bring about desired results. Private companies and citizens are given positive incentives and flexibility to determine how they can best meet the goals of conservation, while still fulfilling their economic needs. Cost efficiency would consider hydrosystem benefits and benefits foregone, as well as program costs. "For us, we have to be left standing if we are going to support it (a unified plan). This can't be a recovery effort that sticks it to all the economic interests."^{15,16}

¹⁴ Schaerer, Brett 1996, p.1.

¹⁵ Smith, Craig 1998.

¹⁶ PNWA 1996; Schaerer, Brett 1996; PNWA 2000.

Differences from Status Quo Implementation Actions:

- Stresses maintenance or enhancement when it is the best economic use of fish and wildlife habitat.
- Increases harvest of fish and wildlife.
- Increases hatchery production of marketable fish.
- Decreases restriction on hydrosystem operations, supporting economic growth.
- Increases commercial activity based on market forces.
- Increases tribal harvest through fish farming and hatchery production.

3.3 COMPARING THE POLICY DIRECTIONS

- **This section compares the five basic Policy Direction alternatives against the Status Quo (baseline), first in terms of their likely environmental consequences, then against the EIS purposes. The comparison of environmental consequences is described in terms of *relationships*, not numeric computations (see Section 3.1.6).**
- **For a comparison that includes PA 2002, please turn to Section 3A, at the end of this Chapter.**

This EIS is not intended to define the Region's values. It is, instead, designed to provide an understanding of the many issues that affect the Region's ability to reach a more comprehensive and consistent unified planning approach for fish and wildlife mitigation and recovery. The Administrator must make fully informed decisions about BPA's funding and the implementation of its fish and wildlife obligations to support the Region's mitigation and recovery effort. Understanding the environmental consequences of implementing the Policy Direction that best reflects the Region's position is paramount. An important objective of this EIS is to provide that information. Another important objective of this EIS is to show how that Policy Direction will affect BPA's ability to fulfill the stated purposes. In deciding on a Policy Direction, the Administrator will consider both the environmental consequences (Section 3.3.1) and the analysis of the purposes (Section 3.3.2), as well as other relevant factors (Section 3.3.3), including public input.

3.3.1 Comparing Alternatives by Environmental Consequences

Table 3.3-1 provides a summary of **Natural Environment** and **Social and Economic Environment**¹⁷ consequences of the alternative Policy Directions, based on the analysis in Chapter 5. Results are summarized as being better or worse for fish and wildlife and their habitat, as well as better or worse for the economic and social well-being of the

¹⁷ For information about the existing environmental conditions in these effect areas, please see Chapter 5, Section 5.1. For a more detailed discussion of environmental consequences, including the analysis behind Table 3.3-1, please see Section 5.3.

Region. The summary table illustrates the anticipated long-term environmental effects of the alternative Policy Directions compared to environmental conditions in the Status Quo (baseline) Policy Direction. The summary highlights the areas where the effects are clearly different, but also shows where they may be similar, offering the opportunity to quickly see the possible "trade-offs."

The effects shown for each Policy Direction are described as they would occur before any mitigation is undertaken. Public policy, as well as mitigation, evolves as the Region responds to these trade-offs. Effects are shown by shading to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo. Effect categories are condensed from the expanded list of categories evaluated in Section 5.3. Condensing allows the reader to more easily see the major trends in effects. Where categories are condensed, the summaries represent the central tendency of the more detailed results presented later in this document.

In reading the Table 3.3-1, which is based on a *relationship analysis*, it is useful to remember the following points:

- The Status Quo (i.e., the No Action Alternative) is used as the *baseline* to compare the environmental consequences of each of the five alternative Policy Directions.
- The Status Quo is established by describing the types of actions being taken prior to 2002 and anticipated to continue without a unified Policy Direction.
- No judgment is made about whether the Status Quo, or any other Policy Direction, is *good* or *bad*. Some may believe that economic prosperity should be the overriding value; others may believe that maintaining a natural environment should be the appropriate value. Still others may believe that some form of balance between economic prosperity and preservation of the natural environment should be the "correct" value for the Region. These disparate viewpoints are represented within the range of alternatives.
- Status Quo serves as a "neutral" point for comparing the environmental consequences for each of the alternative Policy Directions. This makes it possible to determine whether and how much each Policy Direction effects the condition of the environment. These effects are labeled as "better" or "worse."

Ideally, the "best" alternative might be selected by looking for the greatest number of *light-colored* boxes (improving conditions). But there is no clear single choice. The issues are complex: a "better" for one factor may mean a "worse" for another important factor. (For example, a "better" for anadromous fish might mean a "worse" for resident fish.) As noted earlier, there will also be other considerations regarding laws, perceptions, and values. Many people are involved in developing a plan for mitigation and recovery, and many different authorities govern the participants. This means that trade-offs will have to be considered.

The reader can use Table 3.3-1 to determine which one of the Policy Directions might best reflect her or his unique perspective:

- (1) First, look down the column of boxes for each Policy Direction to find where the effect areas of greatest concern for environmental consequences will likely be for the different directions.** Here, mitigation (if available) may be needed to lessen the effect—perhaps by a physical action such as making a dam modification or change in habitat.
- (2) Next, consider which Policy Direction has the greatest number of benefits from the reader's (your) perspective (light-colored boxes).**
- (3) Then, determine how well the desired Policy Direction fulfills the purposes (Chapter 1). (See Table 3.3-2)**

Note: If none of these "fits" the reader's or decisionmaker's concept of a better Policy Direction, the table and the Sample Implementation Actions (Volume 3) can be used to construct additional Policy Directions by "mixing and matching" parts of different Policy Directions. For information on how to do this, please see Section 3.5.3 or Appendix I.

3.3.2 Comparing Alternatives against EIS Purposes

In Chapter 1, we described the state of significant disagreement within the Region about the "best" way to recover endangered or threatened species and to maintain self-sustaining populations of fish and wildlife. There is no clear regional consensus about what the goals of a mitigation and recovery plan should be, and there is considerable uncertainty as to whether any of the proposed actions will produce the desired results. This problem was confirmed in the comments received on the draft of this EIS (See Chapter 8 and Appendix K.).

However, BPA needs a comprehensive and consistent policy to guide its implementation and funding of fish and wildlife mitigation and recovery actions. In meeting that need, BPA must consider whether a policy would:

- Facilitate implementation of a regional unified planning approach,
- Fulfill obligations under the Regional Act,
- Fulfill the Administrations' Fish and Wildlife Funding Principles,
- Fulfill BPA's other obligations under law, and
- Promote predictable and stable fish and wildlife costs and competitive rates.

These purposes, which were described in Chapter 1, are used to measure how well each of the Policy Directions would meet BPA's need. Table 3.3-2 (below) evaluates each Policy Direction against those purposes.

Table 3.3-1: Comparison of the Alternatives*

Effect Area	Status Quo*	Natural Focus	Weak Stocks	Sustainable Use	Strong Stocks	Commerce Focus
NATURAL ENVIRONMENT						
Air Quality						
Land Habitat						
Upland						
Riparian/Wetland						
Water Habitat						
Nitrogen Supersaturation						
Non-thermal Pollution						
Sedimentation**						
Temperature/Dissolved Oxygen						
Instream Water Quantity						
Amount Stream/River Habitat						
Reservoir Habitat						
Fish and Wildlife						
Naturally-spawning Native Anadromous Fish						
Hatchery-produced Native Anadromous Fish						
Native Resident Fish						
Native Wildlife						
Non-Native Species***						
SOCIAL AND ECONOMIC ENVIRONMENTS						
Commerce						
Recreation						
Economic Development						
Funding Costs						
Tribes						
Fish Harvest						
Health, Spirituality, and Tradition						
Cultural/Historic Resources						
Aesthetics						

* The alternatives are compared against Status Quo (baseline conditions). For more information on existing conditions, please see Section 5.1.

** The sedimentation evaluation is based on long-term effects. Under Natural Focus and Weak Stock the short-term effects from dam breaching would be much worse than those conditions.

*** Under this analysis fewer non-native species is considered "better". For a complete discussion, see Chapter 5.



The differences among the Policy Directions (including Status Quo) often turn on differences in opinions and perceptions. This EIS condenses information from thousands of pages of key sources across the Region, presents this information in a user-friendly way, and provides a reasonably objective discussion of the data. However, public opinion in the Region regarding fish and wildlife mitigation and recovery efforts will be a prime factor in determining the degree to which BPA will be able to meet all its purposes. As one group or another sees a particular Policy Direction as superior or inferior, extreme or moderate, those views will affect BPA's ability to meet its purposes. Consideration of factors such as legal challenges, political interventions, and direct pressure on the Administrator from these outside influences, have been factored into the discussion. More information about these factors is presented in Chapter 4.

Table 3.3-2: Comparison of Policy Direction Alternatives against EIS Purposes

Facilitate implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve: coordination, efficiency, and consistency.	
Status Quo	The implementation actions are often uncoordinated and inefficient because there is no unified planning approach. The actions are implemented through a series of multi-governmental plans in an attempt to meet numerous and sometimes-conflicting statutes, regulations, and authorities. In addition, there are many inconsistencies within the mitigation and recovery efforts.
Natural Focus	This approach of letting "nature heal itself" may significantly change existing socioeconomic patterns in the Region. This approach is likely to be perceived as an extreme position that disregards the economic well being of the Region, and given that it is at one end of the alternatives spectrum, it will likely be very difficult to achieve regional consensus on such an approach.
Weak Stock Focus	This approach represents a distinct push to recover <i>all</i> ESA-listed fish and wildlife. This Direction may be seen by some as an inefficient use of financial resources for the overall benefit of fish and wildlife. Because it focuses heavily on legally protected fish and wildlife at a great cost, it may be perceived by some in the Region as not providing a broad benefit for all fish and wildlife or the regional economy, and thus likely would not result in a truly regional unified planning approach.
Sustainable Use Focus	This Policy Direction represents an all-inclusive approach to fish and wildlife mitigation and recovery. By focusing efforts at all stages of the life cycle of ESA-listed and non-listed species, it might be perceived by some as more effective in rebuilding populations, although others may be confused by its lack of specific focus on listed species. Because it recognizes both the obligation to ensure natural resources are self-sustaining and the right for humans to use those same resources to meet sustenance, spiritual, and economic needs, this direction may be acceptable to much of the Region's population.
Strong Stock Focus	The emphasis on strong fish stocks and healthy wildlife populations under this approach will likely alienate those in the Region who believe that the emphasis should be on recovery of ESA-listed species, or those species most at risk. Others may see this approach as more economically efficient because less focus is on the weakest stocks or species. Overall, the likely opposition to this approach probably would make it difficult to achieve regional consensus on such an approach.

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Commerce Focus	This Policy Direction favors a willingness to mitigate fish and wildlife to the extent there is a clear and direct economic benefit to doing so. Because it emphasizes the economic value of the river uses and allocates just a portion of revenue to fund fish and wildlife mitigation, it likely would be viewed by many in the Region as disregarding the importance of fish and wildlife. Therefore this may be seen as an extreme position, and it may be extremely difficult to achieve regional consensus on such an approach.
Fulfill statutory, legal obligations under the Regional Act; especially, BPA's obligations to: protect, mitigate, and enhance fish and wildlife; provide equitable treatment for fish and wildlife with the other purposes of the FCRPS; and provide a reliable, adequate, efficient, and economical power supply for the Pacific Northwest.	
Status Quo	Although BPA currently is able to satisfy all of its legal obligations under the Regional Act, BPA is often faced with difficult decisions in balancing these obligations, particularly in situations such as low water years. The lack of coordination and consensus among the numerous agencies with competing authorities also causes BPA's current fish and wildlife mitigation and recovery efforts to be less efficient and effective than they might otherwise be, which can make it appear that BPA is having difficulty in meeting its relevant legal obligations. In addition, BPA's efforts may sometimes appear inconsistent with other regional actions.
Natural Focus	This focus would require a dramatic change from reliance on the current hydro-based power system to one based on other types of resources. BPA's ability to remain a competitive, low-cost provider of electric power in the Region would likely be compromised with a greater reliance on non-hydro resources. Also, BPA's role as a major contributor to fish and wildlife mitigation and recovery would decrease since the responsibilities for mitigation of the FCRPS effects would be less as the six dams were removed and hydropower impacts and revenues decrease.
Weak Stock Focus	Under a weak stock approach, BPA would have difficulty meeting the agency's power supply requirements because additional hydro operations for fish would reduce power production. BPA's responsibilities for fish and wildlife mitigation due to the effects of the FCRPS would likely be less because four dams would be removed. Overall, BPA would likely have difficulty fully meeting its power-related obligations under this alternative Policy Direction.
Sustainable Use Focus	The approach would be the most likely to allow BPA to remain competitive in the electric utility market and provide low-cost electric power since the hydrosystem and inexpensive hydro power would remain relatively intact. BPA would retain its role as the major contributor to fish and wildlife mitigation because this approach would allow BPA to generate revenues and contain costs.
Strong Stock Focus	This approach would provide greater certainty that BPA could fulfill its power responsibilities under the Regional Act because it would allow for increased power generation from the FCRPS. Conversely, this Policy Direction may give the perception that BPA is not meeting its mitigation obligations under the Regional Act, due to possible differing views over whether a strong stock focus is consistent with the Regional Act's intent for protecting, mitigating, and enhancing fish and wildlife and providing equitable treatment.
Commerce Focus	Under this approach, the focus on enhancing economic values of the river likely would make it more difficult for BPA to fund activities and take other measures to protect, mitigate, and enhance fish and wildlife as well as provide equitable treatment without a change in legislation. Under this Policy Direction, BPA thus would likely have difficulty in meeting this purpose.

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<p>Fulfill the Administration's Fish and Wildlife Funding Principles such that BPA: meets all of its fish and wildlife obligations, once established; takes into account the full range of potential fish and wildlife costs; demonstrates a high probability of Treasury repayment; minimizes rate effects on power and transmission customers; adopts rates and contracts that are easy to implement; and adopts a flexible fish and wildlife strategy.</p>	
Status Quo	<p>Given the number of agencies with competing regional authorities to implement fish and wildlife activities, BPA has sometimes had substantial difficulty in satisfying all of the principles. Increasing requests for funding fish and wildlife actions that may be outside BPA's authorities have complicated BPA's efforts to fund fish and wildlife mitigation and recovery clearly within its authorities. The high costs for fish and wildlife and the lack of regional coordination has reduced the probability of Treasury repayment without, until recently, rate effects. Additionally, cost uncertainty is unsettling to customers and bond markets, making it more difficult for BPA to gain stability and predictability from contracts and refinancing.</p>
Natural Focus	<p>Such a major change to BPA's power and transmission base would likely result in BPA's costs exceeding its revenues because of the increased costs of replacing lost hydropower, constructing new transmission, and protecting habitat would cause BPA's rates to rise substantially. The loss of business and economic flexibility under this approach would make it difficult for BPA to meet the Principles.</p>
Weak Stock Focus	<p>The increased costs of replacing lost hydropower, constructing new transmission, and protecting and enhancing habitat would cause BPA's rates to rise substantially. As BPA's rates approach MSR (see discussion in Chapter 2 Section 2.3.2.3), the probability of making the Treasury repayment decreases and BPA's ability to fulfill the other Principles will be difficult.</p>
Sustainable Use Focus	<p>Under this Policy Direction, modifications to the hydrosystem to benefit fish and wildlife would not likely result in substantial loss of generation and subsequent revenues, thus the need to raise rates or jeopardize the Treasury repayments would be minimized. These modifications, along with habitat enhancements and hatchery production will help BPA meet its other fish and wildlife obligations.</p>
Strong Stock Focus	<p>Decreased restrictions on hydrosystem operations would mean more potential to generate low-cost power. There could also be a reduction in BPA's fish and wildlife costs, as recovery efforts are no longer funded for populations that are so weakened that they are not likely to recover. This would likely result in BPA's ability to keep its rates down and make its Treasury repayment.</p>
Commerce Focus	<p>Under this Policy Direction, hydropower generation likely would increase dramatically allowing for lower rates and higher probability of Treasury repayment. Although more revenues from this increased generation also might be available to fund fish and wildlife programs, the emphasis of this approach on economic efficiencies over fish and wildlife mitigation and recovery may undermine BPA efforts to fulfill its current fish and wildlife commitments, including its equitable treatment obligation. Therefore, BPA's ability to fulfill the Principles would be difficult.</p>
<p>Fulfill BPA's other obligations under other applicable laws, including Federal treaty and trust responsibilities with regional tribes, the Endangered Species Act, the Clean Water Act, and the National Historic Preservation Act.</p>	
Status Quo	<p>The multiple and potentially conflicting authorities held by various Federal, state, and tribal entities involved in fish and wildlife mitigation and recovery frequently cause confusion about compliance with other applicable statutes and requirements. While BPA currently fully complies with these laws and requirements for its activities, the competing interests and priorities in the Region, the legal challenges that arise often stem from the lack of regional coordination, apparently conflicting authorities, and incompatible multi-agency fish and wildlife actions.</p>

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Natural Focus	This Policy Direction would likely make it difficult for BPA to meet all of its obligations under the ESA, CWA, and NHPA unless removal of the six dams also removed BPA's responsibility under these acts. Cultural resources would likely be damaged under this approach due to the removal of dams and subsequent exposure of artifacts, and many listed species and water quality would likely be impacted, at least initially, jeopardizing the ability to meet tribal harvest goals.
Weak Stock Focus	This approach focuses heavily on ESA-listed fish and wildlife, and thus would likely allow BPA to fulfill its ESA obligations. However, there may be impacts to cultural resources, as well as water quality, from dam removal. BPA would still likely be able to meet its treaty and trust responsibilities by retaining the tribes harvest levels.
Sustainable Use Focus	This focus is by design is to be more balanced for the major aspects of fish and wildlife mitigation and recovery. It also gives more of an equal weight to all laws and regulations. Because of this focus, it is likely to meet less resistance to fulfilling these legal obligations.
Strong Stock Focus	This approach, because of its focus on healthy fish stocks and wildlife populations, would likely be viewed as inconsistent with the ESA and other protections for fish and wildlife. This factor alone would likely make it more difficult for BPA to fulfill this purpose.
Commerce Focus	Under this Policy Direction, it would be difficult to comply with the ESA and some provisions of the CWA since it favors a willingness to mitigate fish and wildlife to the extent there is a clear and direct economic benefit to doing so.. There would likely be more fish for tribal harvest from the increase use of artificial production. The inconsistency with other environmental obligations, as well as the extreme nature of this position being at one end of the spectrum of alternatives, is likely to increase the difficulty of meeting this purpose.
Promote predictable and stable fish and wildlife costs and competitive rates, enhancing BPA's ability to provide funding for public benefits and remain competitive in the electric utility marketplace.	
Status Quo	BPA's customers are concerned about increasing and unpredictable fish and wildlife costs. BPA's status as a low-cost power provider and its competitive position in the marketplace is constantly changing. Any significant cost changes such as those for fish and wildlife mitigation and recovery could cause BPA to approach MSR. This makes it difficult to balance costs and revenues and reduce the overall amount of fish and wildlife funding available.
Natural Focus	This approach might eventually lead to more predictable and stable fish and wildlife costs, as a consequence of breaching dams because removing the dams would remove BPA's obligations for fish and wildlife mitigation for that part of the hydro system. However, the cost associated with replacing the lost hydropower with more costly power from other sources would likely cause BPA's rates to increase, making BPA less competitive. This would result in less revenue being available to fund fish and wildlife activities and other public benefits, and BPA thus likely would not be able to fully meet this purpose under this approach.
Weak Stock Focus	Under this Policy Direction, it would be likely that more fish and wildlife funding would be sought from BPA to recover all listed species. However, the cost associated with replacing the lost hydropower with more costly power from other sources would likely cause BPA's rates to increase, making BPA less competitive. This could result in less revenue being available to fund fish and wildlife activities and other public benefits. Thus, BPA likely would not be able to fully meet this purpose under this approach.

Sustainable Use Focus	Funding levels would be established to achieve sustainable populations for harvest. This would likely result in more predictable and stable costs. This approach could be more costly as it provides benefits for both listed and non-listed species, which could affect BPA's competitiveness in the market and ability to provide funding for other public benefits. However, because BPA would retain all of its hydropower resources under this approach, these effects would not be expected to significantly affect BPA's ability to achieve this purpose under this approach.
Strong Stock Focus	This Policy Direction would likely have lower and more stable fish and wildlife costs because funding would not be provided specifically for listed species. Additionally, the decreased restrictions on hydro operations would generate more revenue and forestall costs associated with the acquisition of new energy resources. The more stable costs would likely ensure more predictable funding for fish and wildlife and other public benefits, as well as enhance BPA's competitiveness.
Commerce Focus	This focus would treat fish and wildlife costs as a business expense and factor them into overall competitiveness within the marketplace. The fish and wildlife costs would likely be more predictable and stable than under Status Quo. More funding would be available for fish and wildlife from other sources, making more funds available for BPA funding other public benefits.

3.3.3 Important Policy Direction Decision Considerations

The following considerations are also very important in the consideration of any public policy choice, and should be kept in mind when comparing Policy Directions.

Legal parameters – Some of the Policy Directions listed, or hybrids that may be created, may seem incompatible with current laws or regulations.¹⁸ As with policies, laws and regulations change over time. A Policy Direction considered incompatible with the present laws might be consistent with future legislation or interpretation of the law. If individual actions within a particular Policy Direction would require legal reconciliation or adjustment, necessary measures would have to be taken prior to implementation of that Policy Direction.

Regional values – Given the broad diversity of opinion in the Region, any proposed solution is likely to please some and upset others. Decisionmakers recognize that there are often conflicting values for natural resources in the Columbia River Basin. These different value systems are represented across the range of Policy Directions.

Political intervention – Many of the actions that have been proposed for fish and wildlife mitigation and recovery efforts have generated a great deal of controversy due to their anticipated effects. The degree of political resistance to any given Policy Direction is directly related to the degree of economic, social, and natural environmental consequences of that Policy Direction. The Region must consider what kinds of tradeoffs it is willing to make in minimizing these environmental consequences. It is unlikely that a "sacrifice-free" option will emerge. Political pressure is likely to play a significant role

¹⁸ An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or Federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered. CEQ 1981, Question 2 and CEQ 1987, Sec. 1502.14.

in the selection and successful implementation of any regional fish and wildlife mitigation and recovery plan.

3.3.4 Other Considerations: Implementation

In addition to the environmental consequences and the purposes discussed in this document, decisionmakers need to consider questions about implementation when selecting a Policy Direction. As discussed in Section 3.3.3 above, practical concerns, such as the legal feasibility of implementation, regional values, and the degree of political support, should be taken into account.

Other questions to consider include the following:

- How many species will benefit?
- What is the magnitude of benefit?
- What is the certainty of achieving the intended results?
- How long might it take to achieve the intended results for fish and wildlife?
- How likely is it that the Policy Direction can be implemented?
- How long can the benefits of the selected actions be expected to last?

The questions above were drawn from the Federal Caucus' Conceptual Plan (draft "All-H Paper") process. These are examples only; each decisionmaker undoubtedly will raise his or her own questions, unique to his or her circumstances. A more detailed discussion of implementation factors—those events or influences that may determine whether or not a Policy Direction will be successful—can be found in Chapter 4.

3.4 FURTHER CONSIDERATIONS REGARDING THE COMPARISON OF POLICY DIRECTIONS

- **This section briefly discusses the relationship between short-term uses of man's environment and the effects on long-term productivity, irreversible and irretrievable effects, and cumulative impacts.**

Both NEPA and the CEQ regulations implementing NEPA specify that the analysis of environmental consequences include an examination of the relationship between short-term uses of the environment and the effects on long-term productivity, irreversible and irretrievable effects, and cumulative impacts. In this EIS, the discussion of these environmental impacts has been incorporated into Sections 5.2 Generic Environmental Effects and 5.3 Environmental Consequences of Policy Directions.

3.4.1 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

When considering the environmental consequences of an alternative Policy Direction, it is important to consider the relationships between the short-term uses of man's environment and the maintenance and enhancement of long-term productivity. All of the Policy Directions analyzed in this EIS examine the possible actions the Region could take for fish and wildlife mitigation and recovery. Almost all of these actions require a short-term use of the environment in order to benefit long-term productivity of fish and wildlife. For example, the construction of a hatchery is a short-term use of the environment. Land would need to be cleared for the facility and water would be acquired to use for rearing fish. These short-term uses are necessary in order to maintain and enhance the long-term productivity of the targeted species of fish. It is also important to remember that a short-term uses designed to benefit one species may, in fact, be detrimental to the long-term productivity of another species. Although the hatchery may benefit the targeted species in the long-term, it could facilitate increased competition, predation, and the general decline of other species.

In addition to the impacts to the long-term productivity of the natural environment, short-term uses for fish and wildlife mitigation and recovery may also result in effects to the long-term productivity of the economic and social environments. A hatchery may impact the economic environment by supporting the long-term productivity of commercial and recreational harvest. While in the social environment, a hatchery-produced fish may have less value than a naturally-spawned fish, and be viewed as detracting from the long-term productivity of the ecosystem. For a discussion of the potential effects to the natural, economic, and social environments please see Section 5.3.

Some short-term uses of the environment may also have associated effects. These associated effects may, in turn, limit the maintenance and enhancement of long-term productivity of the environment, including the natural, economic, and social environments. For example, breaching a dam to benefit anadromous fish—the short-term use— would likely result in the need for replacement power. The replacement power could require a new energy generating resource. This resource would likely have impacts to the natural environment—air, land, water, and fish and wildlife—as well as impacts to economic and social environment—increased power rates and decreased aesthetics. For a discussion of intended and associated effects, please see Section 5.2.

3.4.2 Irreversible and Irretrievable Effects

When considering the environmental consequences of an alternative Policy Direction, it is also important to consider any irreversible and irretrievable effects. An irreversible and irretrievable commitment of resources (IIC) occurs when resources are consumed or lost such that they cannot be recovered. These effects must be identified and described where possible.

The discussions of environmental impacts in Section 5.2 and Section 5.3 include examples irreversible and irretrievable effects. In fact, all of the alternative Policy

Directions include some IIC. For example, cultural resources may be lost due to construction, fossil fuels may be consumed by new generation, water spilled to enhance fish migration, and habitat can be inundated. In considering the environmental consequences of alternative Policy Directions for fish and wildlife mitigation and recovery, two important concepts that must be recognized are: extinction is an irreversible and irretrievable effect and fish and wildlife funding, spent in a particular year, is also an irreversible and irretrievable effect. These two effects are very important when making decisions and implementing a Policy Direction.

Any IIC that could occur due to a specific action taken for fish and wildlife mitigation and recovery would be considered in a site-specific manner. Numerous potential actions are described in the Sample Implementation Actions in Volume III. If these or other actions are implemented, the site-specific environmental document (e.g. tiered ROD) will address these effects. See Chapter 1.

3.4.3 Cumulative Impacts

A cumulative impact is one that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Assessing cumulative impacts is best served by consideration of both the broad-based actions (e.g. policy and programs) and the site-specific actions. This EIS is designed to account for the potential cumulative impacts of many site-specific actions when following a particular Policy Direction. The assessment of cumulative impacts from reasonably foreseeable actions in this EIS is furthered by the use of a tiered ROD process (Chapter 1). The tiered ROD process connects program or site-specific projects to the policy-level analysis and decisions of this EIS. Thus, this document describes all the environmental effects—direct, indirect, and cumulative—of choosing a particular Policy Direction or combining several Policy Directions. For more information regarding the types of effects that could result from a particular Policy Direction, please see Section 5.2 and 5.3.

3.5 MODIFYING, EXTENDING, OR CREATING A POLICY DIRECTION

As changes occur in the natural, economic, and social environments, decisionmakers must have the flexibility to respond to these changes by modifying, extending, or creating new Policy Directions. This EIS incorporates three tools to provide flexibility in responding quickly to changing conditions—Response Strategies, Reserve Options, and the Mix and Match approach. Each of these tools is briefly described below.

3.5.1 Response Strategies

Response Strategies allow decisionmakers to make immediate corrections or improvements to a chosen Policy Direction. These modifications are such that they do not alter the underlying theme of the Policy Direction. The Response Strategies are used

to facilitate implementation of fish and wildlife mitigation and recovery efforts and to address unforeseen or uncertain events. For a complete discussion on Response Strategies, see Section 4.2.

3.5.2 Reserve Options

Reserve Options incrementally extend or intensify the different components of the five base alternative policy directions beyond the endpoints circumscribed by the Natural Focus and Commerce Focus alternatives. These Reserve Options essentially give future decisionmakers the flexibility to extend the range of alternatives to respond to change. For a complete discussion of Reserve Options see Section 4.2. For analysis of the environmental consequences of the Reserve Options see Section 5.4

3.5.3 Build Your Own Alternative: A Mix and Match Approach

A new Policy Direction may be needed to meet the changing needs of the fish and wildlife mitigation and recovery effort in the Region. To accommodate this likelihood, a means to "mix and match" components of the alternative Policy Directions to create a myriad of "hybrid" alternatives has been designed. These hybrids can combine the themes, and the sample actions determined to be consistent with those themes, of more than one Policy Direction. (Some implementation actions may be incompatible with others; therefore not all combinations are possible.) Decisionmakers can thereby respond to areas of known controversy or concern within the Region, or can choose alternative strategies that better meet their needs at the time of decision.

In this EIS, BPA has analyzed a broad range of alternative Policy Directions; identified a number of key issues; and, consistent with the themes of the Policy Directions, identified and sorted individual implementation actions across the key issues. By combining components of the various Policy Directions, the BPA Administrator (and other decisionmakers) have the necessary information to understand the overall environmental consequences of other possible alternatives for fish and wildlife mitigation and recovery. Decisionmakers can quickly assess the environmental consequences without being drawn into a needlessly protracted procedural process at a time when expedient decisions are essential to the mitigation and recovery of fish and wildlife species. For a complete discussion on how to use the Mix and Match approach see Appendix I, Build Your Own Alternative.

BPA's preferred alternative, PA 2002, was developed using the Mix and Match approach. PA 2002 is essentially a blend of two different Policy Directions: Weak Stock Focus and Sustainable Use Focus. PA 2002 reflects the overall fish and wildlife mitigation and recovery policy in the Region as of 2002. A full discussion of PA 2002 and its potential environmental consequences follows in Section 3A.

As time goes on, the need for new or substantially modified Policy Directions will likely be necessary, and the same process used to develop the PA 2002 alternative would then be applied. Having this process in place will help avoid unnecessary delays in implementing fish and wildlife mitigation and recovery actions. The Mix-and-Match

approach can also be used to simulate actual regional proposals to determine what natural, economic and social environmental effects can reasonably be expected from their implementation.

- **Chapter 4, Implementation and Response to Change, discusses factors that can influence the direction of and success in implementing each Policy Direction, and presents ways to assist implementation and respond to change. It also presents the criteria for implementation results.**

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3A BPA PREFERRED ALTERNATIVE 2002 (PA 2002)

➤ **After completing several important steps—**

- considering completed and ongoing regional fish and wildlife mitigation and recovery processes,
- seeking out and considering public comment on the issues and alternatives,
- evaluating the likely environmental consequences,
- considering the Status Quo (baseline) alternative,
- comparing the five Policy Direction alternatives, and
- reviewing the EIS purposes—

BPA has identified the Preferred Alternative Policy Direction described below.

During this EIS process, BPA has spent more than three years participating in, surveying, and assessing the various regional fish and wildlife mitigation and recovery processes to be able to describe and understand the Region's policy position on the mitigation and recovery effort. Using this information as a guide, BPA has developed the following Preferred Alternative Policy Direction (PA 2002). The PA 2002 reflects the past several years of regional fish and wildlife policy guidance and more specifically considers the state of the overall 2002 policy in the Region established by several key decisionmaking entities. The PA 2002 will serve as the initial means to guide BPA in meeting its need for a comprehensive and consistent policy for implementation and funding of its fish and wildlife mitigation and recovery efforts.

After carrying out an extensive public discourse on the Policy Directions, BPA reviewed all options equally before selecting a Preferred Alternative. BPA sought, and will continue to seek, suggestions for additional alternatives that might better meet regional, as well as BPA, needs in the future. BPA has considered the comments brought forth during the public review of the Draft EIS and has reflected on this information in light of the related policy actions being taken in 2002 by others before making this designation of a Preferred Alternative Policy Direction. BPA will do the same in any future decisionmaking process.

BPA has obligations to avoid jeopardizing listed species under ESA and to mitigate for impacts to fish and wildlife in a manner consistent with the Council's Fish and Wildlife Program. This EIS shows, however, that there are many other highly important natural and socioeconomic resources affected by any Policy Direction BPA might take. Identifying the PA 2002 Policy Direction to guide its implementation and funding of fish and wildlife mitigation and recovery efforts underscores BPA's desire to be able to make a fully informed decision that will consider the potential environmental consequences and fulfill BPA's purposes in carrying out its mission as a Federal agency. See Section 3A for a detailed analysis of the PA 2002.

Description: The focus of the PA 2002 is to protect weak stocks of fish and achieve biological performance standards, as set forth in the BiOps, while sustaining overall populations of fish and wildlife for their economic and cultural value. PA 2002 is essentially a blend of the *Weak Stock* and *Sustainable Use* Alternative Policy Directions.¹⁹ The Weak Stock Alternative emphasizes *human intervention to support recovery* of weak fish stocks and wildlife populations that are listed or proposed for listing under the Endangered Species Act or that have other legal protections. The Sustainable Use Alternative emphasizes *human intervention as part of a goal to rebuild and maintain* sustainable fish and wildlife populations to promote expanded harvest and recreation opportunities. As under both Alternatives, the unified regional planning approach will be implemented to the greatest degree possible.

The PA 2002 focuses on enhancing fish and wildlife *habitat*, modifying *hydro* operation and structures, and reforming *hatcheries* to both increase listed stock populations and provide harvest opportunities in the long-term. It gives priority to improving water quality and habitat for ESA-listed stocks of fish over economic activity, stopping short of breaching dams. It emphasizes human management, in a least-cost manor, to recover listed species and restore and maintain sustainable populations of fish and wildlife, while recognizing that ultimately the fate of the listed species may be significantly determined by weather and ocean conditions rather than human action.

The principal guidance for this Policy Direction in regard to using the unified regional planning approach comes from the Federal Caucus' Basinwide Strategy, the 1- and 5-year implementation planning and progress reporting efforts of the three Federal Action Agencies (a subset of the Federal Caucus) for the FCRPS, the Council's 2000 Fish and Wildlife Program, Tribal Vision, and the Corps' 2002 Record of Decision on the Lower Snake River Juvenile Salmon Migration Feasibility Study. For example, the Basinwide Strategy states, "This paper [Basinwide Strategy] presents the federal government's recommendations for actions needed to recover threatened and endangered salmon and steelhead in the Columbia River Basin. It is designed to complement the recovery plans

¹⁹ The dam breaching aspects under the Weak Stock Focus alternative are not part of the PA 2002. See Corps 2002c.

for resident fish and other aquatic species, and builds on actions already taking place to recover these species. ... The actions recommended are presented as a Strategy, not a menu."²⁰ The annual 2002 Implementation Plan states, "Both the 5-year plans and the 1-year plans address measures to be undertaken by the Action Agencies *only*, with primary focus on *endangered fish*. ... While some of the projects may not respond directly to an RPA [reasonable and prudent alternative] action, the Action Agencies intend to include relevant projects to benefit ESA-listed fish in the overall Plan to coordinate ongoing and new projects."²¹ The Corps, one of the Action agencies, in a key decision on the lower Snake River hydro operations, gives guidance and further confirms its commitment to use the Implementation Plans by stating, "The Corps will rely on the annual and 5-year plans as the mechanism to implement the action items in the recommended plan (preferred alternative) described in the FR/EIS."²² The Council's Program states, "The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the Region. This ecosystem provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act."²³

All of the documents mentioned above agree that coordinated efforts by governments and organizations in the Pacific Northwest are necessary. The FCRPS agencies intend to reduce adverse fish and wildlife impacts resulting from their actions. The Basinwide Strategy states, "The federal agencies cannot solve the problem alone, or acting unilaterally. Additional and strong action by state and tribal governments, local authorities, and other participants must occur for recovery success."²⁴ The Action Agencies' 2002 Implementation Plan states, "Many of the RPA objectives require that coordination take place with outside parties and their respective programs, processes, and plans"²⁵ In addition the Council states, "Council's program is designed to link to, and accommodate, the needs of other programs in the basin that affect fish and wildlife."²⁶

To further complement the work of the Federal Caucus, FCRPS Action Agencies, and the Council, the EIS Team also extensively consulted the Governors' Recommendations and the Tribal Vision. The Governors' Recommendations state, "In order to succeed, the Region must have the necessary tools including a clear and comprehensive plan, adequate time, and sufficient funding."²⁷ The Governors' Recommendations continue by stating,

²⁰ Federal Caucus 2000b, pp. 1-2.

²¹ USDOJ/Bureau, Corps, and BPA 2001b, pp. 1-2.

²² Corps 2002c, p.6.

²³ Council 2000d, p. 13.

²⁴ Federal Caucus 2000b, p. 2.

²⁵ USDOJ/Bureau, Corps, and BPA 2001b, p. 3.

²⁶ Council 2000d, p. 10.

²⁷ Governors' Recommendations 2000, p. 1.

"... the goal we suggest is protection and restoration of salmonids and other aquatic species to sustainable and harvestable levels meeting the requirements of applicable statutes, including the Endangered Species Act, the Clean Water Act, the Northwest Power Act, and tribal rights under treaties and executive orders while taking into account the need to preserve a sound economy in the Pacific Northwest."²⁸

The Tribal Vision notes, "For the tribes, there has always been a common understanding—that their very existence depends upon their respectful enjoyment of the Basin's rich and vast land and water resources. ... Tribal people believe that there is no distinction between *natural* resources and *cultural* resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained."²⁹

Where there are Key Issues not specifically addressed in the above referenced documents, BPA was guided by the overall themes of the associated Weak Stock and Sustainable Use Policy Directions, other regional fish and wildlife processes, and public input to determine the remaining aspects of the PA 2002. For example, as part of the ICBEMP process, a strategy was recently adopted for implementation. It states in the vision of the strategy, "[t]hat agency personnel will work with the public, involved regulatory agencies and tribal governments, State and local governments, and the science community to conserve rare ecosystems, restore degraded ecosystems, and provide benefits to people within the capabilities of the land."³⁰ The press release for the Strategy succinctly captures the meaning of this vision state the, "...goal is to manage public lands in the Interior Columbia Basin to meet community needs for goods and services in an ecologically sustainable way."³¹

The Philosophy Behind the PA 2002 Policy Direction:

"Our goal is to arrive at a "unified plan"—a set of common understandings and actions that enjoy a wide base of regional support and commitment. The Action Agencies believe that there is much common ground between the 2002–2006 5-Year Plan and the various regional recommendations and programs for salmon recovery," (USDOJ, Corps, and BPA, 2002 Annual Implementation Plan)³²

"... Recovery must provide for immediate, emergency needs of the fish, but also commitment for the long-term. Recovery must operate across multiple jurisdictions—five states, two nations, and numerous Indian tribes. Recovery must meld the needs of the anadromous and resident fish, listed and non-listed fish, and hatchery and wild fish. Through all of these challenges, recovery must deal with human actions, yet strive to restore some semblance of the natural conditions and

²⁸ Governors' Recommendations 2000, p. 2.

²⁹ CRITFC 1999, pp. 1-2.

³⁰ USDA/USFS and USDOJ/BLM 2003

³¹ USDA/USFS and USDOJ/BLM 2003

³² USDOJ/Bureau, Corps, and BPA 2001a, p. 3.

functions that support wild fish." (USDOJ, Corps, and BPA, 2002-2006 Implementation Plan)³³

"It is the federal government's role to administer the Endangered Species Act and to uphold tribal trust responsibilities. But the states also have an important role and responsibilities, as do other regional entities. Agreement on a regional approach, consisting of specific federal, state and regional plans that protect both our salmon and our communities, should be reached and accepted by federal and state officials in consultation with tribal leaders" (Governors Recommendations)³⁴

"Under the Northwest Power Act, the Council's fish and wildlife program is not intended to address all fish and wildlife problems in the basin from all sources. But the Council adopted the vision, objectives, strategies and scientific foundation with the belief that they will complement and help support other fish and wildlife recovery actions in the region." (Council's 2000 Fish and Wildlife Program)³⁵

"There are gaps and unavoidable uncertainties associated with the science. Therefore, the Strategy calls for a comprehensive research monitoring and evaluation program to reduce those uncertainties that are critical to future decisions regarding salmon and steelhead recovery, while providing information for needed adjustments to future strategies." (Federal Caucus, Basinwide Strategy)³⁶

"The tribal vision for the future of the Columbia River Basin is one in which people return to a more balanced and harmonious relationship with the environment." (CRITFC, Tribal Vision)³⁷

The PA 2002 is a blend of Policy Directions (as noted above, primarily the **Weak Stock** and **Sustainable Use** Focus Policy Directions) that emphasizes the need to recover ESA-listed fish while trying to preserve the economy and work cooperatively with human actions and activities affecting that resource. This PA 2002 emphasizes "... working with the governments and people of the region to upgrade the FCRPS, to protect and enhance fish habitat, to reform hatcheries, and to rebuild harvestable fish runs."³⁸

Differences from Status Quo Implementation Actions:³⁹

- Increases enhancement of fish habitat (e.g., increases tributary streamflow, removes passage barriers, protects high-quality habitat, and screens irrigation diversions) to improve fish productivity and, where blocked areas remain, uses substitution of resident fish species as mitigation. Replacement of wildlife habitat lost to hydro development will continue in areas where full mitigation has not yet

³³ USDOJ/Bureau, Corps, and BPA 2001, p. 4.

³⁴ Governors, Pacific Northwest States 2000, p. 17.

³⁵ Council 2000d, Introduction section, p. 10.

³⁶ Federal Caucus 2000b, Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy (Basinwide Strategy). December, p. 2.

³⁷ CRITFC 1999, p. 2.

³⁸ USDOJ, Corps, and BPA 2001a, p. 4.

³⁹ Federal Caucus 2000b, pp. 4-8.

been achieved. (*Note: The Council's subbasin planning process and Provincial Reviews can be used to provide focus and discipline to our identification of desirable "offsite" improvements and RM&E projects and the information from this planning and review process will be implemented as appropriate based on its conclusions.*)

- Focuses on achieving biological performance standards in the mainstem of the Federal hydrosystem, and developing and achieving biological performance standards for protection and enhancement of fish and wildlife habitat that is not on the mainstem (i.e., offsite).
- Increases overall harvest through transition to selective fisheries to reduce impacts to listed and weak fish stocks.
- Increases tribal harvest through selective fisheries.
- Reforms hatcheries to both reduce risks to wild fish while continuing to supplement harvest and contribute to recovery of ESA-listed stocks by acting as a safety net to avoid extinction (e.g., reform hatcheries to focus on genetic management and conservation⁴⁰).
- Increases adult and juvenile fish survival at dams (e.g., changes in flow, spill, passage, and water quality) to meet biological performance standards.
- Increases opportunities for commercial activity except where priority is given to ESA-listed species (e.g., zoning changes for residential/commercial/industrial development, restrictions on water usage for commercial/industrial purposes, and recreational sport fishing and hunting).

3A.1 Assessment of PA 2002

BPA committed to evaluate the ongoing fish and wildlife efforts throughout the Region before determining a preferred alternative Policy Direction. BPA also committed to consider the information from the public process that was completed on this EIS. The BPA Administrator has honored both commitments in selecting a preferred alternative. PA 2002 reflects a culmination of fish and wildlife policy from many different regional guidance sources as of 2002. Clearly, BPA has used a unified planning approach to reach a comprehensive and cumulative assessment of the PA 2002. For a more complete description of the PA 2002, see Section 3.2.8.

The PA 2002 substantially represents a blend of the *Weak Stock Focus* and *Sustainable Use Focus* Policy Directions. This combination of Policy Directions best reflects BPA's goal of implementing a Policy Direction that, to the maximum extent practicable, is feasible, is scientifically sound, and uses a unified planning approach. It accounts for the vast differences of opinions and values throughout the Region, the degree of scientific uncertainty that still surrounds fish and wildlife mitigation and recovery, and the difficulty of bringing together the diverse authorities and obligations of Federal, state, and tribal entities. Some readers will likely perceive little difference between the

⁴⁰ USDOJ/Bureau, Corps, and BPA 2001a, p. 25.

PA 2002 (Preferred Alternative) and Status Quo, while others will see it as a sizable change.

3A.2 Summary of the Environmental Consequences of PA 2002

The environmental consequences of the PA 2002 are summarized in Table 3A-1 below. Like the base Policy Directions, the PA 2002 has been compared to the Status Quo. A discussion of the environmental consequences for each effect category follows in Tables 3A-2 through 3A-12.

3A.3 Environmental Consequences of PA 2002

This section consists of tables (Tables 3A-2 through 3A-12) organized by effect areas to allow for conveniently comparing the impacts of PA 2002 to Status Quo. Each of these broad effect areas is broken into subcategories for analysis. For each effect area category or subcategory, the affected environment is briefly summarized in terms of existing conditions. Next, the environmental conditions under the Status Quo Policy Direction are briefly described. Then, the environmental conditions under PA 2002 are described. The environmental effects analysis considers both the short and long term.

Each effect area is first summarized in a table, broken down by the environmental consequences on each subcategory, when applicable. Shading is used to quickly show the reader whether the Policy Direction results in *much worse*, *worse*, *the same*, *better* or *much better conditions* relative to the Status Quo policy. For the Natural Environment, the environmental consequences are described in terms of the effects on fish and wildlife. For the Economic Environment and Social Environment, the human perspective is considered in describing the environmental consequences. Following each table, the environmental consequences are summarized for PA 2002.

The environmental consequences for each effect area are followed by **Regional Guidance**. Regional Guidance is made of broad statements taken from several of the key documents BPA considered in determining its PA 2002. These documents represent the views of several Federal agencies (including the Action Agencies), the Northwest Power Planning Council, recommendations from the governors of the affected states, and Tribal interests. As previously discussed, BPA considered much more than the information in the Regional Guidance documents prior to determining its PA 2002; however, these documents serve as important indicators of regional concerns. The Sample Implementation Actions in Volume 3 provide further examples of actions the Regional Guidance documents offered for consideration in implementing a strategy or policy.

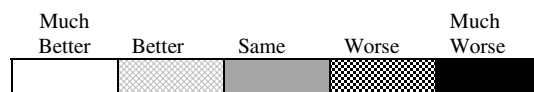
Table 3A-1: Comparison of the Alternatives Including the Preferred Alternative*

Effect Area	Status Quo*	Natural Focus	Weak Stocks	PA 2002	Sustainable Use	Strong Stocks	Com. Focus
NATURAL ENVIRONMENT							
Air Quality							
Land Habitat							
Upland							
Riparian/Wetland							
Water Habitat							
Nitrogen Supersaturation							
Non-Thermal Pollution							
Sedimentation**							
Temperature/Dissolved Oxygen							
Instream Water Quantity							
Amount Stream/River Habitat							
Reservoir Habitat							
Fish and Wildlife							
Naturally-spawning Native Anadromous Fish							
Hatchery-produced Native Anadromous Fish							
Native Resident Fish							
Native Wildlife							
Non-Native Species***							
SOCIAL AND ECONOMIC ENVIRONMENTS							
Commerce							
Recreation							
Economic Development							
Funding Costs							
Tribes							
Fish Harvest							
Health, Spirituality, and Tradition							
Cultural/Historic Resources							
Aesthetics							

* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 5.1.

** The sedimentation evaluation is based on long-term effects. It should be noted that the short-term effects under Natural Focus and Weak Stock from dam breaching would be much worse than those conditions under Status Quo.*** Under this analysis fewer non-native species is considered "better". For a complete discussion, see Chapter 5.

*** Under this analysis fewer non-native species is considered "better". For a complete discussion, see Chapter 5.



The short and full citations for each of these key Regional Guidance documents are:

Key Document Full Citation

Regional Guidance Short Citation

Federal Caucus. 2000b. Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy. December.

Basinwide Salmon Recovery Strategy

USDOI/Bureau, Corps, and BPA. 2001a. Endangered Species Act Implementation Plan for the Federal Columbia River Power System. [known as the 5-Year Implementation Plan]. Summer.

Draft Action Agency ESA 2002-2006 Implementation Plan

Corps. 2002c. Record of Decision: Lower Snake River Juvenile Salmon Migration Feasibility Study. September

Corps 2002 LSR ROD

Council. 2000d. 2000 Columbia River Basin Fish and Wildlife Program. Council Document 2000-19.

Council's 2000 Fish and Wildlife Program

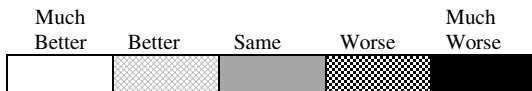
Governors, Pacific Northwest States. 2000. Recommendation for the Protection and Restoration of Fish in the Columbia River Basin. July.

Governors' Recommendations

Columbia River Inter-Tribal Fish Commission. 1999. The Tribal Vision for the Future of the Columbia River Basin and How to Achieve It.

Tribal Vision

Tables Key:



3A.3.1 Natural Environment

The natural environment effect areas include air quality, land habitat, water habitat and fish and wildlife. Land is further broken into upland habitat (amount and quality) and riparian/wetland habitat (amount and quality). Water is divided into numerous subcategories: nitrogen supersaturation, non-thermal pollution, sedimentation, temperature/dissolved oxygen, instream water quantity, amount of stream/river habitat, and reservoir habitat. Fish and wildlife is also broken into subcategories: naturally-spawning and hatchery-produced anadromous fish, native resident fish, native wildlife, and non-native species.



AIR QUALITY

Table 3A-2: Air Quality Effects Comparison of PA 2002

AIR QUALITY fewer emissions = better	Status Quo	PA 2002
CO		
CO ₂		
NO _x		
PM ₁₀		
SO ₂		

Existing Conditions: With regard to fish and wildlife, the major concerns for existing air quality conditions are emissions from transportation and energy generation. Emissions of major concern are carbon monoxide (CO), carbon dioxide (CO₂), nitrogen oxides (NO_x), particulate matter (PM₁₀), and sulfur dioxide (SO₂).

Status Quo: Relative to existing air conditions, the Status Quo Policy Direction is expected to include some increase in air pollutants associated with additional economic growth. The increase in air emissions would be regulated by existing pollution abatement programs and technological improvements, such as those under the Clean Air Act.

PA 2002: The changes from modifying hydro operations to benefit listed species (such as those suggested in the 2000 NMFS and FWS BiOps for the FCRPS) are not expected to affect air emissions much, if at all, because replacement power generation would not likely be needed. No change is expected from increased road and rail transportation to replace barging, as dams would not be breached. Air quality is not likely to change compared to conditions under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Minimize Adverse Effects on Humans. Implement salmon and steelhead conservation measures in ways that minimize their adverse socio-economic and other human effects." (p. 33)

Governors' Recommendations

"We acknowledge that the Columbia and Snake River hydropower system has been improved for fish passage. ... we support further modifications to the configuration and operation of the hydrosystem where appropriate and necessary to benefit fish and so long as the modifications do not jeopardize the Region's reliable electricity supply." (p. 8)



LAND HABITAT

Table 3A-3: Land Habitat Effects Comparison of PA 2002

LAND HABITAT	Status Quo	PA 2002
UPLAND HABITAT AMOUNT AND QUALITY more quality habitat = better		
RIPARIAN/ WETLAND HABITAT AMOUNT AND QUALITY more quality habitat = better		

Existing Conditions: With regard to fish and wildlife, the most important land and land use issues concern the potential loss of and adverse impacts to habitat from human activities. The use or development of some habitat is controlled or limited by regulation. Land habitats are fragmented and degraded by urban development, grazing, mining, timber harvest, transportation, recreation, hydro development, stream channelization, and introduction of exotic species.

Status Quo: Native habitat and agricultural lands are being developed to meet urban growth needs. Although some upland and wetland habitat is being improved, development of upland and riparian areas continues to decrease habitat. Mitigation efforts have focused on protecting, enhancing, and managing land habitat, but the trend is toward increased habitat fragmentation.

PA 2002: A balanced management approach that considers habitat needs for both listed and non-listed fish and wildlife would be used. Substantial human intervention would be necessary to protect habitat and enhance degraded habitat for ESA-listed fish and wildlife, especially in areas designated as critical habitat. A variety of habitat protection and enhancement mechanisms would be used to increase the amount and quality of both upland and riparian/wetland habitats. These mechanisms could include purchase of conservation easements, fee title acquisitions, riparian fencing, and cost sharing with other Federal agencies under various agricultural incentive programs, to protect important habitat features for listed species. Habitat protection and enhancement efforts would use a "watershed" or "ecosystem" approach, i.e., a more comprehensive look at a subbasin and its biological needs. Implementation of habitat protection and enhancement projects in any particular watershed or subbasin would result in benefits to all species located within that watershed or subbasin regardless of the species targeted. Habitat protection and enhancement efforts would result in an increase in the amount of high-quality habitat. Overall, more habitat for ESA-listed species, as well as habitat for non-listed species, would be protected and enhanced than under the Status Quo.⁴¹

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Protect existing high quality habitats." (p. 33; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9)

"Restore habitats on a priority basis." (p. 9)

⁴¹ Due to possible changes in flows and spill some planned transmission construction projects could accelerate from the development over Status Quo. The land impacts of building new transmission would occur sooner but would likely not be different than Status Quo.

Draft Action Agency ESA 2002-2006 Implementation Plan

"Conserve critical habitats upon which salmon, steelhead, bull trout, sturgeon, and other aquatic species depend, including watershed health." (p. 9)

Council's 2000 Fish and Wildlife Program

"Wherever feasible, this [Fish and Wildlife] program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin.... Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem" (p. 13)

Governors' Recommendations

"Protecting and recovering salmonids and other aquatic species requires protecting land on and around fish-bearing streams." (p. 5)

WATER HABITAT

The Water Habitat Effect area has been further broken down into, and evaluated by, the following subcategories:

- Nitrogen Supersaturation
- Non-Thermal Pollution
- Sedimentation
- Temperature/Dissolved Gas
- Instream Water Quantity
- Amount of Stream River Habitat
- Reservoir Habitat

More often than not, the Regional Guidance documents make broad policy direction statements regarding water habitat that can be applied to more than one of the subcategories. In an effort to eliminate repetitiveness within the overall Water Habitat Effects section, the following Regional Guidance list conglomerates the most commonly used Regional Guidance directives with the appropriate subcategories. For example, the Governors' Recommendations called for increased operational reliability, which applies to both nitrogen supersaturation and non-thermal pollution. For this Water Habitat Effects section, Regional Guidance statements unique to each subcategory are listed below the respective PA 2002. Otherwise, the common Regional Guidance objectives can be found listed below:

Regional Guidance Compilation for Water Habitat Effects:

Basinwide Salmon Recovery Strategy

"In the long term, attain state and tribal water quality standards in all critical habitats in the Columbia River and Snake River basins." (p. 33; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9) (Applies to: *Nitrogen supersaturation, Non-thermal pollution, Sedimentation, Temperature/Dissolved oxygen, Instream water quantity*)

"Prevent further degradation of tributary, mainstem and estuary habitat conditions and water quality." (p. 33; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9) (Applies to: *Nitrogen supersaturation, Non-thermal pollution, Sedimentation, Temperature/Dissolved oxygen, Instream water quantity, Amount of stream/river habitat, Reservoir habitat*)

"Conserve Ecosystems. Conserve the ecosystems upon which salmon and steelhead depend, including watershed health." (p. 33) (Applies to: *Non-thermal pollution, Sedimentation, Temperature/Dissolved oxygen, Instream water quantity, Amount of stream/river habitat, Reservoir habitat*)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Conserve critical habitats upon which salmon, steelhead, bull trout, sturgeon, and other aquatic species depend, including watershed health." (p. 9) (Applies to: *Nitrogen supersaturation, Non-thermal pollution, Sedimentation, Temperature/Dissolved oxygen, Instream water quantity, Amount of stream/river habitat, Reservoir habitat*)

Council's 2000 Fish and Wildlife Program

"Wherever feasible, this [Fish and Wildlife] program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin.... Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem." (p. 13) (Applies to: *Amount of stream/river habitat, Reservoir habitat*)

Table 3A-4: Water Habitat Effects Comparison of PA 2002

WATER HABITAT	Status Quo	PA 2002
NITROGEN SUPERSATURATION less = better		

Existing Conditions: The main issue for fish concerning Nitrogen Supersaturation (also called Total Dissolved Gas or TDG) is increased fish mortality due to gas bubble trauma (GBT) caused by high levels of dissolved gas. TDG is caused by spill over large dams. The problem is cumulative as the river flows over each of the dams. Many existing structures are not designed to minimize TDG.

Status Quo: TDG is being managed by controlled flow and spill operations, as well as spillway modifications. Some excessive voluntary spill operations for weak stocks and spring migrations may continue to cause TDG problems. Attempts to manage spill at dams so that gas levels are within Federal clean water guidelines will be partially successful, except in high-flow years. The dissolved gas abatement structures should assist in lowering current TDG.

PA 2002: Significant actions are already being taken to reduce TDG; spill and flow regimes would be modified to ensure compliance with local clean water standards. The dams, although not breached, would receive additional structural improvements (such as spillway flow deflectors, modifications to existing spillway flow deflectors, and pier wall extensions) to benefit weak stocks of fish. However, TDG, a problem even with improvements, would likely be about the same as under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

Corps 2002 LSR ROD

"The recommended plan ... structural and operational measures ... are intended to ... reduce TDG, and improve operational reliability. (p. 14)

Governors' Recommendations

"Priority capital improvements must also include those necessary to address water quality issues relating to both temperature and dissolved gas." (p. 8)

WATER HABITAT	Status Quo	PA 2002
NON-THERMAL POLLUTION less = better		

Existing Conditions: The main concerns for fish and wildlife regarding non-thermal pollution include direct adverse physiological effects and habitat degradation. Sources of non-thermal pollution include municipal and industrial wastewater, run-off from mines, and non-point sources such as irrigation return flows, agricultural runoff, and stormwater. Non-thermal pollution can include excesses of organic matter, fertilizers, pesticides, sediment, and numerous metals and chemicals. These pollutants can impair water quality and designated uses of specific water bodies.

Status Quo: Increasing population and economic growth produces additional pollution, but existing and planned regulations and programs, technological improvements for new industry, and decline of old industries all combine to reduce pollution. The net effect is that pollution increases from existing levels, but would continue to be regulated.

PA 2002: Positive incentives, monitoring, and enforcement would be used to help reduce both point and non-point sources of pollution. Regional entities would continue to work toward attainment of state and Federal water quality standards for non-thermal pollution throughout the Region pursuant to the CWA, especially in critical habitat. In addition, there would be management for multiple purposes to protect and enhance other habitat to promote recovery of listed species and maintain harvestable populations of fish and wildlife. Overall, there would be less non-thermal pollution than Status Quo, as the standards are applied region-wide.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

WATER HABITAT	Status Quo	PA 2002
SEDIMENTATION less = better		

Existing Conditions: With respect to fish and wildlife, the main concerns regarding sedimentation involve the potential degradation of aquatic habitat and the related adverse effects of soil erosion on terrestrial habitat. Sedimentation from erosion results from land disturbances (including agriculture, grazing, logging, urban development), and river disturbance such as dredging. Sediment is captured and accumulates behind dams. In addition to degrading habitat, sedimentation has negative effects on certain species during various stages of their lifecycles.

Status Quo: Large sediment loads are deposited into the river system throughout the Basin. Although an increase in urbanization may result in more sedimentation, other changes in land-use practices (conversion to more permanent crops, agricultural and grazing management, and practices to control erosion during construction) could compensate. The Region could experience gradual improvement as current water quality standards, BMPs, and new TMDLs are applied across the land base.

PA 2002: Erosion and sedimentation would be reduced throughout the Basin as part of a more active land use and water management strategy. Weak stock habitat would be emphasized. Enhancing and managing habitat (e.g., ensuring the availability of spawning gravel, providing streambank stabilization and managing riparian habitat) might have temporary, adverse effects, but would result in the long-term stabilization of ground surfaces, decreasing sedimentation. Overall, sedimentation in some areas would be somewhat less compared to Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

WATER HABITAT	Status Quo	PA 2002
TEMPERATURE/ DISSOLVED OXYGEN lower temperature = better		

Existing Conditions: Non-optimal water temperatures and low dissolved oxygen (DO) levels are major concerns for fish and wildlife management efforts. Water temperatures and low dissolved oxygen are seasonal problems for all fish in the mainstems and tributaries. Water temperature is a critical parameter affecting salmonid migration. Water temperatures affect DO levels. Adequate dissolved oxygen concentrations are important to fish, invertebrates, and other aquatic life. Mainstem changes in water temperature and DO levels are associated with dry years, low flows, long water retention times in reservoirs, and warm weather. Thermal pollution from industrial discharges also could contribute. Problems in tributaries could be linked to irrigation diversion quantity and timing, low storage releases, altered channel geometry, increased solar radiation through loss of riparian and streambank shading, and irrigation return flows.

Status Quo: Cooler water from within the Dworshak reservoir is released during the summer months for temperature control with diminishing benefits downstream on the Snake River. State water quality standards vary throughout the Region. Revised regional water quality standards and TMDLs for impaired watersheds should result in gradual improvement. Water temperature/dissolved oxygen conditions could be affected by global warming.

PA 2002: To ensure compliance with revised regional water quality standards and TMDLs for impaired watersheds, efforts would focus on reducing water temperatures in tributaries. Actions might include system-wide irrigation water management, retention, and reuse of irrigation return flows, and active streambed and riparian management to increase shading at strategic reaches and habitat features. Actions reducing water temperature in tributaries would have little immediate effect on the mainstem. Temperature control structures or improved mixing zones and cold water releases on mainstem and upstream tributary facilities might help. Improvements would be focused where weak stocks are correlated with impaired water quality. Overall, temperature and DO would likely be about the same or slightly better than under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

Governors' Recommendations

"Priority capital improvements must also include those necessary to address water quality issues relating to both temperature and dissolved gas." (p. 8)

WATER HABITAT	Status Quo	PA 2002
INSTREAM WATER QUANTITY more = better		

Existing Conditions: With respect to fish and wildlife, the main concern regarding instream water quantity is the loss of habitat caused by water withdrawals during summer months, when water levels are at their lowest. Water withdrawals for storage, irrigation, consumption, and groundwater storage reduce the amount of river and stream flow and habitat. Tributaries, more arid areas, and areas upstream of the lower Snake River dams experience the most substantial adverse effects from water withdrawals.

Status Quo: Water quantity problems (as a result of withdrawing water for irrigation, urban and other uses) are a major cause of habitat degradation and reduced fish production. Existing programs to manage storage releases and acquire water supplies from irrigation would continue. Development of new surface-water irrigation is somewhat limited by state permit systems. Water conservation programs to increase efficient use of water (such as irrigation management, more efficient irrigation systems, and information systems) would reduce per acres water application.

PA 2002: Water withdrawals would be managed to reduce or avoid adverse effects, primarily through the use of more efficient technology and water conservation programs. For example, water rights acquired from irrigated lands in riparian zones would be dedicated to instream use to benefit fish and wildlife, especially listed species. Some storage would be used to increase flows during fish migrations. In some areas, there would be more instream water than under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

Governors' Recommendations

"... we recommend federal assistance and support be made available to the states to better coordinate these timelines and, where necessary, to accelerate water quality improvements and to establish instream flows that benefit listed aquatic species in the Columbia Basin." (p. 4)

"We support voluntary exchanges to obtain needed water for fish and support the development of water markets to effect exchanges among willing buyers and sellers. ... we are committed to support changes in state law or policies to facilitate this approach. We also recognize existing efforts to conserve water and support further assistance to promote conservation." (p. 4)

WATER HABITAT	Status Quo	PA 2002
AMOUNT OF STREAM/RIVER HABITAT more = better		

Existing Conditions: The amount of stream/river habitat, a function of water quantity, is a major concern for fish and wildlife management efforts. The quality and quantity of freshwater habitat in much of the Columbia River Basin have declined dramatically in the last 150 years. Activities such as logging, farming, grazing, road construction, mining, and urbanization have changed the historical habitat conditions in the Basin by creating passage obstacles. The amount of habitat is also related to the highly regulated nature of the river.

Status Quo: Purchasing/leasing water rights from irrigators increases the amount of stream and river habitat. Some tributaries still lose habitat during dry months or low water years. Other actions taken are similar to those under instream water quantity.

PA 2002: Increases in instream water quantity through the purchase or lease of water rights would create some increase in habitat, especially in the tributaries. Flow augmentation throughout the drier months could increase the amount of habitat available during that time. Currently degraded river/stream habitat would be protected and enhanced to benefit listed species. There would likely be more stream/river habitat compared to the Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Protect existing high quality habitats." (p. 2; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9)

"Restore habitats on a priority basis." (p. 33; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9)

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

Council's 2000 Fish and Wildlife Program

See above: Regional Guidance Compilation for Water Habitat Effects

Governors' Recommendations

"The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish."

WATER HABITAT	Status Quo	PA 2002
RESERVOIR HABITAT more = better		

Existing Conditions: The main issue for fish and wildlife management concerning reservoir habitat is the potential increase or decrease in available habitat based on reservoir operation. Reservoir operations can affect water temperature, velocity, and sedimentation. Reservoirs provide surface and water column habitat for certain species of fish and wildlife. The amount of reservoir habitat is determined by dams in place and their associated storage and operations. Habitat can be lost because of irrigation and domestic use withdrawals, drought, and flow modifications to the hydro system. Reservoirs can adversely affect anadromous fish species by extending travel time and decreasing survival rates.

Status Quo: Reservoir habitat fluctuates seasonally to allow for improved anadromous fish migrations, and in response to irrigation and domestic use withdrawals. Water withdrawals potentially result in lost reservoir habitat. Federal Biological Opinions outline actions to be implemented relating specifically to reservoir management. Some water rights have been obtained through leases to be used for instream benefits.

PA 2002: The amount of reservoir habitat could fluctuate slightly from changes in flow management intended to benefit fish and wildlife. The fluctuations could be more dramatic when such changes are being made to support listed species. Water rights acquired from irrigated lands and water left instream for fish and wildlife could temporarily increase the amount of reservoir habitat; however, some storage would be used to increase flows during fish migrations. Overall the amount of reservoir habitat would be about the same as Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Water Habitat Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Water Habitat Effects

Council's 2000 Fish and Wildlife Program

"Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily come at the expense of other species." (p. 14)

Tribal Vision

"Manage water resources to more closely mimic the natural, historic river hydrograph ... but maintain, to the maximum extent practicable, full, stable water levels in ... reservoirs according to their Integrated Rule Curves and consistent with the Northwest Power Planning Council's Fish and Wildlife Program" (p. 6)

Corps 2002 LSR ROD

"The Corps intends to take actions in accordance with the 2001 ROCASOD [2001 Record of Consultation and Statement of Decision] and NMFS and USFWS 2000 Biological Opinions, continuing coordination with NMFS and USFWS and consultation, as may be required, to meet the adaptive management approach for the Lower Snake River Project." (p. 1)

"The Corps will rely on the annual and 5-year plans as the mechanism to implement the action items in the recommended plan (preferred alternative) described in the FR/EIS. The majority of the structural and operational items included in the recommended plan (preferred alternative) are addressed in the RPAs of the NMFS and USFWS 2000 Biological Opinions." (p. 6)

FISH AND WILDLIFE

Table 3A-5: Fish and Wildlife Effects Comparison of PA 2002

FISH AND WILDLIFE	Status Quo	PA 2002
NATURALLY-SPAWNING NATIVE ANADROMOUS FISH more fish = better		
HATCHERY-PRODUCED NATIVE ANADROMOUS FISH more fish = better		

Existing Conditions: The main concerns regarding native anadromous fish include ocean conditions, loss of habitat, over-harvest, and historical hydro operations. Also there is some concern that hatchery-produced anadromous fish cause problems for naturally-spawning anadromous fish. The proportion of hatchery fish found in the river systems has steadily increased. Many salmon stocks are listed as threatened or endangered, and few naturally-spawning stocks are healthy. Other species of anadromous fish include the Pacific lamprey and some sturgeon.

Status Quo: Major policies shaping salmon management are defined and guided by mitigation requirements, the Regional Act, the ESA, tribal fishing rights, and international treaties. However, there is no unified policy direction among all the interested parties and the science remains unclear. Anadromous fish populations vary erratically, driven by ocean and freshwater harvest, ocean and freshwater survival conditions, and weather cycles. Hatcheries are used primarily to mitigate the effects of the hydro system and support harvest. Some hatcheries, however, are used to meet conservation goals. Efforts are made to protect and enhance habitat. Hydro operations and modifications to improve passage are guided by biological opinions issued by NMFS to benefit listed anadromous fish. Given the numerous parties involved with anadromous fish policy, it is unclear whether salmon populations will increase to sustainable levels.

PA 2002: Efforts would be made to enhance habitat for anadromous fish in order to increase production and maintenance of harvestable levels of anadromous fish. Emphasis would be placed on protecting and enhancing critical habitat for listed anadromous fish. Management of undesirable fish species to benefit anadromous fish could include methods such as changes in angling regulations, physical removal (e.g., nets, traps, or electrofishing), the use of pesticides (e.g., rotenone and antimycin), dewatering, and stream flow augmentation, and habitat manipulation techniques. The hydro system would be modified to further increase passage survival of anadromous fish. Also, increased fish transport would be used to improve survival. Hatcheries would be reformed and managed primarily for conservation/recovery and, where applicable and compatible, compensation/supplementation. Compared to Status Quo, native anadromous fish (both naturally-spawning and hatchery-produced) would increase with habitat, hatchery, hydro, and harvest improvements.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Conserve Species. Avoid extinction and foster long-term survival and recovery of Columbia Basin salmon and steelhead and other aquatic species." (p. 33)

"Conserve Ecosystems. Conserve the ecosystems upon which salmon and steelhead depend, including watershed health." (p. 33)

"Maintain and improve upon the current distribution of fish and aquatic species, and halt declining population trends within 5–10 years." (p. 33)

"Establish increasing trends in naturally sustained fish populations in each subregion accessible to the fish and for each ESU within 25 years." (p. 33)

"Conserve genetic diversity and allow natural patterns of genetic exchange to persist." (p. 33; Draft Action Agency ESA 2002-2006 Implementation Plan, p. 9)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Avoid jeopardy and assist in meeting recovery standards for Columbia Basin salmon, steelhead, ... and other ESA-listed aquatic species that are affected by the FCRPS." (p. 9)

"Establish increasing trends in naturally sustained fish populations in each sub-region accessible to the fish and for each ESA-listed population within a timeframe determined through recovery planning." (p. 9)

"Conserve genetic diversity and allow natural patterns of genetic exchange to persist." (p. 9)

"Ensure that salmon, steelhead, sturgeon, and bull trout conservation measures are integrated with NWPPC Fish and Wildlife Program and balanced with the needs of other native fish and wildlife." (p. 10)

Council's 2000 Fish and Wildlife Program

"Systemwide water management, ... should balance the needs of anadromous species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily come at the expense of other species." (p. 14)

"Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas." (p. 22)

"Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases.... Any proposal to

produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species." (p. 21)

"Achieving the vision requires that habitat, artificial production, harvest, and hydrosystem actions are thoughtfully coordinated with one another. There also must be coordination among actions taken at the subbasin, province, and basin levels, including actions not funded under this program. Accordingly, creating an appropriate structure for planning and coordination is a vital part of this program." (p. 14)

Governors' Recommendations

"... We commit to support a recovery approach designed not only to achieve ESA delisting levels but also to rebuild the runs to levels that support treaty and non-treaty harvest." (p. 10)

"To assist the local planning effort, we recommend that state authorities designate priority watersheds for salmon and steelhead and that plans for these watersheds be developed" (p. 5)

"... the goal we suggest is protection and restoration of salmonids and other aquatic species to sustainable and harvestable levels meeting the requirements of the Endangered Species Act, the Clean Water Act, the Northwest Power Act and tribal rights under treaties and executive orders while taking into account the need to preserve a sound economy in the Pacific Northwest." (p. 2)

Tribal Vision

"The tribal vision for the future is one where people, fish, wildlife, plants and other natural and cultural resources are once again biologically healthy and self-sustaining.... It not only supports viable and genetically diverse fish and wildlife resources that provide direct benefits to society, through harvest and improved physical health of tribal and non-tribal members, but also nourishes the spirit." (p. 3)

"[Goals and Objectives] Biologically healthy, self-sustaining and harvestable anadromous ... protect and restore fish and wildlife and the aquatic and terrestrial ecosystems on which they directly and indirectly depend." (p. 4)

"[Strategies] Reintroduce and restore anadromous fish to rivers and streams that historically supported them, in numbers sufficient to provide for the needs of the ecosystem and people, in perpetuity." (p. 5)

Corps 2002 LSR ROD

"The stated purpose of the Feasibility Study was to evaluate and screen structural alternative measures that may increase the survival of juvenile anadromous fish through the Lower Snake River Project and assist in the recovery of listed salmon and steelhead stocks." (p. 3)

"The Corps concurs with NMFS' determination that the integrated operation of the FCRPS by the three action agencies, in a manner consistent with the NMFS 2000 Biological Opinion, will avoid jeopardy to listed anadromous fish stocks and lead to the survival and recovery of the listed species." (p. 6)

"The Corps has selected Alternative 3 as the recommended plan (preferred alternative). This alternative has ... more of a focus on adaptive migration, reflecting the strategies in the NMFS 2000 Biological Opinion. Adaptive migration is an approach that provides greater flexibility to switch between in-river migration and barge or truck transportation as conditions require and as new information becomes available." (p. 12)

"Operations under Alternative 3 – Major System Improvements (Adaptive Migration) would include applicable activities prescribed in the 1995, 1998, and 2000 Biological Opinions to improve juvenile fish passage conditions." (p. 12)

"Based on a thorough examination of the best available biological, economic, social, environmental, and other related information, the Corps has selected ... a modified version of Alternative 3 – Major System Improvements (Adaptive Migration), with increased focus on adaptive migration capabilities." (p. 14)

FISH AND WILDLIFE	Status Quo	PA 2002
NATIVE RESIDENT FISH More fish = better		

Existing Conditions: The main concerns relating to native resident fish include habitat loss and degradation, competition with and predation from introduced exotic species, and the effects of management focused on the recovery and harvest of anadromous fish. Some native resident species including bull trout, redband trout, mountain whitefish, and white sturgeon are in decline. Other native resident species--such as northern pikeminnow, largescale sucker, and bridgelip sucker--have high populations.

Status Quo: Resident fish encounter continuous pressure from intense efforts to recover anadromous fish, habitat loss or degradation, and non-native species. Other resident species (e.g. northern pikeminnow) have been determined to be undesirable and intense management programs focus on reducing their numbers. Although some native resident fish benefit from habitat restoration and hatchery measures, the priority is largely for anadromous fish.

PA 2002: Measures would be taken to improve conditions for both listed and non-listed resident fish. When possible native resident fish would be prioritized over non-native species. Specific measures taken to improve weak stocks to promote recovery could include the protection and enhancement of weak stock habitat, further modifications and limits on the hydrosystem, and reforming hatcheries with a focus on conservation. Management for resident species could take priority over management for anadromous species in certain areas such as blocked anadromous fish habitat. Management of undesirable fish species to benefit resident fish could include methods such as changes in angling regulations, physical removal (e.g., nets, traps, and electrofishing), the use of pesticides (e.g., rotenone and antimycin), dewatering and stream flow augmentation, and habitat manipulation techniques. Sustainable harvest levels would be achieved through managing predation, human activities, and habitat improvements. There would likely be more native resident species than compared to Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Balance the Needs of Other Species. Ensure that salmon and steelhead conservation measures are balanced with the needs of other native fish and wildlife species." (p. 33)

"Maintain and improve upon the current distribution of fish and aquatic species, and halt declining population trends within 5–10 years." (p. 33)

"Restore distribution of fish and other aquatic species within their native range within 25 years (where feasible)." (p. 33)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Avoid jeopardy and assist in meeting recovery standards for Columbia Basin ... bull trout, sturgeon, and other ESA-listed aquatic species that are affected by the FCRPS." (p. 9)

"Ensure that salmon, steelhead, sturgeon, and bull trout conservation measures are integrated with NWPPC Fish and Wildlife Program and balanced with the needs of other native fish and wildlife." (p. 10)

Council's 2000 Fish and Wildlife Program

"Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous species with those of resident fish species in upstream storage

reservoirs so that actions taken to advance one species do not unnecessarily come at the expense of other species." (p. 14)

"Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish ..." (p. 22)

"Mitigation in areas blocked to salmon and steelhead by the development and operation of the hydropower system is appropriate, and flexibility in approach is needed to develop a program that provides resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur." (p. 21)

"Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases.... Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species." (p. 21)

Tribal Vision

"[Goals and Objectives] Biologically healthy, self-sustaining and harvestable ... resident fish ... protect and restore fish and wildlife and the aquatic and terrestrial ecosystems on which they directly and indirectly depend." (p. 4).

FISH AND WILDLIFE	Status Quo	PA 2002
NATIVE WILDLIFE more wildlife = better		

Existing Conditions: The main concerns regarding native wildlife relate to the loss of habitat due to human activities and inter-specific competition with exotic or introduced species. Some species of native wildlife are listed as threatened or endangered, others are substantially diminished in population, while still others have healthy, stable populations. Some wildlife species require undisturbed habitats, and others have flourished in modified habitats. Many species continue to be adversely affected by economic growth, urbanization, and habitat fragmentation.

Status Quo: Listed species are protected and managed through Federal ecosystem management policies and private initiatives. Many non-listed species are regulated and managed by the states for recreational purposes. Native wildlife benefit from actions taken to protect and manage fish and measures taken to mitigate human activities.

PA 2002: More habitat mitigation and better management techniques would be used to enhance production, benefiting listed wildlife species while trying to achieve more stable populations of wildlife. This could include enhancing degraded habitat, improving existing habitat to increase production (e.g., planting food plots), reducing mortality (e.g., construction of avian-friendly facilities), and controlling predators and undesirable species. Management of undesirable wildlife species could include techniques such as relocation of problem individuals or populations, change in hunting regulations, physical removal/deterrence (e.g., shooting, trapping, water spray, and avian predator lines), biological/chemical controls (e.g., sterilization), and habitat manipulation. Impacts on listed and non-listed species would be mitigated through the creation and/or substitution of habitat similar to that lost due to hydropower development. There would be more native wildlife than under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Balance the Needs of Other Species. Ensure that salmon and steelhead conservation measures are balanced with the needs of other native fish and wildlife species." (p. 33)

"Restore distribution of fish and other aquatic species within their native range within 25 years (where feasible)." (p. 33)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Ensure that salmon, steelhead, sturgeon, and bull trout conservation measures are integrated with NWPPC Fish and Wildlife Program and balanced with the needs of other native fish and wildlife." (p. 10)

Council's 2000 Fish and Wildlife Program

".... Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem." (p. 13)

"Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases.... Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species." (p. 21)

"The Council adopts...funding principles to prioritize among the many needs to address fish and wildlife impacts throughout the basin..." (p. 47)

"Wildlife mitigation should emphasize addressing areas of the basin with the highest proportion of unmitigated losses." (p. 47)

Tribal Vision

"[Goals and Objectives] Biologically healthy, self-sustaining and harvestable ... wildlife and other plant and animal populations and communities protect and restore fish and wildlife and the aquatic and terrestrial ecosystems on which they directly and indirectly depend" (p. 4)



FISH AND WILDLIFE	Status Quo	PA 2002
NON-NATIVE SPECIES fewer non-native species = better		

Existing Conditions: Major concerns for fish and wildlife regarding non-native species are predation, competition for resources, and habitat modification. The introduction of exotic species is a major reason for species decline. Non-native species include fish, mammals, amphibians, reptiles, birds, mollusks, crustaceans, insects, and plant species. There have been some attempts to regulate and prohibit the introduction of undesirable non-native species. Some non-native species, such as small mouth bass and ring-necked pheasant, have become established and are actively managed for harvest.

Status Quo: The number of non-native species continues to increase. These populations have a substantial negative impact on native fish and wildlife. Efforts are underway to control undesirable non-native species, and to prevent the introduction of any new, potentially harmful non-native species. Populations of desirable non-native species are encouraged to increase.

PA 2002: Non-native species are actively managed to benefit the greatest number of targeted native fish and wildlife species, especially listed species. Management of non-native fish species could include methods such as changes in angling regulations, physical removal (e.g., nets, traps, and electrofishing), the use of pesticides (e.g., rotenone and antimycin), dewatering and stream flow augmentation, and habitat manipulation techniques. Non-native fish would be enhanced only under certain circumstances (for example, in areas that completely lack native fish and where native fish could not be reintroduced). Management of non-native wildlife species could include techniques such as relocation of problem individuals or populations, change in hunting regulations, physical removal/deterrence (e.g., shooting, trapping, water spray, and avian predator lines), biological/chemical controls (e.g., sterilization), and habitat manipulation. Increases in some desirable non-native wildlife species would continue due to species-specific management. Overall, there would be fewer non-native species resulting in potentially better conditions for native fish and wildlife compared to Status Quo.

Regional Guidance:

Council's 2000 Fish and Wildlife Program

"... Where impacts have irrevocably changed the ecosystem, the [Fish and Wildlife] program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem." (p. 13)

"... Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species." (p. 21)

Governors' Recommendations

"Sport fishing regulation changes also should strive to minimize effects of exotic species on native species." (p. 11)

Tribal Vision

"Mitigate hydrosystem and other impacts by native resident fish restoration, if possible, and native/non-native fish substitution, where appropriate" (p. 9)

3A.3.2 Economic Environment

The economic environment is addressed in terms of commerce, recreation, economic development, and funding costs. The commerce effect is divided into six subcategories: power; transmission; transportation; agriculture; ranching, and forestry; commercial fish harvest, and other industry. Recreation is broken into two subcategories: sport fishing and wildlife harvest; and other recreation. Economic Development also has two subcategories: industrial, residential and commercial development; and employment. Funding costs are examined in terms of ratepayers and other sources of funding.

COMMERCE

The Commerce Effect is evaluated by the following:

- Power
- Transmission
- Transportation

- Agriculture, Ranching and Forest Products
- Commercial Fish Harvest
- Other Industry

More often than not, the Regional Guidance documents make broad policy direction statements regarding commerce that can be applied to more than one of the subcategories. In an effort to eliminate repetitiveness within this Commerce section, the following Regional Guidance list conglomerates the most commonly used Regional Guidance directives with all of the subcategories. Where Regional Guidance statements are unique to each subcategory they are listed immediately below the respective PA 2002 description.

Common Regional Guidance Compilation for Commerce Effects:

Basinwide Salmon Recovery Strategy

"Minimize Adverse Effects on Humans. Implement salmon and steelhead conservation measures in ways that minimize their adverse socio-economic and other human effects." (p. 33) (Applies to: *Power; Transmission; Transportation; Agriculture, Ranching, and Forestry; Commercial Fish Harvest; and Other Industry*)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Ensure salmon, steelhead, sturgeon, and bull trout conservation measures are balanced with human needs, including FCRPS project purposes." (p. 10) (Applies to: *Power; Transmission; Transportation; Agriculture, Ranching, and Forestry; Commercial Fish Harvest; and Other Industry*)

Governors' Recommendations

"... the goal we suggest is protection and restoration of salmonids and other aquatic species to sustainable and harvestable levels meeting the requirements of the Endangered Species Act, the Clean Water Act, the Northwest Power Act and tribal rights under treaties and executive orders while taking into account the need to preserve a sound economy in the Pacific Northwest." (p. 2) (Applies to: *Power; Transmission; Transportation; Agriculture, Ranching, and Forestry; Commercial Fish Harvest; and Other Industry*)

Tribal Vision

"Tribal people believe that there is no distinction between natural resources and cultural resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained." (p. 2) (Applies to: *Power; Transmission; Transportation; Agriculture, Ranching, and Forestry; Commercial Fish Harvest; and Other Industry*)

Table 3A-6: Commerce Effects Comparison of PA 2002

COMMERCE	Status Quo	PA 2002
POWER less need for new resources = better		

Existing Conditions: The impacts to power generation capability of the hydrosystem from changes to benefit fish are a major concern. The current regional firm power resources are made up of hydro, coal, nuclear, combustion turbines, and miscellaneous resources supplemented with imports and independent/small power producers. The FCRPS includes 31 major multiple-use facilities on the Columbia River and its tributaries. Since 1995, hydrosystem operational requirements on the FCRPS for salmon

recovery have reduced power generation in the Region by about 1000 MW. Most of the lost power has been replaced by power from higher-cost combustion turbines and power market purchases.

Status Quo: With continued population growth, the need for power will increase. Between 2002 and 2011, regional firm loads are projected to grow by nearly 2,400 MW. This electrical demand is likely to be met by higher-cost combustion turbines and some renewable energy resources.

PA 2002: The hydrosystem would be modified at existing facilities to benefit fish, especially weak stocks, while balancing the need for reliable generation for the Region. Hydro modifications could include both operational modifications (such as changes in flow, spill, and reservoir operations) and facility modifications to improve in-river juvenile salmon survival. Some actions could result in slight decreases in generation while others could result in more generation, such as an increase in fish transportation. For example, the 2000 BiOps are projected to change hydropower ranging from a possible small increase to a small decrease in power production.⁴² Any lost power would most likely be replaced by combustion turbines, or by renewable resources as they become more cost-competitive. However, there is likely to be only a very small need, if any, for additional resources. Therefore the need for new resources is the same as Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

See above: Regional Guidance Compilation for Commerce Effects

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Commerce Effects

Council's 2000 Fish and Wildlife Program

"Actions taken under this [Fish and Wildlife] program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply." (p. 13)

Governors' Recommendations

"We acknowledge that the Columbia and Snake River hydropower system has been improved for fish passage. ... we support further modifications to the configuration and operation of the hydrosystem where appropriate and necessary to benefit fish and so long as the modifications do not jeopardize the Region's reliable electricity supply." (p. 8)

Tribal Vision

See above: Regional Guidance Compilation for Commerce Effects

Corps 2002 LSR ROD

"The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas [loss of hydropower]." (p. 17)

COMMERCE	Status Quo	PA 2002
TRANSMISSION fewer impacts = better		

⁴² Corps 2002b; Section 6.4.2.7 Electric Power. USDOE/BPA 2000d.

Existing Conditions: The most important impacts to transmission (including maintenance of the transmission facilities) from fish and wildlife activities are related to reliability. BPA owns and operates more than 15,000 circuit-miles of high-voltage line (or about three-fourths of the bulk transmission in the Northwest). The current transmission system delivers low-cost power, connects 31 Federal hydro projects and numerous other generating facilities, and imports/exports power among several regions. Ancillary services are also very important. Vegetation removal, herbicide application, and other actions necessary to maintain the transmission system can be affected by habitat activities for fish and wildlife.

Status Quo: There will be some increase in the need for new transmission facilities in response to population growth, transmission congestion, and the increased need for power. Also, since the transmission system was originally built to complement the hydrosystem, changes to the hydrosystem will affect the transmission system and transmission reliability. Transmission construction and maintenance will continue to be impacted by habitat management/protection activities.

PA 2002: Transmission could be affected by modifications to existing hydro generation facilities to benefit fish and wildlife, especially listed species. However, any changes will be balanced with the need for reliable generation and transmission. It is likely that any hydro changes would be within the Region's ability to continue to benefit from the existing transmission facilities over the next 10-20 years. Efforts to protect and enhance listed fish and wildlife species habitat could affect the development and maintenance of transmission facilities or ancillary services. However, no additional transmission improvements would likely be necessary. Therefore there would be no more impacts to transmission than under Status Quo. (See also Power section.)

Regional Guidance:

See Power above and Regional Guidance Compilation for Commerce Effects.

COMMERCE	Status Quo	PA 2002
TRANSPORTATION fewer impacts = better		

Existing Conditions: The most important impacts to transportation from fish and wildlife activities are associated with impacts to the waterway. The 465-mile Columbia-Snake Inland Waterway is a major route for transporting goods, facilitating barge traffic from inland ports to the Pacific Ocean. The Corps maintains the channel, which consists of two segments: the deep-draft downriver portion and the shallow-draft upriver portion. The products shipped through the system include grain, wood products, petroleum products, and sand and gravel. Other major modes of transportation are rail and trucking.

Status Quo: The mode of transportation most likely adversely impacted by fish and wildlife activities is navigation, especially the shallow-draft portion of the Columbia-Snake Inland Waterway and lower Snake River system. Rail and road transportation will continue to increase in response to a growing economy.

PA 2002: Navigation could be affected by changes made to hydro facilities and operations for fish enhancements; however, any impacts are likely to be small. Navigation could be improved through practices such as channel deepening, as long as impacts to listed fish and wildlife are mitigated. Any reduction in navigation would result in a small increase in the use of rail and road transportation. There might be some small increases in other transportation costs if there are modifications to the hydro system for fish and wildlife. However, the modes of transportation for goods are not likely to change. Impacts to transportation from fish and wildlife activities will be the same as those under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives." (p. 33)

Draft Action Agency ESA 2002-2006 Implementation Plan

See above: Regional Guidance Compilation for Commerce Effects

Governors' Recommendations

See above: Regional Guidance Compilation for Commerce Effects

Tribal Vision

See above: Regional Guidance Compilation for Commerce Effects

Corps 2002 LSR ROD

"The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas [loss of navigation]." (p. 17)

COMMERCE	Status Quo	PA 2002
AGRICULTURE, RANCHING, AND FOREST PRODUCTS		
fewer impacts = better		

Existing Conditions: The most important impacts to agriculture, ranching, and forestry from fish and wildlife activities are reductions or changes in farm yield, range production, and timber harvest. These impacts are related to restrictions in land and water use, and increased regulation on Federal lands to protect listed species and ecosystem health. There are approximately 7 to 9 million acres of irrigated agriculture in the Columbia River Basin. Some of this acreage is dependant on irrigation water from Federal facilities. The Columbia River Basin also supports approximately 16 million acres of non-irrigated lands, 45 million acres of rangeland (of which approximately 25 million acres are on Federal property), and 65 million acres of forested lands (42 million acres on Federal property). Commodity prices for these industries are largely controlled by national and world market conditions.

Status Quo: Overall, there will be a gradual increase in impacts to farming, ranching, and timber harvest as activities taken to benefit fish and wildlife increase. In particular, actions to benefit listed species will restrict agriculture, grazing, and forestry.

PA 2002: Agriculture, ranching, and the forest products industry could be limited as more habitat was protected and enhanced to benefit listed fish and wildlife. Under this Policy Direction, these industries would focus on increasing production efficiency or adjusting operations, while maintaining compatibility with habitat management for fish and wildlife. Some land retirement could be used where practical. Overall, impacts to agriculture, ranching, and forest industries would be the same as those under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Agriculture and rangeland use typically is not subjected to the regulations and ordinances associated with other land uses. Yet, literature and many federal and state conservation programs clearly confirm that agricultural land use patterns need to be changed for aquatic habitats to be adequately protected and restored." (p. 42)

Draft Action Agency ESA 2002-2006 Implementation Plan

"Because human activity, development, and population growth will continue, conservation [Columbia Basin fish and aquatic species] depends on managing human impacts to achieve suitable ecosystem conditions." (p. 22)

Governors' Recommendations

"Stream and river reaches throughout the Columbia River Basin have flow and water quality problems that impede regional fish recovery efforts. The states are setting water quality standards and preparing implementation plans in accordance with previously established schedules. The states are also reviewing instream flow levels to address biological requirements for ESA-listed aquatic species. ... we recommend federal assistance and support be made available to the states to better coordinate these timelines and, where necessary, to accelerate water quality improvements and to establish instream flows that benefit listed aquatic species in the Columbia Basin." (p. 4)

"We also recognize existing efforts to conserve water and support further assistance to promote conservation." (p. 4)

"...given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged ..." (p. 5)

Tribal Vision

"Protect, enhance, rehabilitate and restore instream flows and conditions and overall watershed health and productivity..." (p. 7)

Corps 2002 LSR ROD

"The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas [loss of water supply]." (p. 17)

COMMERCE	Status Quo	PA 2002
COMMERCIAL FISH HARVEST More harvest = better		

Existing Conditions: Impacts to commercial fish harvest from fish and wildlife activities relate to the harvest levels set for specific stocks of anadromous fish. Columbia Basin salmon are harvested in the northwest U.S., Canada, and Alaska ocean fisheries, and in mainstem Columbia River and tributary freshwater fisheries. The salmon fishery is largely a mixed-stock fishery, with increases in harvest only when abundance is high. Hatcheries have been operated to support harvest. Changes in harvest regulations have been in the form of restrictions, shortened seasons, area closures, special gear regulations, license

moratoria, and buyouts of fishing fleets. There has been a trend to reduce harvest rates in mixed-stock areas in favor of harvests in terminal areas where the stocks can be segregated and more selectively caught. Management of the ocean fishery is difficult because of salmonid migratory patterns, multiple jurisdictions, laws, treaties, and the mixing of salmon populations from different river systems. The in-river commercial fishery is subject to Federal, state, and tribal jurisdictions, laws, treaties, and management strategies.

Status Quo: Recently, some harvest has increased, with increased abundance, likely as a result of improved ocean conditions. ESA obligations have resulted in increased emphasis on protecting listed native fish. Harvest may be reduced to comply with planned ESA and Pacific Salmon Treaty actions. The increased emphasis on protecting threatened and endangered native fish is reducing the economic benefits to some local communities and industries. The commercial salmon fishery has recently been subject to intense economic competition from the farmed salmon industry. Despite the recent improvement in harvest levels, economic trends and more costly harvest regulations are expected to result in continuing declines in the amount of commercial salmon fishing.

PA 2002: Harvest opportunities for both naturally-spawning and hatchery-produced native anadromous stocks would likely be increased by reforms in hatchery operation and a shift to selective fisheries. Habitat would be improved and managed to enhance production of fish and increase harvest. There could be an increase in the harvest of weak stocks as they recover. Overall, commercial harvest would increase relative to Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Assure Tribal Fishing Rights and Provide Non-Tribal Opportunities. Restore salmon and steelhead populations over time to a level that provides a sustainable harvest sufficient to provide for the meaningful exercise of tribal fishing rights, and where possible, provide non-tribal fishing opportunities." (p. 33)

"Restore salmon and steelhead to population levels that will support treaty and non-treaty harvest." (p. 34)

Council's 2000 Fish and Wildlife Program

"Harvest can provide significant cultural and economic benefits to the region, and the program should seek to increase harvest opportunities consistent with sound biological management practices. Harvest rates should be based on population-specific adult escapement objectives designed to protect and recover naturally spawning populations." (p. 14)

Governors' Recommendations

"... We commit to support a recovery approach designed not only to achieve ESA delisting levels but also to rebuild the runs to levels that support treaty and non-treaty harvest. But we believe rebuilding requires that all harvest may have to be reduced in the short term, together with aggressive actions taken to address mortality in the other life stages." (p. 10)

"For commercial and non-treaty sport fisheries, we recommend that harvest rates, gear and timing in the mainstem fisheries be consistent with ensuring survival of the species and providing for their eventual recovery when combined with recovery actions in other sectors." (p. 10)

Tribal Vision

"The tribal vision for the future is one where people, fish, wildlife, plants and other natural and cultural resources are once again biologically healthy and self-sustaining.... It not only supports viable and genetically diverse fish and wildlife resources that provide direct benefits to society, through harvest and improved physical health of tribal and non-tribal members, but also nourishes the spirit." (p. 3)

COMMERCE	Status Quo	PA 2002
OTHER INDUSTRY Fewer impacts = better		

Existing Conditions: The regional economy has evolved from being primarily natural resource-based to a more diverse economy with growing trade and service sectors. Increasingly, mining, aluminum products, and other natural resource-based and/or water-dependant industries are facing increased regulation, operational costs, and foreign competition. The largest industry sectors (and their relative contributions to the regional employment) are services, trade, government, and manufacturing.

Status Quo: The regional economy will continue to grow. Information-based technologies and services will likely grow the fastest, followed by trade, government, and manufacturing. Facing increasing operational costs and competition, natural resource dependant industries will continue to decline.

PA 2002: There would be some decrease in industrial development in areas that affect weak stocks. This would likely be counter-balanced by other development, especially in the services, trade, and government sectors. Active remediation of impacts from natural resource-based industries would be required. Environmentally friendly industries and development would be encouraged. Overall, there would be fewer impacts to other industry compared to Status Quo.

Regional Guidance:

See Transportation above and Regional Guidance Compilation for Commerce Effects.

RECREATION

Table 3A-7: Recreation Effects Comparison of PA 2002

RECREATION	Status Quo	PA 2002
SPORT FISHING AND WILDLIFE HARVEST more opportunities = better		

Existing Conditions: Impacts to sport fishing and hunting (including trapping) are areas of concern related to fish and wildlife policies. Recreational opportunities for sport fishing and hunting are plentiful throughout the Region and hundreds of thousands of people participate annually. Sport fishing is supported by hatchery production to maintain harvest levels.

Status Quo: Sport fishing and hunting would continue at levels similar to existing conditions. Although some ESA listings may have reduced economic benefits (especially to local communities and tourism-related industries), sport fishing and hunting produce a sizable economic benefit in the Region. Hatcheries would continue to supplement the fisheries.

PA 2002: The management of fish and wildlife habitat to improve production could increase fishing and hunting opportunities. The restriction on harvest for listed species may limit some of the increased opportunities. However, the reformation of hatcheries to include both conservation hatcheries—to assist weak stocks—and compensation/supplementation hatcheries—to increase harvest—would lessen the impact of fishing restrictions. The economic benefits, especially from supporting services, could increase as fish and wildlife are managed for the purpose of increasing harvest opportunities. The creation of a sustainable resident fishery, particularly in blocked areas, would likely allow for more harvest opportunities for recreational anglers. Overall, the sport fishing and wildlife harvest opportunities and associated economic benefits would be better than under Status Quo.

Regional Guidance:

See **Commercial Fishing** above and **Regional Guidance Compilation for Commerce Effects**.

RECREATION	Status Quo	PA 2002
OTHER RECREATION more opportunities = better		

Existing Conditions: Impacts to other areas of recreation result from changes in fish and wildlife policy. Some recreational activities are water-based, such as rafting, kayaking, canoeing, water-skiing, boating, windsurfing, and swimming. Others, such as picnicking, camping, mountain biking, horseback riding, wildlife viewing, hiking, siteseeing, skiing, and ecotourism are land-based. Many of these recreational opportunities are located in rural areas removed from population centers. Population increases have created more demand for recreational resources.

Status Quo: Population growth will bring continued pressure for increased recreational resources and ecotourism opportunities. It will also result in a shift away from traditional consumptive uses. Developed recreation will be limited in areas with listed species.

PA 2002: Efforts to recover weak stocks may limit recreational opportunities. Other actions to rebuild fish and wildlife populations would be managed to accommodate recreational needs. Land-based recreation might benefit from land acquired and managed for habitat. There may be changes in the types of recreational activities available; however, overall the amount of recreation should be about the same as under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives." (p. 33)

Corps 2002 LSR ROD

"The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas [loss of recreational opportunities]." (p. 17)

See also **Regional Guidance Compilation for Commerce Effects**.

ECONOMIC DEVELOPMENT

Table 3A-8: Economic Development Effects Comparison of PA 2002

ECONOMIC DEVELOPMENT	Status Quo	PA 2002
INDUSTRIAL, RESIDENTIAL AND COMMERCIAL DEVELOPMENT fewer impacts = better		

Existing Conditions: Impacts to economic development from policies implemented for fish and wildlife activities are concerns for developers. Population growth has fueled development in all three sectors. Major urban areas have undergone significant growth in high-tech industries and corresponding economic development, while rural areas continue to rely on traditional industries experiencing little economic growth. There are concerns about how fish and wildlife activities affect local land use plans. Habitat conservation plans are becoming more common.

Status Quo: Regionwide, it is expected there will be continued growth in the industrial, residential, and commercial development sectors. However, this growth is expected to continue to be restricted based on environmental requirements. Development in rural areas, which often rely more on natural resource-based economies, is more impacted by restrictions to protect listed fish and wildlife species.

PA 2002: Industrial, residential, and commercial development is promoted where it is compatible with fish and wildlife and their habitats. Any development that adversely affects listed species would be restricted. The goals are to manage human activities, while protecting listed species, and rebuilding fish and wildlife populations to sustainable harvest levels. Overall, development is expected to be about the same as Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives." (p. 33)

Corps 2002 LSR ROD

"The recommended plan (preferred alternative) was determined to minimize the net economic impacts in these areas [loss of water supply]." (p. 17)

See also **Regional Guidance Compilation for Commerce Effects.**

ECONOMIC DEVELOPMENT	Status Quo	PA 2002
EMPLOYMENT more employment = better		

Existing Conditions: Impacts to employment from fish and wildlife mitigation and recovery activities are a region-wide concern, especially for industries that rely directly on natural resources. Generally, the economy of the Region is evolving away from its dependence on natural resources toward information-based technologies and services. Services, trade, and government activities account for most regional employment and are growing sectors of the economy. Resource-related employment industries

(agriculture, forestry, fisheries, mining, and electric and gas utilities) account for less than 10% of the Region's employment.

Status Quo: Despite periodic downturns, employment is projected to increase significantly over the next 20 years—especially in manufacturing and services. Some of these increases are due to fish and wildlife mitigation and recovery efforts. Employment in resource-based industries will likely continue to decline. However, especially in small communities, resource-based employment (especially agriculture) will remain important to the economic base.

PA 2002: Land management under a multiple-use approach would cause a slight increase in employment associated with agricultural and forest products industries. However, efforts to protect listed species and their habitats would continue to limit employment. Active habitat enhancement would create some added jobs in government, construction and related services. Employment opportunities could also increase because of increased hatchery production and harvest opportunities. However even with these slight gains, long-term employment would likely be about the same as Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives." (p. 33)

See also **Regional Guidance Compilation for Commerce Effects.**

FUNDING COSTS

Table 3A-9: Funding Cost Effects Comparison of PA 2002

FUNDING COSTS	Status Quo	PA 2002
RATEPAYERS increased ability to fund = better		

Existing Conditions: Increased costs for fish and wildlife, combined with foregone revenue, constitute the main concerns for ratepayers with regard to fish and wildlife funding. The trend for fish and wildlife expenditures from 1996–2000 has been toward increased expenditures, with no plan for guiding fish and wildlife mitigation and recovery costs. Although Program expenses were kept relatively stable, other fish and wildlife costs (related hydro operations) have steadily increased.

Status Quo: In 2001, BPA's fish and wildlife expenditures (including power replacement costs) were more than \$1.7 billion. There appears to be no long-term plan for stabilizing funding expenditures. Absent such a plan, funding costs for fish and wildlife will likely continue to increase, resulting in higher rates.

PA 2002: The ratepayers would continue to pay a large part of the costs for the direct actions (e.g., habitat protection and enhancement, hatchery and hydro modifications) taken to recover listed species. In addition, ratepayers would continue to fund other fish and wildlife mitigation actions under BPA's Program to promote sustainable populations of harvestable fish and wildlife, such as increasing fish transport and managing habitat. Action measures would be implemented at least cost, using a long-term plan that would ensure predictability and stability in funding and accountability for results. However, funding costs would be limited by BPA's MSR. Overall, funding costs and ratepayer ability to fund would be about the same as Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Select actions to restore and enhance fish and their habitat that achieve the biological and ecological objectives at the least cost." (p. 33)

"Seek adequate funding and implementation for strategies and actions." (p. 34)

"Coordinate restoration efforts to avoid inefficiency and unnecessary costs." (p. 34)

Council's 2000 Fish and Wildlife Program

"Actions taken under this [Fish and Wildlife] program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply." (p. 13)

"The Council adopts ... funding principles to prioritize among the many needs to address fish and wildlife impacts throughout the basin" (p. 47)

"Where mitigation measures are designed to benefit both U.S. and Canadian fish and wildlife populations, U.S. ratepayer funding should be in proportion to anticipated benefits to the U.S. populations." (p. 21)

Governors' Recommendations

"We believe the principles and activities in this document will protect the Federal Columbia River Power System and also recover and rebuild Columbia River Basin fish and wildlife. There will be a significant cost, but we expect the power system to pay only its fair share." (p. 14)

"Planning and overhead expenses must be kept to a minimum, and project expenditures should focus on activities that benefit fish and wildlife." (p. 15)

"To better understand Bonneville's expenditures in a basinwide context, and to improve accountability to the ratepaying public, the Council should prepare an annual report to clearly document progress toward meeting fish and wildlife mitigation goals, and how ratepayer money is being spent. ... The report could provide assurance that Bonneville's expenditures are directed toward on-the-ground projects rather than redundant or excessive planning processes and that funding for research is clearly focused and prioritized. ..." (p. 15)

"All capital improvements [to hydro system] should benefit the fullest range of salmonid species and should offer demonstrated biological gains." (p. 8")

FUNDING COSTS	Status Quo	PA 2002
OTHER FUNDING SOURCES increased ability to fund = better		

Existing Conditions: The increasing cost of funding fish and wildlife mitigation and recovery is a major concern for other funding sources (e.g., Federal taxpayers, states, tribes, and private/commercial interests). Their contributions include monies from Federal appropriations, taxes, user fees, tags and licenses, and private/commercial donations. Many of the costs for fish and wildlife are spread across numerous categories of funding sources and programs, making it very difficult to accurately capture the true expenditures for either fish or wildlife mitigation and recovery.

Status Quo: The amount and share of costs paid by other funding sources are likely to increase. However, an accurate accounting of all fish and wildlife expenditures would remain difficult because of the fragmentation in funding and programs.

PA 2002: Other funding sources would pay some portion of the costs for the direct actions taken to recover listed species and benefit other fish and wildlife (e.g., habitat protection, enhancement and management, hatchery modifications, and hydro modifications). Further costs may be incurred if BPA's funding is limited by its MSR. The ability of other funding sources may be limited by economic conditions. However, other funding sources could generate more revenue from the sale of licenses, tags and user fees as fish and wildlife are enhanced and managed for harvest. The costs to other funding sources, and their ability to fund, would be about the same or slightly better than Status Quo.

Regional Guidance:

Council's 2000 Fish and Wildlife Program

"... There also must be coordination among actions taken at the subbasin, province, and basin levels, including actions not funded under this program. Accordingly, creating an appropriate structure for planning and coordination is a vital part of this program." (p. 14)

Governors' Recommendations

"Because much of the habitat is on non-federal lands, state, tribal and local governments, as well as private landowners, must be full partners in the recovery effort." (p. 4)

"Congress should ... increase the amount of federal appropriations, in recognition of the fact that fish and wildlife of the Columbia River Basin are national resources and their protection satisfies obligations in federal law, including treaties with Indian tribes and Canada, the Endangered Species Act, the Clean Water Act and the Northwest Power Act." (p. 14)

"We strongly endorse the concept of local planning for recovery of salmonids and other aquatic species. This concept has the advantage of bringing together local and tribal governments with local citizens to develop and implement local recovery plans. A local focus also helps avoid duplication of efforts and "top-down" planning." (p. 5)

Corps 2002 LSR ROD

The Corps will rely on the annual and 5-year plans as the mechanism to implement the action items in the recommended plan (preferred alternative) described in the FR/EIS. The majority of the structural and operational items included in the recommended plan (preferred alternative) are addressed in the RPAs of the NMFS and USFWS 2000 Biological Opinions. Implementation of actions is dependent upon receiving adequate funding, completing appropriate engineering designs and prototype tests, obtaining favorable test conditions (weather and available fish), and engaging the Region on the priority of each action. (p. 6)

See also Ratepayers above.

3A.3.3 Social Environment

The social environment is addressed in terms of tribal interests, cultural/historic resources, and aesthetics. The tribal interests effect area is further divided into four subcategories: fish harvest, health, spirituality, and tradition.

TRIBAL INTERESTS

Table 3A-10: Tribal Interests Effects Comparison of PA 2002

TRIBAL INTERESTS	Status Quo	PA 2002
FISH HARVEST more tribal harvest = better		

Existing Conditions: A major issue for tribes, concerning fish and wildlife management, is the availability of sufficient numbers of fish to ensure continued harvest. Both anadromous and resident fish have great cultural significance to Native American Indian peoples. Salmon are a major food source and trading commodity for most Columbia Basin tribes. Tribal harvest, especially for anadromous fish, has been substantially reduced from historic levels. Most of the upriver anadromous fishing opportunities no longer exist. The ability of the Federal government to meet trust responsibilities (as it pertains to fish harvest) has been limited because of declining fish populations.

Status Quo: Harvest has continued to be below tribal expectations. Despite improvements, some salmon populations continue to decline and tribal harvest opportunities are expected to be restricted for many years. Recently, some upriver opportunities for fish harvest have been developed. Bright fall chinook being reared in hatchery facilities for release in the Hanford Reach of the mid-Columbia River may enhance the upriver tribal fishery. However, expectations are that the declining trends in some of the salmon populations will continue, limiting harvest.

PA 2002: The protection and enhancement of listed species habitat, reformation of hatcheries, and changes in hydro operations/facilities would likely increase the levels of resident and anadromous fish. Tribal fish harvest would improve as the naturally-spawning and hatchery-produced fish populations increased. The tribes would likely adopt more selective harvest methods to avoid weak stocks. The creation of a sustainable resident fishery would increase upriver fish harvest. This Policy Direction would result in more harvest opportunities in more locations than Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Assure Tribal Fishing Rights and Provide Non-Tribal Opportunities. Restore salmon and steelhead populations over time to a level that provides a sustainable harvest sufficient to provide for the meaningful exercise of tribal fishing rights, and where possible, provide non-tribal fishing opportunities." (p. 33)

"Select actions that consider or take into account tribal socio-economic or cultural concerns." (p. 34)

"Restore salmon and steelhead to population levels that will support treaty and non-treaty harvest." (p. 34)

Council's 2000 Fish and Wildlife Program

"Harvest can provide significant cultural and economic benefits to the region, and the program should seek to increase harvest opportunities consistent with sound biological management practices." (p. 14)

"[Basinwide Provisions] The vision for this program is a Columbia River ecosystem that...provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act." (p. 13)

Governors' Recommendations

"... We commit to support a recovery approach designed not only to achieve ESA delisting levels but also to rebuild the runs to levels that support treaty and non-treaty harvest. But we believe rebuilding requires that all harvest may have to be reduced in the short term, together with aggressive actions taken to address mortality in the other life stages." (p. 10)

"We support continuing current levels of tribal ceremonial and subsistence harvest." (p. 10)

"... the goal we suggest is protection and restoration of salmonids and other aquatic species to sustainable and harvestable levels meeting the requirements of the Endangered Species Act, the Clean Water Act, the Northwest Power Act and tribal rights under treaties and executive orders while taking into account the need to preserve a sound economy in the Pacific Northwest." (p. 2)

Tribal Vision

"Resource populations and ecosystem conditions that provide for human sustenance, increased health and that support the traditional economic, cultural and spiritual needs and practices of the tribes, including harvest in throughout the international basin." (p. 4)

TRIBAL INTERESTS	Status Quo	PA 2002
HEALTH more = better		
SPIRITUALITY more = better		
TRADITION more = better		

Existing Conditions: A major concern for tribal members is the effect of fish and wildlife management activities on their health, spirituality, and tradition. Native American Indians believe that there is a close physical and spiritual interrelationship between humans and nature. Their health, spirituality, and tradition have been impaired by the loss of subsistence and ceremonial harvest of fish, wildlife, and plants, and access to traditional lands.

Status Quo: The Native American Indian community is concerned with the continued degradation of the air, land, and water, and the effects of this degradation on sacred places. There is increasing concern about heavy metal bioaccumulation in salmon and its disproportionate effect on tribal health. Efforts have recently been made to assess the impacts of Federal agency activities on tribes and to ensure that tribal interests and rights are adequately considered before Federal actions are taken. Maintaining tribal health, spirituality, and tradition is likely to become more difficult with the increasing pressure on natural resources in the Region from population growth and urbanization.

PA 2002: Habitat protection and enhancement activities for weak stocks/populations would increase listed species, as well as other plant and animal species that are important to tribal health, spirituality and tradition. Enhanced habitat, improved hydro operations and increased hatchery production would increase harvest opportunities, improving tribal health and tradition. The creation of a sustainable resident fishery would likely increase upriver fish harvest resulting in benefits to tribal health and tradition. These increases in plants, fish, and wildlife and the enhancement of habitat would also help increase spiritual values. Tribal health could also improve as fish and wildlife management actions and harvest result in more tribal employment. Overall, tribal health, spirituality, and tradition would likely be better than under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Consider Resources of Cultural Importance to Tribes. In implementing recovery measures, seek to preserve resources important to maintaining the traditional culture of the basin tribes." (p. 33)

"Select actions that consider or take into account tribal socio-economic or cultural concerns." (p. 34)

Governors' Recommendations

"We support continuing current levels of tribal ceremonial and subsistence harvest." (p. 10)

Tribal Vision

"Tribal people believe that there is no distinction between natural resources and cultural resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained." (p. 2)

"Resource populations and ecosystem conditions that provide for human sustenance, increased health and that support the traditional economic, cultural and spiritual needs and practices of the tribes, including harvest in throughout the international basin." (p. 4)

"The tribal vision for the future is one where people, fish, wildlife, plants and other natural and cultural resources are once again biologically healthy and self-sustaining.... It not only supports viable and genetically diverse fish and wildlife resources that provide direct benefits to society, through harvest and improved physical health of tribal and non-tribal members, but also nourishes the spirit." (p. 3)

CULTURAL/HISTORIC RESOURCES

Table 3A-11: Cultural/Historic Resources Effects Comparison of PA 2002

CULTURAL/HISTORIC RESOURCES	Status Quo	PA 2002
CULTURAL/HISTORIC RESOURCES fewer impacts = better		

Existing Conditions: Impacts to cultural and historic resources are a concern related to actions taken for fish and wildlife. There are many cultural and historic resources within the Pacific Northwest, and the losses of cultural and historical resources have been extensive. Many sites have been inundated by reservoirs or covered by sediment as a result of the construction of the FCRPS. Many other sites have been disturbed or destroyed by development. The major impacts on cultural and historical resources are from high water flows, wave action, and human activities (including vandalism).

Status Quo: Local, state, and Federal regulations provide some protection for cultural and historic resources. Even with legal protections and mitigation actions in place, some loss of historical and cultural resources is likely to occur. These losses would result from such actions as residential, commercial, and industrial development; hydrosystem operations; and recreational activities.

PA 2002: Sites would be protected where new residential, commercial, and industrial development was restricted for listed species. Historic and cultural resources may be affected by system operation strategies for fish and wildlife. For example, certain river operations to improve fish populations may involve the modification of structures such as spillways, dam embankments, and fish passage facilities, potentially causing direct effects on historic or cultural properties. Overall, the effects from this policy direction would be similar to those under Status Quo.

Regional Guidance:

Basinwide Salmon Recovery Strategy

"Protect Historic Properties. Consistent with the requirements of the national Historic Preservation Act and other applicable law, assure that effects of recovery measures on historic properties are identified and addressed in consultation with all interested and affected parties." (p. 33)

"Consider Resources of Cultural Importance to Tribes. In implementing recovery measures, seek to preserve resources important to maintaining the traditional culture of the basin tribes." (p. 33)

Tribal Vision

"Tribal people believe that there is no distinction between natural resources and cultural resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained." (p. 2)

AESTHETICS

Table 3A-12: Aesthetic Effects Comparison of PA 2002

AESTHETICS	Status Quo	PA 2002
AESTHETICS fewer impacts = better		

Existing Conditions: Impacts to aesthetics is a major concern related to fish and wildlife activities. Landscape aesthetics, or scenery, is important to residents in the Region. Aesthetics is also important to the ever-increasing number of visitors and the economies that depend on them. The demand for good visibility is high, but there are increasing concerns about regional haze.

Status Quo: Increased development and power generation to meet a growing population would cause a continued decrease in the aesthetics of the Northwest. For example, more land would likely be developed, reducing the quality of natural landscapes. This is likely to have impacts on both residents and visitors to the regions, and the economies that depend on them. Overall, a future decrease in aesthetics is expected.

PA 2002: Habitat protection and enhancement for listed fish and wildlife and habitat enhancement for non-listed fish and wildlife would improve aesthetics throughout the Region. Changes in hydrosystem operations that would cause the need for replacement power are unlikely. Therefore impacts, such as visibility, to aesthetics from resource development would be similar to Status Quo. Shoreline areas could be affected by changes in reservoir operations intended to benefit fish and wildlife, potentially impacting aesthetics. However in other areas, aesthetics could be improved through the acquisition of water rights for instream purposes. There would be increased opportunities to enjoy the additional aesthetic values created by the habitat improvement activities. Overall, aesthetics would be better than under Status Quo.

Regional Guidance:

Draft Action Agency ESA 2002-2006 Implementation Plan

"Avoid adverse modification of critical habitat for ESA-listed fish, including salmon, steelhead, bull trout, and sturgeon." (p. 9)

Council's 2000 Fish and Wildlife Program

"Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin." (p. 13)

Tribal Vision

"The tribal vision for the future of the Columbia River Basin has specific, measurable short-term and long-term goals and objectives. It is a vision achieved by clearly defined strategies and actions. Together, their collective aim is to maintain, protect and enhance currently healthy, natural ecosystems and habitat, and all their human and non-human resources." (p. 3)

3A.4 Comparison of PA 2002 against the BPA Purposes

The purposes, which were described in Chapter 1, will help to measure how well the PA 2002 would meet BPA's need. Table 3A-12 evaluates the PA 2002 against those purposes. This evaluation often turns on differences in opinions and perceptions. Public opinion in the Region regarding fish and wildlife mitigation and recovery efforts will be a prime factor in determining the degree to which BPA will be able to meet all its purposes.

Table 3A-13: Comparison of PA 2002 against the BPA Purposes

Facilitate implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve: coordination, efficiency, and consistency	
PA 2002	<p>This approach represents a distinct push to recover <i>all</i> ESA-listed fish and wildlife. This Direction may be seen by some as an inefficient use of financial resources for the overall benefit of fish and wildlife. Because it focuses heavily on legally protected fish and wildlife at a great cost, it may be perceived by some in the Region as not providing a broad benefit for all fish and wildlife or the regional economy, and thus likely would not result in a truly regional unified planning approach.</p> <p>This Policy Direction represents an all-inclusive approach to fish and wildlife mitigation and recovery. By focusing efforts at all stages of the life cycle of ESA-listed and non-listed species, it might be perceived by some as more effective in rebuilding populations, although, others may be confused by its lack of specific focus on listed species. Because it recognizes both the obligation to ensure natural resources are self-sustaining and the right for humans to use those same resources to meet sustenance, spiritual, and economic needs, this direction may be acceptable to much of the Region's population.</p> <p>This Policy Direction approach represents an all-inclusive focus for the BPA fish and wildlife mitigation and recovery efforts. It consolidates the regional guidance from other</p>

	<p>Federal agencies, State governors, Council, and tribes to assist BPA in achieving a more comprehensive policy for its fish and wildlife program. This approach will help BPA more efficiently direct its funding for mitigation and recovery efforts in a coordinated and consistent manner. Since it focuses on all stages of the life cycle of ESA-listed and non-listed species, and attempts to balance natural resource and social values, it is likely to be more regionally accepted. Because this approach uses guidance from throughout the Region and tries to better balance the fish and wildlife needs with the social and economic needs of the human population, it is expected that it will have a much greater chance of facilitating a unified planning approach.</p>
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<p>Fulfill statutory, legal obligations under Regional Act; especially, to evaluate how Policy Directions may affect BPA's obligations to: protect, mitigate, and enhance fish and wildlife, and provide a reliable, adequate, efficient, and economical power supply.</p>	
PA 2002	<p>Under a weak stock approach, BPA would have difficulty meeting the agency's power supply requirements because additional hydro operations for fish would reduce power production. BPA's responsibilities for fish and wildlife mitigation due to the effects of the FCRPS would likely be less because four dams would be removed. Overall, BPA would likely have difficulty fully meeting its power-related obligations under this alternative Policy Direction.</p> <p>The approach would be the most likely to enhance BPA's ability to remain competitive in the electric utility market and provide low-cost electric power since the hydrosystem and inexpensive hydro power would remain relatively intact. BPA would retain its role as the major contributor to fish and wildlife mitigation because this approach would allow BPA to generate revenues and contain costs.</p> <p>This approach allows BPA use biological performance standards to assist in evaluating how it is meeting the obligations under the Regional Act, as well as other legal and business requirements. Because BPA can remain competitive in the electric markets through the continued marketing of low-cost hydropower, it will be better able to provide a reliable, adequate, efficient, and relatively economical power supply. Hydrosystem operations will continue to place flood control and fish concerns over power for planning purposes, as provided in the SOR EIS and 2000 BiOps, thus providing fish and wildlife equitable treatment with the other system purposes. In addition, BPA has a better chance of maintaining its role as a major contributor to the Region's fish and wildlife recovery effort costs and meeting the costs associated with protecting, mitigating, and enhancing fish and wildlife pursuant to the Regional Act.</p>

<p>Fulfill the Administration's Fish Funding Principles such that BPA: meets all of its fish and wildlife obligations, including trust and treaty obligations; takes into account the full range of potential fish and wildlife costs; demonstrates a high probability of Treasury repayment; minimizes rate effects on power and transmission customers, adopts rates and contracts that are easy to implement; and adopts a flexible fish and wildlife strategy.</p>	
PA 2002	<p>The increased costs of replacing lost hydropower, constructing new transmission, and protecting and enhancing habitat would cause BPA's rates to rise substantially. As BPA's approaches MSR (see discussion under 2.3.2.3), the probability of making the Treasury repayment decrease and BPA's ability to fulfill the other Principles will be difficult.</p> <p>Under this Policy Direction, modifications to the hydrosystem to benefit fish and wildlife would not likely result in substantial loss of generation and subsequent revenues, thus the need to raise rates or jeopardize the Treasury repayments would be minimized. These modifications, along with habitat enhancements and hatchery production will help BPA meet its other fish and wildlife obligations.</p> <p>Any modifications to the hydrosystem under this approach to benefit fish and wildlife would not likely result in substantial loss of generation and associated revenues. This</p>

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	could increase the chance of a comprehensive and consistent unified planning approach for fish and wildlife mitigation and recovery, provide BPA's customers more certainty for fish and wildlife costs and power rates, and enhance BPA's ability to make a timely Treasury repayment. A flexible fish and wildlife strategy, including the protection and enhancement of habitat, especially for ESA-listed species, would help BPA meet its other fish and wildlife obligations. Overall, BPA would likely be able to fulfill the Principles—meeting its fish and wildlife obligations and rate requirements.
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Fulfill BPA's other obligations under other applicable laws, including Federal treaty and trust obligations with regional tribes, the Endangered Species Act, the Clean Water Act, and the National Historic Preservation Act.	
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PA 2002	<p>This approach focuses heavily on ESA-listed fish and wildlife, and thus would likely allow BPA to fulfill its ESA obligations. However, there may be impacts to cultural resources, as well as water quality, from dam removal. BPA would still likely be able to meet its treaty and trust responsibilities by retaining the tribes harvest levels.</p> <p>This focus, by design, is to be more balanced for the major aspects of fish and wildlife mitigation and recovery. It also gives more of an equal weight to all laws and regulations. Because of this focus, it is likely to meet less resistance in meeting these legal obligations.</p> <p>This approach tries to give more balance to the numerous competing laws, regulations, and related obligations. This Policy Direction approach was based on regional guidance from the other Federal agencies, the State Governors, the Council, the tribes, and the public to facilitate ensuring full consideration during its design. Because this approach gives intense consideration of all relevant laws, regulations, and obligations, and benefits more fish and wildlife in the Region, it is likely that overall there will be less resistance in meeting these legal obligations.</p>
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Promote predictable and stable fish and wildlife costs, enhancing BPA's ability to provide funding and remain competitive in the marketplace.	
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PA 2002	<p>Under this Policy Direction, it would be likely that more fish and wildlife funding would be sought from BPA to recover all listed species. However, the cost associated with replacing the lost hydropower with more costly power from other sources would likely cause BPA's rates to increase, making BPA less competitive. This could result in less revenue being available to fund fish and wildlife activities and other public benefits. Thus, BPA likely would not be able to fully meet this purpose under this approach.</p> <p>Funding levels would be established to achieve sustainable populations for harvest. This would likely result in more predictable and stable costs. This approach could be more costly as it provides benefits for both listed and non-listed species, which could affect BPA's competitiveness in the market and ability to provide funding for other public benefits. However, because BPA would retain all of its hydropower resources under this approach, these effects would not be expected to significantly affect BPA's ability to achieve this purpose under this approach.</p> <p>Under this approach, funding is provided for a broader number of listed and non-listed fish and wildlife species. However, the fish and wildlife costs are expected to be more predictable and stable over the long-term because of the focus on extensive management practices with biological performance standards to assist in evaluating how BPA and others are meeting their obligations on an ongoing basis. Overall, this approach is expected to allow BPA to provide funding for fish and wildlife and remain competitive.</p>
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Efforts

CHAPTER 4 – IMPLEMENTATION AND RESPONSES TO CHANGE

- **Provides examples of factors** that can influence the success in implementing a Policy Direction.
 - **Presents the options** available to assist implementation of the Policy Directions and strategies for accommodating future change.
-

Once the BPA Administrator, or any other decisionmaker, chooses a Policy Direction, it will need to be implemented. Individuals, groups, or agencies will take appropriate implementing actions, such as those provided as examples in the Sample Implementation Action Tables (Volume 3). Many natural, economic, and social environmental factors will strongly influence the ultimate success of these actions. If we have chosen well, fish and wildlife mitigation and recovery will improve at an acceptable social pace and economic cost.

Even if we have chosen as well as we can, we may find, in monitoring results that we need to change our implementation actions, or the overall Policy Direction itself. Successful mitigation and recovery may mean that the Region needs to manage its resources differently. On the other hand, our efforts may not be as successful or as speedy as we wish, or the consequences for other resources may prove unacceptable. Research and development may result in new types of implementation actions, or science may determine that other types of actions might better foster fish and wildlife mitigation and recovery. Federal or state officials and the actions they advocate may change, or the preferences of society may change. Regardless of the reason, eventually, any selected Policy Direction will likely need to be modified or changed. This EIS is designed to accommodate such need.

This chapter focuses on how a Policy Direction would be implemented in light of changing conditions and influencing factors, and how it could be modified to meet future needs.

4.1 FACTORS INFLUENCING IMPLEMENTATION

Many factors can influence an implementation action (or even an entire Policy Direction). Some factors outside human control—such as weather, ocean conditions, species-specific disease, and social or economic crises—can change the predicted effect of a particular course of action. Also, while the "relationship analysis" utilized in this EIS has proven very effective in past analyses, we must allow for the possibility that forecasts of future actions and their respective impacts may require adjustment over time. New decisionmakers and the decision-making process, itself, may also affect implementation. The method of implementation influences the success and effects of an

action. Methods of implementation include voluntary assistance and incentives, as well as regulation.

Using an adaptive management approach, BPA and other Federal agencies may adjust FCRPS operations over time as changing circumstances warrant. These circumstances may involve water supply, economic outlook, power market conditions, fish and wildlife, water quality, cultural resources, or other project uses.

For example, the NMFS 2000 BiOp recognized that water management actions might change due to unforeseeable power-system, flood-control, or other emergencies. Other emergencies can include a power emergency—one based on insufficient power supply to meet demand in the Pacific Northwest. There can also be West Coast power shortages that threaten health and human safety and require an emergency response from BPA. During 2001, poor water conditions in the Columbia River Basin, coupled with an extraordinary power market on the West Coast, caused an unprecedented situation. Changes in hydropower operations were required to help maintain an adequate and reliable power supply for the Region and surrounding area (see Chapter 2 for a more detailed description).

Emergency actions are a last resort. They are not used in place of the long-term plan. Therefore, such emergency operations will not alter the analysis in this EIS because they can be taken under any of the Policy Directions. The emergency actions are intended for a relatively short duration, especially when considered in the context of this EIS, which is intended to support decisions for a number of years. If the emergency actions do persist, they could signal the need to shift to a new Policy Direction.

4.1.1 Factors in the Natural Environment

The natural environment will likely change in ways that cannot be accurately predicted. Natural disasters can influence the success of a Policy Direction. For instance, wildfires, volcanic eruptions, or other natural events can destroy or alter habitat. Ocean conditions can change, with consequent effects on fish and wildlife. Changes in the natural environment can similarly affect human activities. Changes can affect fish and wildlife mitigation and recovery efforts directly (by affecting food, habitat, or reproductive success) or indirectly, as humans react to changes in the natural environment by revising their priorities and re-evaluating their commitments.

4.1.2 Factors in the Social and Economic Environment

Social and economic factors can also influence the implementation and success of a chosen Policy Direction. A Policy Direction may have broad effects on population, regional economies, or funding that affect its implementation. Many implementation actions—especially most habitat and harvest actions—will likely require economic and social changes that cannot simply be mandated. Instead incentives may be required to realize those changes. Examples of incentives include subsidy, acquisition, leasing, and

education. Regulation may be used by those having the authority to implement it, but it is likely this will be done sparingly.

Table 4.1-1 shows some of the possible factors that could affect implementation of any Policy Direction.

Table 4.1-1: Summary of Some of the Factors Influencing Implementation of the Policy Directions

CONDITIONS IN THE NATURAL ENVIRONMENT
<ul style="list-style-type: none"> ▪ Natural disasters
<ul style="list-style-type: none"> ▪ The relationships among fish and wildlife recovery, climatic change, normal climatic variations, and ocean conditions (these relationships are not well understood, but may affect the success of a Policy Direction, perhaps justifying a change in Policy Direction or implementation actions)
<ul style="list-style-type: none"> ▪ Species extinction
FUNDING AND FISH AND WILDLIFE POLICY
<ul style="list-style-type: none"> ▪ Changes in policy-makers
<ul style="list-style-type: none"> ▪ Intervention by the Legislative, Executive, or Judicial branches, resulting in a loss of regional control over fish and wildlife mitigation and recovery
<ul style="list-style-type: none"> ▪ Increased reliance on Federal taxpayers and the subsequent requirements attached to Federal funding
<ul style="list-style-type: none"> ▪ Additional listing or delisting of fish and wildlife species
<ul style="list-style-type: none"> ▪ Lack of regional commitment, financial or otherwise, to a fish and wildlife mitigation and recovery effort plan and subsequent Policy Direction
<ul style="list-style-type: none"> ▪ Lack of identified BPA results and mechanism for monitoring/achieving those results
<ul style="list-style-type: none"> ▪ Other agencies' or regional decisions on fish and wildlife mitigation and recovery efforts that affect BPA's revenue stream or increase costs
<ul style="list-style-type: none"> ▪ Changes in laws and regulations requiring additional expenditures on fish and wildlife mitigation or prolonging implementation
<ul style="list-style-type: none"> ▪ Perceived success or failure of fish and wildlife recovery and mitigation actions
ELECTRICITY MARKETS AND REGULATION
<ul style="list-style-type: none"> ▪ A significant change in market price (perhaps altering BPA's maximum sustainable revenue (MSR) and ability to pay fish and wildlife costs)
<ul style="list-style-type: none"> ▪ Electricity deregulation
<ul style="list-style-type: none"> ▪ Economic recession or dramatic change
FACTORS SPECIFIC TO POLICY DIRECTIONS
<ul style="list-style-type: none"> ▪ Ineffective BPA cost controls
<ul style="list-style-type: none"> ▪ The need for changes in law
<ul style="list-style-type: none"> ▪ Inability to affect population growth and development patterns in the Region
<ul style="list-style-type: none"> ▪ Selection of implementation options (such as acquisition, leasing, positive incentives, regulation, education, and methods) and intensity of enforcement
<ul style="list-style-type: none"> ▪ Monitoring programs and response to monitoring efforts
<ul style="list-style-type: none"> ▪ Inability to enforce new regulations
<ul style="list-style-type: none"> ▪ Inability to police restricted areas or activities

▪ Inability to establish successful Basinwide Strategy practices to achieve fish and wildlife results
▪ Lack of environmental constituent support for businesses using the river, which may undermine Policy Directions

4.1.3 Factors in the Decisionmaking Process

It is particularly important to understand how the interaction of public process, political intervention, and judicial review may affect implementation of fish and wildlife mitigation and recovery plans. There are three major functions in this interaction.

- **Decisionmaking.** The major public policy decisionmakers are the tribes, states, and Federal agencies that manage and implement fish and wildlife policy. They make the key decisions, and have the ultimate responsibility for implementing a regional fish and wildlife policy.
- **Influencing.** The general public—as a special interest group or individual concerned citizens—may influence the decisionmaking process. This influence can take the form of voting, political pressure, expressing opinions and/or introducing information on technical/scientific developments. Effective public involvement is essential to sound decisionmaking. The public's influence varies based on the conflict surrounding the particular policy issue. Where regional policy on fish and wildlife is concerned, public, scientific, and political discord is extremely high. Any individual or group dissatisfied with a process or a decision may seek redress as described below.
- **Intervening.** A dissatisfied party may seek redress through the Executive, Legislative, or Judicial branches of the respective governments. These entities can directly affect the direction of a decision or its execution. See Figure 4-1 for a brief description of the different avenues of relief.

In Chapter 1, we suggested that public policy might evolve in two different ways: policy by deliberate action (via technical, political, public, and legal input), or by simple default (due to inaction or delays in making formal policy). Figure 4-2 shows how each of these influences in the development of a fish and wildlife mitigation and recovery policy. The interrelationships among the regional decisionmakers, the public interest groups, and the various branches of Federal, state, and tribal governments are some of the checks and balances in the development and implementation of public policy.

Consensus building does not always mean unanimity of thought. Parties rarely reach complete agreement on any issue, much less on an issue as controversial as developing a fish and wildlife mitigation and recovery policy. The advantage, however, of the decisionmaking process is that even a lone dissenter has avenues of relief: through policy-makers, politicians, courts, or a combination of all three, he or she may try to persuade an entity with direct control over regional decisionmakers.

A prime example of this process for the fish and wildlife mitigation and recovery efforts can be seen in a review of the history of efforts to list Oregon Coast coho salmon under the ESA (see the "Judicial Impact on Natural Resource Policy" and "Problems in

Figure 4-1: Potential Avenues Used to Change Policy Maker Decisions

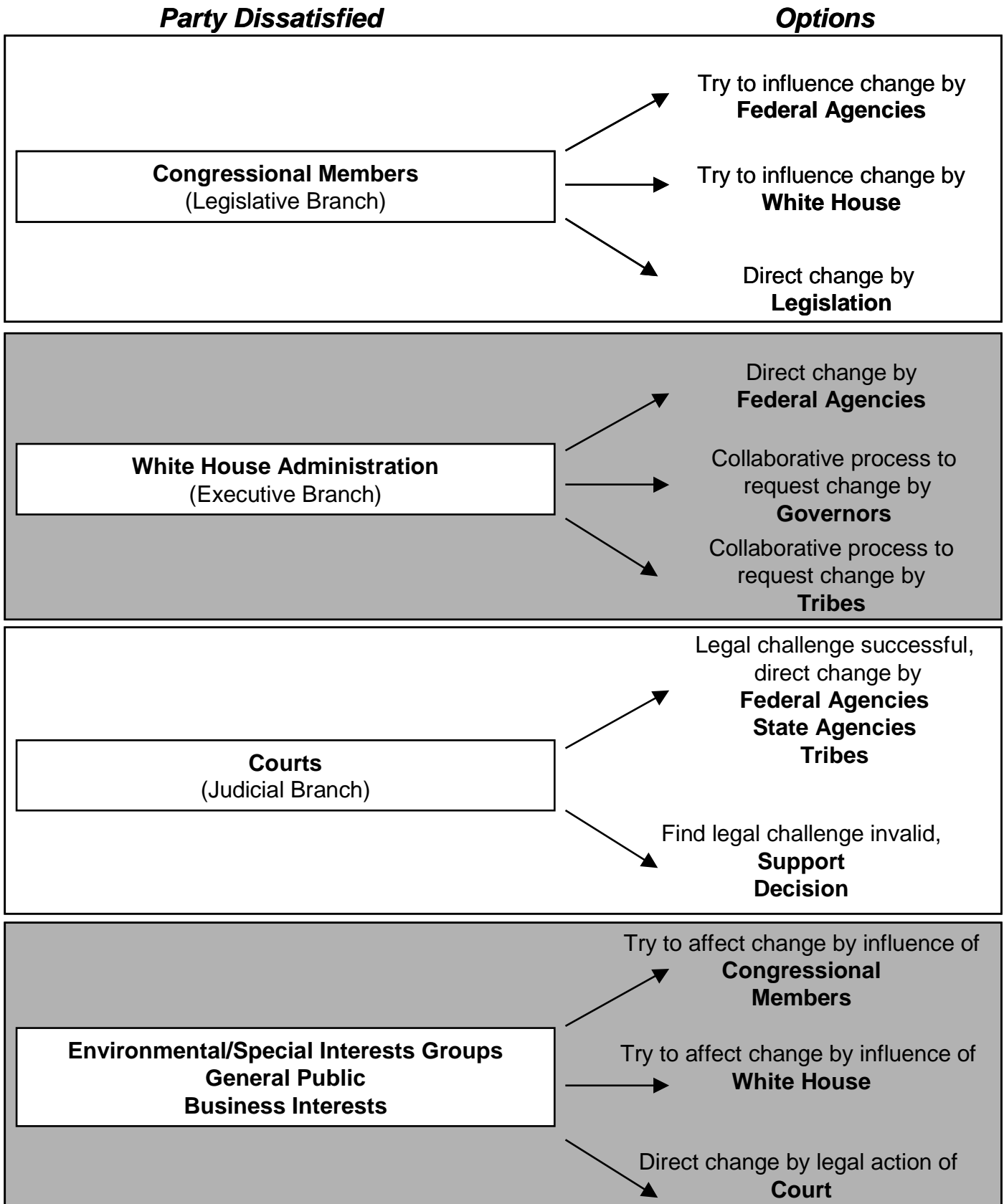
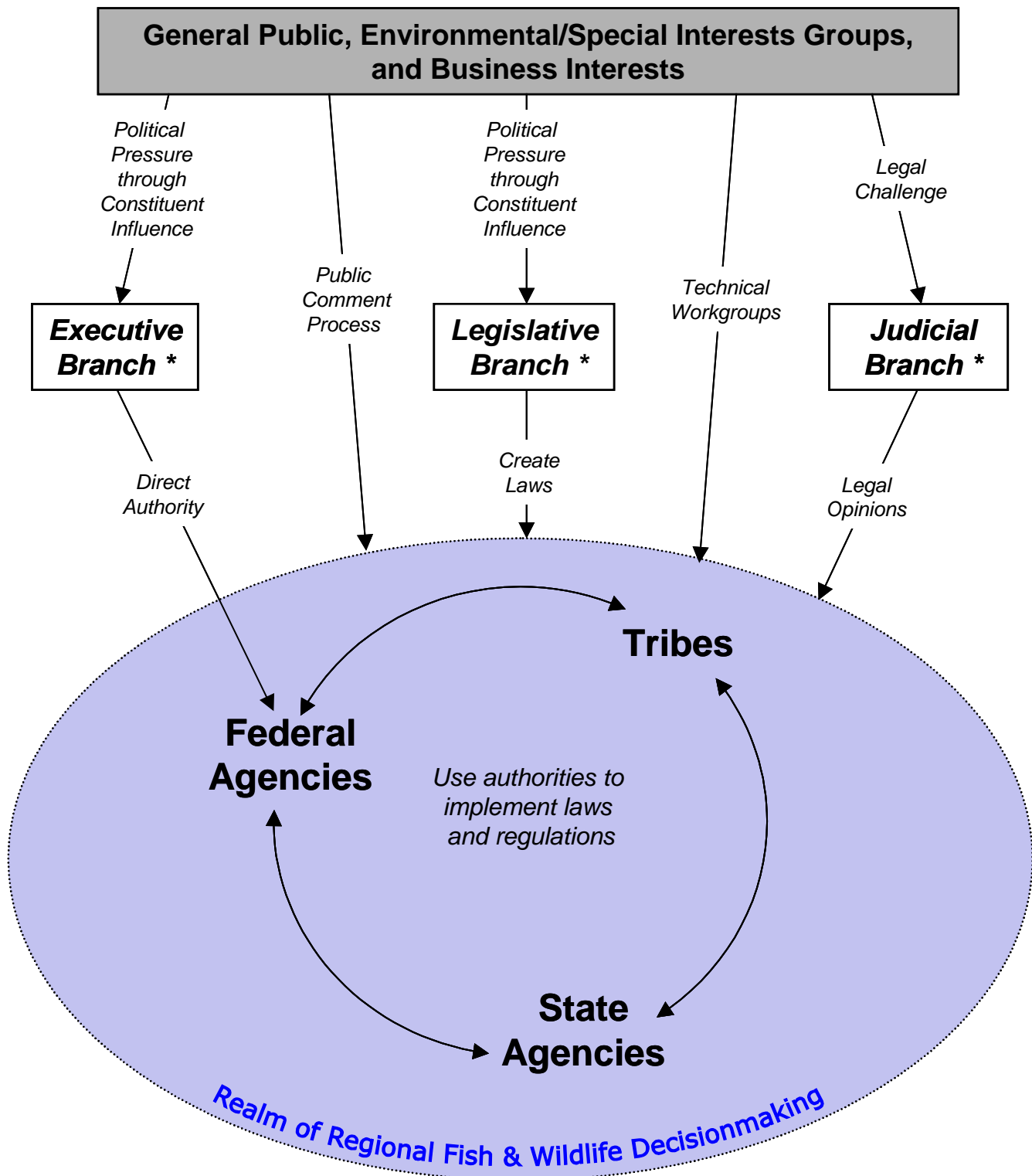


Figure 4-2: Influences on Regional Decisionmaking



* **NOTE:** *The regional decisionmakers face influences from several different levels. A dissatisfied party may seek redress through:*

- the **Executive Branch** - Federal: President and Administration; and States: Governors and their Administrations
- the **Legislative Branch** - Federal: US Congress; and States: Legislatures
- the **Judicial Branch** - Federal: District, 9th Circuit, and Supreme Courts; and States: District and Supreme Courts
- the **Tribes** have their own set of governing bodies (e.g., Tribal Councils)

Defining and Applying Listings" sections in Chapter 2 for a detailed description of this history). After several *decisions* by NMFS in the 1990s regarding fish policy, the checks and balances of the system began. First, in 1991, NMFS decided to issue a policy that introduced the term "evolutionarily significant unit" (ESU), which was NMFS' interpretation of the term "distinct population segment" under the ESA. Next, in 1993, NMFS decided to issue another policy providing that hatchery-spawned salmon were not part of the same ESU as the naturally spawned salmon proposed for listing, unless these salmon were considered essential to recovery of the ESU. Then, in 1998, NMFS decided to list only "naturally spawned" salmon as threatened in the Oregon Coast coho salmon ESU. Hatchery-spawned salmon from the same ESU were not listed because NMFS did not consider these salmon to be "essential to recovery" of the ESU. Finally, in 1999, parties dissatisfied with this listing decision began trying to *influence* NMFS' decisions by bringing a challenge in U.S. District Court. The court subsequently found NMFS' approach to the listing arbitrary and capricious, and thus *intervened* to have NMFS delist the Oregon Coast coho salmon ESU.

Instead of appealing the District Court's opinion, NMFS *decided* to conduct status reviews for this ESU as well as the other Pacific salmon and steelhead stocks listed in accordance with NMFS' hatchery salmon policy, to determine whether to reissue listings. As part of this review, NMFS has been conducting public review of its policy, allowing the public the opportunity to *influence* how hatchery-spawned salmon factor into listing decisions.

Various environmental and fishing groups who were dissatisfied with NMFS' decisions regarding the District Court's opinion once again tried to *influence* NMFS' decision by petitioning for the right to appeal the opinion to the Ninth Circuit Court of Appeals. They were granted the right to the appeal. The Ninth Circuit *intervened* by issuing a stay of the District Court's decision to delist the Oregon Coast coho salmon ESU, pending a Ninth Circuit ruling on the appeal. However, NMFS has nonetheless *decided* to proceed with its status review process for this ESU and others.

This series of decisions, influences, and intervention led to changes in NMFS' policy direction and related actions, changes that ultimately have altered the possible environmental consequences. As can be seen by this example, *decisionmaking*, *influencing*, and *intervening* all play roles in shaping and changing mitigation and recovery efforts for Pacific salmon ESUs. It is likely that future decisionmaking, influencing, and intervening will continue to affect how mitigation and recovery efforts are implemented for these species and others.

To reach a policy goal that will weather technical, legal, and political scrutiny, and to create a useful and enduring tool, we must make sure that any Policy Direction can be modified. The purpose of this EIS is to identify, in advance, the potential environmental consequences of various Policy Directions, so that all interests can be better informed of the potential consequences of their actions, including modification.

4.2 RESPONSES TO CHANGE

We know that change will occur—to the natural environment and to the social and economic environments. Any given Policy Direction might reach its intended goal, or it might fall short in one or more critical areas. Policies may change, but not all actions and effects can be changed as readily. We must be able to address future changes in the environment or in public policy. This EIS is designed to accommodate such changes: selecting a particular Policy Direction or combination of Policy Directions now does not foreclose changing the policy in the future.

To respond to change, BPA will routinely revisit and review the effects of its decisions (see Figure 3-3) on implementation of the selected policy alternative and make modifications, as necessary. Three tools help to make this process possible:

- (1) **response strategies** that do not change the underlying theme of the Policy Direction;
- (2) **reserve options** that extend the individual components beyond the endpoints established by the Natural Focus and Commerce Focus Policy Directions; and
- (3) **mix-and-match approach (hybrid alternatives)** after the initial decision that changes the Policy Direction.

4.2.1 Modifications that Do Not Change the Policy Direction: Response Strategies

After the Region has decided on a particular Policy Direction, it is likely that economic, social, or natural environmental changes will require corrective measures to maintain the selected course. Response strategies allow immediate corrections or improvements *without changing the overall Policy Direction* in effect. Response strategies are used to facilitate implementation of fish and wildlife mitigation and recovery efforts and to mitigate for unforeseen or uncertain events such as changing ocean conditions or natural disasters. They represent management options within the agency's jurisdiction that have been contemplated, implicitly or explicitly, and evaluated in advance, allowing for immediate implementation.

Response strategies can be grouped into three categories: Management and Operating Agency Response Strategies, BPA Funding Response Strategies, and Regional Response Strategies.

4.2.1.1 Management and Operating Agency Response Strategies

As part of the normal course of operations, agencies must be prepared to deal with reasonably foreseeable events. When such events occur, a pre-designed and pre-assessed plan can be executed in a timely manner. Such advance preparation is usually the product of response strategies designed by both management and operating agencies.

Management responses associated with fish and wildlife mitigation and recovery efforts are developed through laws or regulations, public policy, or official plans. These responses are often influenced by Federal, state and tribal governments, the general public, or specific interest groups. These management responses do not directly interact with the natural environment.

Operating responses, on the other hand, are activities by the entities specifically authorized to carry out laws, regulations, policies or plans. For example, operating responses can include specific hydro operations, natural resource management, or construction activities.

Many Federal and state entities, as well as tribal governments, are frequently engaged in both management and operating responses. Over the past several decades, a combination of influences from agencies, courts, and others has shaped the development and management of the water, land, and fish and wildlife of the Columbia River Basin. Table 4.2-1 lists those entities with the most significant roles and responsibilities in implementing management and operating responses.

Table 4.2-1: Roles and Responsibilities

ENTITY	GENERAL REGIONAL RESPONSIBILITY
<i>Primary Entities with Management Responsibilities</i>	
Executive Branch	Constitutional – Manages the actions of the Federal agencies, certain veto powers
Judicial Branch	Constitutional – Determines whether actions are consistent with the U.S. Constitution, and Federal and state laws and regulations
Legislative Branch	Constitutional – Promulgates and amends laws as necessary; makes appropriations to complement laws
Tribes	Treaty – Sovereigns within the United States – Enforces Treaty rights and applicable Federal statutes
Northwest Power Planning Council	Statutory – Develops Regional Power Plan and Fish and Wildlife Plan under the Regional Act
NOAA Fisheries (formerly National Marine Fisheries Service)	Statutory – Pursuant to the ESA, produces Biological Opinions on regarding listed anadromous fish; regulates commercial/tribal harvest
Bonneville Power Administration (power marketing)	Statutory – Markets electric power and meets statutory obligations for fish and wildlife pursuant to the Regional Act (e.g., funding fish and wildlife mitigation measures).
U.S. Fish and Wildlife Service	Statutory – Pursuant to ESA, produces Biological Opinions on listed plants, wildlife, and resident fish
U.S. Army Corps of Engineers	Statutory – Oversees CWA regulations and implementation
Environmental Protection Agency	Statutory – Oversees CWA regulations and implementation, and general environmental oversight through NEPA
Federal Energy Regulatory Commission	Statutory – Regulates non-Federal hydroelectric projects on the Columbia River and its tributaries

ENTITY	GENERAL REGIONAL RESPONSIBILITY
<i>Agencies with Primary Operating Responsibilities</i>	
Bonneville Power Administration (transmission)	Statutory – Constructs and maintains a high-voltage transmission system throughout the Pacific Northwest. Provides primary transmission to electric utilities, public power suppliers, electric generators, and others needing wholesale transmission within and outside the Region
Bureau of Land Management	Statutory – Manages public forest and range lands
U.S. Forest Service	Statutory – Manages National Forest System Lands
U.S. Army Corps of Engineers	Statutory – Operates Federal dams and locks for multiple purposes including navigation, flood control, recreation, and power
Bureau of Reclamation	Statutory – Operates multiple purpose Federal dams and water projects for irrigation and flood control as well as power
Bureau of Indian Affairs	Statutory – Serves as trustee for tribal/individual Indian land and resources held in trust
State Fish and Wildlife Related Agencies	Statutory – Maintains separate and/or joint responsibility with the Federal government for regulating fish and wildlife, air, land, and water issues within their particular state

4.2.1.2 BPA Funding Response Strategies

Events outside BPA's control may impair the agency's ability to fund a chosen Policy Direction. This EIS presumes that such changes or unexpected results can and will occur. This section describes possible BPA strategies that will enable BPA to respond promptly to these challenges without changing the intent of the Policy Direction. Typically, these corrective measures would consist of an action(s) that would not require additional environmental analysis or process. However, should BPA determine that extraordinary circumstances exist, additional analysis, documentation, and public process could take place, possibly leading to Policy Direction changes as described in Section 4.2.2.

For example, if BPA's financial situation should change—a prolonged drought makes it impossible for the agency to recover sufficient revenues to meet its obligations—BPA could take action to (1) increase revenues, or (2) decrease spending, or (3) transfer costs in order to maintain the chosen Policy Direction. Table 4.2-2 provides examples of potential BPA funding response strategies. A more detailed discussion of response strategies is available in the BPA Business Plan EIS.¹

¹ USDOE/BPA 1995a.

Table 4.2-2: Potential BPA Funding Response Strategies

Increase Revenues	Decrease Spending	Transfer Costs
Raise firm power rates	Eliminate power purchases	Seek 4(h)(10)(c) credit from fish and wildlife mitigation
Raise transmission rates to cover other power system costs	Reduce BPA spending on corporate overhead	Increase cost-sharing for BPA programs
Increase unbundled products and services revenues	Reduce Washington Nuclear Plan (WNP)-1, -2, and -3 spending	Reallocate costs and debt between power and non-power
Increase sales of new products and services	Reduce conservation incentive spending	Secure appropriations for BPA's costs
Implement a stranded investment charge	Reduce generation acquisition spending	Transfer program and financial responsibility
Increase seasonal storage	Reduce pollution prevention and abatement spending	Reduce mitigation and recovery actions from those BPA is authorized to implement to only those required by law*
Optimize hydro operations for net revenues	Reduce fish and wildlife spending	Prioritize projects and programs, giving lower priority items to outside entities to fund*
Increase extra-regional sales revenues	Reduce transmission construction spending	
Increase joint venture revenues	Share ownership and spending in new facilities	
Sell assets	Reduce operations and maintenance spending	
Increase rates for environmentally enhanced products*	Shift from revenue to debt financing	
Direct charge for environmental costs*	Seek increased Treasury borrowing limits	
	Lower probability of making Treasury payments	
	Restructure or refinance capital debt to reduce annual payments*	
	Prioritize projects and programs, extending implementation timeline to reduced the near-term costs*	

Source: BPA Business Plan EIS (USDOE/BPA, 1995a)

** Denotes additional examples for this EIS.*

4.2.1.3 Regional Response Strategies

Other Federal, state, tribal, or public entities may wish to develop administrative, operational, or funding strategies specific to their needs so that they may respond quickly to unexpected events, and still maintain the integrity of the chosen Policy Direction. Many of these response strategies would be consistent with existing environmental

documentation. Other response strategies would typically consist of those activities, which are the product of years of typical agency responses to change, and facilitate implementation of a chosen Policy Direction. Examples of such activities are noted below.

- *Planning Activities:* Archeological surveys or test excavations for cultural resources investigations.
- *Project Implementation Activities:* Classifying and certifying lands or fixing minor unsatisfactory environmental conditions.
- *Operations and Maintenance Activities:* Work that is within existing disturbed environmental areas and where the level of use will not increase and environmental conditions are satisfactory.

4.2.2 Modifications that Change the Policy Direction

Fish and wildlife policy in the Columbia Basin has changed over time, and is expected to continue to evolve. The specific actions being considered today are different from those that were considered 10 or 20 years ago. Developments in science and technology, past successes and failures, different people and priorities, changes in focus from salmon to multi-species, and a change in perspective from hydro actions to reviewing the interaction of all the "Hs" (habitat, harvest, hatcheries, and hydrosystem) are just a few examples of changes that have occurred recently. In the future a new Policy Direction may be needed to meet the changing needs of the fish and wildlife mitigation and recovery effort in the Region. The ability to quickly change a Policy Direction is crucial when time is a critical factor. For BPA, this ability to respond to change is also crucial in successfully competing in the electric utility marketplace. This EIS provides two tools for changing Policy Directions—Reserve Options, and the Mix and Match approach.

4.2.2.1 Reserve Options for Future Action

In the event that future developments necessitate changes beyond the specific actions currently being considered under the Policy Directions, we have identified Reserve Options to ensure that those future decisionmakers have the needed flexibility to respond to change.

All of the Policy Directions, discussed in Chapter 3, were characterized regarding their differences from Status Quo. These differences were divided into six components for each Policy Direction. These components addressed the changes in habitat, harvest, hatcheries, hydro, commerce, and tribal harvest. The Reserve Options are also characterized based on these components. These Reserve Options incrementally extend or intensify each of the six components discussed in the Policy Directions beyond the endpoints circumscribed in Natural Focus and Commerce Focus. Table 4.2-3 lists and describes the Reserve Options.

For example, the Natural Focus Policy Direction calls for removing four dams on the Snake River as well as two mainstem dams. Depending on the outcome, future

Table 4.2-3: Key to Reserve Options

Endpoints of the Reserve Options in the Fish and Wildlife Implementation Plan					
Fish and Wildlife Reserve Options					
Reserve Option	Beyond Natural Focus Endpoints	Example	Reserve Option	Beyond Commerce Focus Endpoints	Example
RO-1	Protect all levels of habitat	Protect pristine, marginal, and low-quality habitat for increased species diversity and abundance	RO-7	Set aside habitat only where there is little or no commercial value	Allows development of all areas that possess some commercial value even if existing habitat
RO-2	Ban all harvest	Total closure of all commercial and recreational harvest	RO-8	Allow unrestricted harvest	Eliminates regulatory control of commercial and recreational fishing, any limits or restrictions are lifted
RO-3	Eliminate hatcheries and all hatchery-produced fish	All hatchery are closed and all hatchery-produced are actively caught and removed	RO-9	Maximize artificial production through fish farming (private sector)	Eliminates the need for subsidized fish hatcheries and increases marketable fish production
RO-4	Breach/remove all mainstem dams	Remove all remaining mainstem dams after those removed under Natural Focus	RO-10	Maximize commercial benefits of the hydrosystem, including the construction of new dams	Hydrosystem is operated to maximize its multiple purposes such as power, navigation, irrigation, and recreation. New dams could be constructed on the mainstem or tributaries.
RO-5	Restrict growth and curtail economic development	Restricts development to control growth and preserve more natural conditions with less human pressure	RO-11	Maximize commercial use of natural resources	Increases the production, extraction, and use of natural resources, eliminating past restrictions
RO-6	Eliminate tribal harvest	Total closure of all tribal harvest	RO-12	Allow unrestricted tribal harvest	Allows unlimited tribal fishing, any limits or restrictions are lifted

decisionmakers may chose to breach additional mainstem dams. Consequently, one of the Reserve Options is to "breach, or remove all mainstem dams." With each step toward the endpoint of the Reserve Option, natural, economic, and social effects could become more intense and extensive, although the *kinds* of effects anticipated would remain the same. To more fully understand the anticipated effects of implementing the Reserve Options, please see Section 5.4.

When using Reserve Options decisionmakers must understand two important points:

- **A Reserve Option should be compatible with the other components of the new Policy Direction**
- **Public process will be required.**

4.2.2.2 Mix and Match Approach

By using the mix and match approach discussed in Section 3.5 and Appendix I, regional decisionmakers could revisit a chosen Policy Direction after it has been implemented and make changes. If a particular action or set of actions proved to be very successful, decisionmakers may want the flexibility to implement such actions on a broader scale. Conversely, if a particular action or set of actions were not producing the desired result, decisionmakers could substitute a more aggressive action or opt for a different strategy. By mixing and matching components of the basic Policy Directions, decisionmakers could create a new Policy Direction. Because the mix-and-match approach is used to *change a Policy Direction*, regional discussion and public process would likely be necessary.

In using the mix-and-match approach to change Policy Directions, one must keep in mind the cautions noted in Appendix I: consistency, effectiveness, clarity, coordination, cause-and-effect relationships, and compatibility of changes.

- **Chapter 5 presents the affected environment and environmental consequences of the different Policy Directions.**

Preparation for

CHAPTER 1
Purpose and
Need for
Action

CHAPTER 2
Policy
History

Implementing a
Decision

Comparison of
Alternatives

CHAPTER 3
Comparison
of
Alternatives

CHAPTER 4
Implementation
and Responses
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for Implementing
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**Assessing the
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Conditions**

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and
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**for Making
a Decision**

Chapter 5

***Existing Environmental
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***Categories of Actions
and Effects***

***Generic Environmental
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***Environmental
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***Environmental
Consequences of
Reserve Options***

Choices for Managing

CHAPTER 6
Governance

the Fish & Wildlife
Mitigation & Recovery
Efforts

CHAPTER 5 — ENVIRONMENTAL CONSEQUENCES

- **Describes those aspects of the human environment** that will or may be affected by changes in **Policy Direction** for fish and wildlife mitigation and recovery.
- **Provides a discussion of the generic effects of common human activities on fish and wildlife**, and possible mitigation measures.
- **Provides a discussion of the generic effects of potential fish and wildlife actions on human activities**, and possible mitigation measures.
- **Briefly reviews the methodology that underlies the analysis of environmental consequences for this EIS.**
- **Describes the environmental consequences of the alternative Policy Directions.**
- **Describes environmental consequences of Reserve Options**

Information found in this chapter is the technical and detailed analysis of the environmental consequences for implementing each alternative Policy Direction. For a summary of the philosophy behind each of the alternative Policy Directions and for a summary of the effects, please see Chapter 3 (Comparison of Alternatives).

This chapter is organized to allow logical review of the affected environment and the environmental consequences of implementing actions consistent with each of the Policy Directions. The analysis in this document focuses on the policy level. The description of environmental consequences is based not on numbers, but on a broader and more general qualitative analysis—an analysis built on observable relationships among policies, people, and the environment. We have demonstrated in other processes that use of these basic relationships will lead to a more reliable understanding of the environmental consequences of our actions, appropriate for this level of decisionmaking. Analysis at the policy level accommodates changing conditions and provides greater flexibility in making decisions concerning specific actions.

Refresher: *The items below are summarized from Chapters 3 and 4 to provide a quick review for the reader.*

- (1) *To arrive at the Policy Directions discussed in this FEIS, we studied the regional processes and proposals recently completed, identified the key issues, and collected potential implementation actions. From this information, several broad policy themes emerged.*
- (2) *The Status Quo is the No Action alternative, an option for continuing into the future with no Policy Direction change, using all the same implementation actions in use prior to 2002.*

- (3) *All of the Policy Directions assume that the human population will grow and development will continue, though each Policy Direction can influence these rates of growth.*
- (4) *This EIS explores the environmental consequences of implementing each Policy Direction. With this information in hand, the BPA Administrator can assess the potential effects of any given Policy Direction and determine how BPA will meet its obligation to fund and implement fish and wildlife mitigation and recovery actions.*
- (5) *Environmental consequences fall naturally into two areas:*
 - a) *major environmental consequences for fish and wildlife and their habitats (air, land, and water) caused by common human activities, and*
 - b) *major environmental consequences for humans caused by actions taken for fish and wildlife mitigation and recovery.*
- (6) *The Policy Directions, as defined in this EIS and discussed below in terms of consequences, are not rigidly set. This EIS anticipates that the public or decisionmakers may modify them. Accordingly, three tools to modify Policy Directions have been provided: response strategies, "mixing and matching" components, and reserve options. These tools were discussed in Chapter 4. In addition, provisions have been made to "build your own alternative" (Chapter 3 and Appendix I).*

Section 5.1 describes the affected environment. Section 5.2 describes broad categories of actions taken for fish and wildlife mitigation and recovery and the generic effects of these actions on the natural, economic, and social environments. Section 5.3 is the detailed analysis of the environmental consequences of implementing the alternative Policy Directions. Each Policy Direction is evaluated based on its effect on the natural, economic, and social environments. Similarly, in Section 5.4, the environmental consequences of the reserve options are analyzed.

5.1 AFFECTED ENVIRONMENT

This section is intended to provide the reader with a basic understanding of existing environmental conditions, the "Affected Environment." These descriptions are provided to facilitate an understanding of the effects of the Policy Direction Alternatives as evaluated in Section 5.3. Much of the information is summarized from the environmental documents incorporated by reference, especially the SOR Final EIS, the BPA Business Plan EIS, the Corps Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS, and the Interior Columbia Basin Ecosystem Management Project Final EIS. Other sources include the Federal Caucus Conceptual Plan and Basinwide Strategy papers, the Human Effects Analysis of the Multi-Species Framework Alternatives (2000), the *U.S. Department of Commerce's* Statistical Abstract of the United States (1999), and the USDA's Agricultural Statistics (2000).

5.1.1 Natural Environment

The Pacific Northwest's tremendous wealth of natural resources sustained native people for centuries and contributed to immigration that has lasted for more than a century. The settlement and development of the region brought changes to the natural environment that have culminated in the environmental conditions existing today.

The discussion of the existing natural environment described in this section is organized by these effect areas:

- air quality;
- land habitat—use and quality;
- water habitat—use and quality;
- fish and wildlife; and
- ocean and climate.

This section is meant to provide a brief description of the affected environment. For more discussion on each effect area listed above see Section 5.3.2.

5.1.1.1 Air Quality

Generally, the Pacific Northwest region is known for its excellent air quality. However, the air quality of the Columbia River Basin can vary widely because of local air pollution sources, meteorology, and topography. Most sources of air pollution are in urban areas; however, rural areas also contribute to air pollution problems. On the west side of the Cascades there are large urban population centers and high concentrations of emissions from industrial development and automobiles. These areas also support a large amount of agriculture that impacts air quality as a result of field burning. East of the Cascades, the region is less populated and developed. Factors exacerbating air quality problems in this area are the dry climate, proximity to large areas of exposed and highly erodible soils, and wind. Sources of air pollution include agricultural practices and industrial emissions. For example, in the lower Snake River area, a primary source of air pollution is industrial emissions, typically soot and fine wood particles.¹ Throughout the region there are concerns about the impact of thermal power generation on air quality. Air quality is particularly an issue in certain defined air basins—usually in and around large urban areas. In areas already air quality limited, existing and new development must comply with increased restrictions.

The Columbia River SOR EIS identifies three major categories of pollutants (1) urban sources, (2) major single-point emitters, and (3) large areas of exposed soils. Important sources of urban air pollution include internal combustion engines used for transportation, industrial plants, burning of fuels for heating and other purposes, and burning of wastes. Single-point emitters include combustion turbines located in urban

¹ Corps 2002b, Section 4.3.2 Sources of Air Pollutants.

and rural areas. Most areas of exposed soils are agricultural and grazing lands and unpaved roads.

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to set primary and secondary National Ambient Air Quality Standards (NAAQSs) for criteria air pollutants. Primary standards are developed to protect the public health, allowing a margin of safety, while secondary standards protect the public welfare. Public welfare includes protection from decreases in visibility, and damage to animals, crops, vegetation, and buildings. Air quality standards have been established for carbon monoxide (CO), lead (Pb), particulate matter with aerodynamic diameters less than 10 micrometers (PM₁₀), nitrogen dioxide (NO₂), ozone (O₃), and SO₂. Geographic areas with measured pollutant concentrations greater than the NAAQSs are referred to as "nonattainment areas."² Other air pollutants—known as "greenhouse" gases—have been determined to contribute to global warming. These greenhouse gases are emitted when fossil fuels, wood products, or solid waste are burned. For a more detailed discussion of global warming, see Section 5.1.1.5 and Appendix F. The air emissions considered in this EIS are carbon monoxide (CO), carbon dioxide (CO₂)³, oxides of nitrogen (NO_x), particulate matter (PM₁₀), and sulfur dioxide (SO₂).⁴ These air pollutants are common to both transportation and power generation.

CO is a colorless, odorless gas that interferes with the oxygen-carrying capacity of the blood. CO has 210 times more affinity for red blood cells than does oxygen. Prolonged exposure to low levels can impair physical coordination and cause dizziness. Continued exposure to CO above 750 parts per million (ppm) can cause death. Ambient CO concentrations do not measurably affect plantlife or building materials.

CO₂ is a natural product of respiration and is produced by burning fossil fuels. It is taken up by plants during photosynthesis. Elevated concentrations are known to accelerate plant growth. Atmospheric CO₂ absorbs heat radiated from the earth, preventing heat loss to space. For this reason, CO₂ is considered a greenhouse gas and has been linked to global warming. It has no health effects at atmospheric concentrations. CO₂ is also produced during the production of natural gas.

Nitrogen oxides (NO_x) can also slow plant growth and reduce crop yield at relatively low concentrations. NO_x are a respiratory irritant that, in the presence of sunlight, combine with hydrocarbons to form photochemical smog (ozone, peroxyacetyl nitrate [PAN], and peroxybenzoyl nitrate [PBN]). Photochemical smog drastically reduces visibility and causes respiratory and eye irritation.

² See generally, Clean Air Act, 42 U.S.C. §§ 7401–7410 (2000).

³ CO₂, though not a criteria pollutant, is considered a "greenhouse" gas. Other "greenhouse" gases include nitrous oxide, water vapor, methane, and ozone.

⁴ Corps 2002b, Section 4.3.1.1 Regulated Air Pollutants; and USDOE/BPA 1995, Section 3.6.3 Air Quality.

Particulate matter is made up of fine solid particles suspended in the air that can cause nuisance effects from blowing dust, and health effects from fine particulate matter and airborne chemicals attached to the dust. Animal and plant health effects depend on the size of the particulates and the pollutants contained in the particle.⁵ PM₁₀ travels deep into the lungs, where pollutants can rapidly diffuse into capillary beds. Elevated particulate concentrations are associated with an increase in the severity and frequency of respiratory diseases. The EPA has recently considered lowering the primary standard because it does not adequately protect human health.

When combined with moisture, SO₂ forms sulfuric acid, which corrodes most building materials, impoverishes soil, affects nearby livestock, acidifies lakes, and kills or damages plant life. Sulfuric acid and SO₂ are both respiratory irritants. About 40% of the natural gas processed in the province of Alberta (Canada) contains sulfur and is termed "sour gas." Processing removes much of the sulfur in gas, recovering it as a salable byproduct.

Barges, trains, and trucks remain the main modes of transportation for moving commodities within the Region.⁶ Trains, trucks, and ocean-going cargo vessels are used widely for importing and exporting goods to and from the Region. These modes of transportation, along with automobiles and industrial combustion processes, increase the levels of CO, CO₂, NO_x, and SO₂. Construction activities, agricultural and forestry practices, unpaved roads, and the exposure of sediments can result in increased PM₁₀.

The fuel sources for power generation that affect air quality primarily include natural gas and coal, and to a lesser extent, wood residue.⁷ These fuels can cause increases in CO, CO₂, NO_x, SO₂, and PM₁₀. Combustion turbines are situated throughout the Region. Coal-fired plants are located near Centralia, Washington, and Boardman, Oregon. Sulfur dioxide emissions are a major concern for coal-fired plants; nitrogen oxides are more of a concern for natural gas combustion turbines (CTs). Figure 2-5 shows the breakdown of the generation resources projected for operation in the 2000-2001 operating year; Figure 2.6 identifies Non-Hydro Generation sites in the region (see also Appendix E: Energy Generation Facilities.). Figure 2.15 shows the location of major gas pipelines that could supply fuel for existing and new gas-fired CTs. See Appendix J ("per-unit table") for the specific levels of air emissions associated with the different types of power generation.

Reservoir drafting exposes shoreline areas, which are normally underwater, to the drying action of the sun and wind potentially increasing levels of airborne particulate matter.

⁵ Polycyclic aromatic hydrocarbons (PAHs) are formed during the incomplete combustion of fossil fuels, municipal waste, and other organic substances and consist of more than 100 chemicals. Humans are exposed by breathing PAHs bound to airborne particles. Although no harmful effects have been proven in humans, PAHs may reasonably be expected to be carcinogens. Animal studies have shown adverse effects on the reproductive cycle, body fluids, and the ability to fight disease.

⁶ Council 2000a, Section 5.3.4 Transportation.

⁷ See Appendix E of this EIS.

Clear, windy, summer days typically provide the weather conditions most conducive to high levels of blowing dust. Effects occur primarily around reservoirs located in the drier portions of the Columbia River Basin; both local residents and recreational users of the projects can be affected.

Currently some areas in the Columbia River Basin do not fully meet Federal, state, and local Ambient Air Quality Standards. The most common types of non-attainment in the region involve PM₁₀; however, some urban areas do not meet CO standards. See Figure 2.6 for a map showing air non-attainment areas and federally-protected Class I Areas.⁸

Recent long-term planning estimates by the Council show that the region could need up to an additional 6,000 MW of electricity over the next 10 years. This demand for electricity has led to proposals for a number of new generating resources. BPA is being asked to integrate many of these resources into the Federal Columbia River Transmission System (FCRTS). Since most of these proposed resources are CTs, there is a regional concern for air quality, particularly impacts to federally-designated Class 1, scenic, and wilderness areas. Therefore, BPA initiated a Regional Air Quality Modeling Study to provide clarifying information for the air quality cumulative effects analysis in the Business Plan EIS.

The Regional Air Quality Modeling Study assessed emissions of NO_x, PM₁₀, and SO₂. It compared predicted air pollution from 45 proposed power plants (almost 24,000 MW) to established benchmarks for visibility, National Ambient Air Quality Standards, and nitrogen and sulfur deposition. It also estimated annual CO₂ emissions. The study found that these emissions would not violate regulated air quality standards. The study did show a slight decrease in visibility in some sensitive areas of the region; however, visibility is not regulated at this time.⁹

Impacts to air quality, as a result of fish and wildlife mitigation and recovery actions, are associated in nature. Localized air quality can improve as areas are set aside for fish and wildlife or as industry and land development is regulated. However, air quality may decrease in other areas where development increases due to fewer restrictions. For example, decreasing hydropower generation for fish is not intended to impact air quality. However, the CTs used to replace that hydro power would result in impacts to air quality. Although the action taken for fish was not intended to affect air quality, there were still associated impacts. For a discussion of intended and associated effects see Section 5.2.2.

5.1.1.2 Land Habitat—Use and Quality

The lands within the region can be characterized as three general vegetation types: grasslands, shrublands, and forests. These vegetation types can be broken down further

⁸ Designated Class 1 areas include international parks, national wilderness areas which exceed 5,000 acres in size, national memorial parks which exceed 5,000 acres in size, and national parks which exceed 6,000 acres in size and which were in existence in 1977.

⁹ USDOE/BPA 2001d, pp. 1-7.

into upland, riparian, and wetland habitat. Land use in the region has changed dramatically in the last 150 years. Forests have been cut, and grasslands, shrublands, forests and wetlands converted to grazing and agriculture. This loss of quality habitat is further compounded by activities that result in habitat fragmentation, especially in upland and riparian areas. The use or development of some habitat areas is currently controlled or limited by natural resources regulations.

Lands have also been converted for other developed uses. Urbanization of lands causes a loss of the native land characteristics. "Urbanization paves over or compacts soil, and increases the amount of runoff reaching rivers and streams."¹⁰ However, urbanized and agricultural lands, depending on their management, can provide habitat values for some native species.

Table 5.1-1 shows recent land use by ecological province¹¹ as defined by the Multi-species Framework Process. See also Figure 2.10 for a map of the different land use and vegetation types across the Region.

Table 5.1-1: Recent Land Use of Columbia Basin Lands in the United States by Ecological Province, 1000 Acres Total and Percent by Use

Province	1000 Acres Total	Agri-cultural	Forest	Range-lands	Urban	Water and Wetland
Lower Columbia	11,265	16.9%	74.3%	0.9%	5.4%	2.5%
Columbia Gorge	1,234	18.9%	71.1%	4.8%	1.3%	4.0%
Columbia Plateau	30,136	30.9%	35.8%	30.7%	0.9%	1.7%
Cascade Columbia	4,744	3.9%	71.2%	19.4%	0.4%	5.1%
Blue Mountains	5,014	21.3%	48.6%	28.2%	0.4%	1.4%
Mountain Snake	14,946	6.7%	70.5%	19.8%	0.2%	2.9%
Inter-mountain	5,417	16.9%	70.5%	8.2%	2.2%	2.3%
Middle Snake	20,059	8.3%	26.5%	62.6%	0.6%	2.0%
Upper Snake	23,372	19.2%	13.4%	61.3%	0.7%	5.3%
Mountain Columbia	21,542	5.2%	76.8%	10.2%	0.6%	7.0%
Total	137,729	15.9%	47.3%	32.1%	1.1%	3.5%

Source: Council 2000a: Human Effects Analysis of the Multi-Species Framework Alternatives, 2000

Soils west of the Cascades are generally deep residual or glacial deposits interspersed with rich alluvial stream bottoms.¹² Many of these soils are highly productive, limited only by drainage. In the Willamette Valley, "human induced actions have altered most of

¹⁰ Federal Caucus (1999b), p. 29.

¹¹ Ecological provinces are groupings of adjoining subbasins with similar climates and geology to account for distinct environments for fish and wildlife populations.

¹² USDOE/BPA 1995c, p. 2-4.

the valley's natural drainage affecting soil productivity."¹³ East of the Cascades, river valleys and lower terraces are predominantly young alluvial soils. Uplands tend to have a thin covering of highly erodible wind-blown soils. In the Rocky Mountain portion of the Basin, valley floors are predominantly glacial outwash and glacial alluvium, and upland soils tend to be rocky, coarse and permeable. Soil productivity has decreased due to loss of nutrients and organic matter. Such losses are often caused by exposure of soil to wind and water. Exposure can be caused by agriculture, grazing, trampling, vehicle traffic, and a variety of other human activities. For example, riparian cottonwood forests in Idaho are no longer self-sustaining because dams have eliminated the spring flooding that exposed the mineral soil needed for seed germination.¹⁴

Overgrazing, introduction of exotic species, and inundation by dam construction has reduced the overall quality and quantity of native upland habitat. For example, introductions of noxious plants contribute to the reduced quality of rangelands and other habitat types; notable examples include cheatgrass, starthistles, knapweeds, and saltcedar. The ICBEMP EIS documents help identify the condition of forests and grazing lands east of the Cascades. Many of these statements are representative for other areas of the Basin as well.¹⁵

- "Soil productivity is generally stable to declining ... sustainability of soil ecosystem function and process is at risk ... in some areas."¹⁶
- "Interior ponderosa pine has decreased across its range.... There has been a loss of the large tree component.... Generally, mid-aged forest structures have increased...."
- "Increased fragmentation and loss of connectivity within and between blocks of habitat ... have isolated some habitats and populations.... Fragmentation has isolated some animal and plant habitats and populations and reduced the ability of populations to disperse."
- "Rangeland noxious weeds are spreading rapidly ... infestations have simplified species composition, reduced diversity Woody species encroachment ... have reduced biodiversity."
- "Declines in plant ... species are due to a number of human causes including conversion of habitat to agriculture and urban development, grazing, timber harvest, introduction of exotic plant and animal species, recreation, high road densities, fire exclusion, and mining."

The amount and continuity of riparian areas has decreased, primarily because of conversion to agriculture and range, but also because of urbanization, transportation improvements, and stream-channel modifications. The quality of riparian areas has been lost because of excessive livestock grazing and increases in exotic vegetation. Riparian

¹³ USDO/USFWS and BLM 1994. (Northwest Forest Plan)

¹⁴ Smith et al.

¹⁵ USDA/USFS and USDO/BLM 2000b, Chapter 2.

¹⁶ USDA/USFS and USDO/BLM 1997, pp. 18-19.

and aquatic ecosystems continue to experience competing developmental interests, associated disturbances, and unsustainable resource extraction. Logging, grazing, mining, water diversions, dams, and other human activities have at least moderately, if not severely, altered or destroyed most riparian ecosystems in the Pacific Northwest. Many riparian areas, floodplains and wetlands that once stored water during periods of high runoff have been developed. For example, agricultural development, channelization, and diking to control flooding along the Willamette River have drastically simplified the once braided system of oxbows, small side channels, ponds, and sloughs that supported extensive marshlands and riparian forests.

Wetlands have also decreased because land use activities have degraded, modified, or destroyed them. However, creation of water impoundments has allowed for some limited increases in wetland habitat. The health of estuaries has declined. Estuarine conditions have also been substantially affected by development. "More than 50% of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreation, agricultural or urban uses. More than 3,000 acres of inter-tidal marsh and spruce swamps in the estuary have been converted to other uses since 1948.¹⁷ Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Dam construction and operation up-stream of the estuary has changed the seasonal patterns and volumes of discharge into the estuary. The peaks of spring-summer floods have been reduced and the amount of water discharged in winter has been increased.

5.1.1.3 Water Habitat

Water habitat in the region varies in terms of water quality, instream water quantity, and the amount of river and reservoir habitat for fish and wildlife. Various factors that can affect water habitat include dams, agriculture and ranching, navigation and transportation, forestry, and other industries. New industrial, residential and commercial development also can affect water habitat.¹⁸

Water Quality

Water quality problems generally originate as intentional use of water for waste disposal, or from non-point source pollution. Non-point sources include irrigation return flows, forestry practices, malfunctioning septic systems, urban runoff, and mining leachates. A long history of mining, logging, and grazing has badly degraded substantial portions of forested eastside river systems such as the John Day, Grande Ronde, Yakima, Wenatchee, Entiat, and Methow rivers. Mining may have deposited new hazardous substances, or disturbed naturally occurring hazardous substances, in floodplain sediments. Some water quality problems are directly related to dewatering streams for irrigation and other water supply purposes. Water quality continues to be a major concern in the region; it is an issue of increasing importance to the Federal agencies involved with regional fish and wildlife decisions.

¹⁷ Lower Columbia River Estuary Program 1999.

¹⁸ Corps 2002b, Chapter 4.

"Withdrawing water for irrigation, urban and other uses can increase temperatures, smolt travel time, and sedimentation. Runoff from irrigation can introduce nutrients and pesticides into streams and rivers."¹⁹

"A 1992 survey of Washington rivers classified 54% of them as not fully supporting designated beneficial uses because of various types of pollution and degradation."

"Until secondary sewage treatment began in the 1950's, large quantities of organic wastes from agricultural and urban operations greatly reduced the water quality along the Willamette River."

"Columbia River streams, both mainstem and tributaries, have been designated as water quality limited under the Clean Water Act. The degraded condition of these streams is directly related to declining fish populations throughout the basin."²⁰

"Water quality in streams throughout the Columbia River Basin has been degraded by human activities such as dams and diversion structures, water withdrawals, farming and grazing, road construction, timber harvest activities, mining activities and urbanization. Over 2,500 streams and river segments and lakes do not meet federally-approved, state and tribal water quality standards under the significant cause of habitat degradation and reduced fish production."

"In Oregon and Washington most waterbodies, and in Idaho many waterbodies, on the 303(d) lists do not meet water quality standards for temperature."²¹

Figure 2.7 shows water quality-impaired rivers and streams in the Region. Of the streams surveyed in Oregon in 1988, 95% were determined to be moderately or severely degraded because of excessive sedimentation, high water temperatures, bank instability, or other problems with water quality related primarily to logging and removal of large woody debris from stream channels. Of the 3.4% (1,099 of the 32,150 segments) of Washington State's waters that have been surveyed, 58.5% (643 of the 1,099 surveyed) have been identified by the Washington Department of Ecology as impaired.²² Pursuant to Section 303(d) of the Federal CWA, 7,994 stream miles and 228,277 lake acres in Idaho have been listed as impaired.²³

Of these rivers and streams, the one that is receiving perhaps the most attention for water quality issues is the lower Snake River in eastern Washington. This river frequently exceeds state water quality standards, established under the Clean Water Act, for both temperature and total dissolved gases (see Appendix K for a discussion on Clean Water Act issues). For years, there has been a concern that the four Federal dams along this river—Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams—are raising the river water temperatures to levels that are harmful to salmon and steelhead. In

¹⁹ Federal Caucus 1999b, pp. 28-29.

²⁰ Federal Caucus 1999b, p. 2.

²¹ Federal Caucus 1999b, p. 28.

²² Washington Department Of Ecology 1998.

²³ EPA 1998a.

addition, research has shown that spills of water from dams can increase the levels of total dissolved gases in the water; if these levels are sufficiently high, they can be harmful or even lethal to non-acclimated fish.

As the owners and operators of the lower Snake River dams, the Corps has been working to address these concerns. The Corps believes that, although temperatures are indeed a concern and the dams likely delay the annual warming and cooling cycle of the river by about a week or two, empirical and modeling data indicate that the dams do not significantly increase water temperatures in the river.²⁴ The Corps has also identified that improving existing and installing additional spillway deflectors at the dams as a measure that would reduce total dissolved gas levels, and has sought variances from the states for exceedances of state standards.²⁵ The Corps believes that, because there are several major contributors to water quality problems along the lower Snake River, the appropriate method for resolving these problems is through a TMDL process to be conducted by the jurisdictional states and EPA.²⁶

Water quality is divided into four effects subcategories for evaluation in this EIS. These subcategories are discussed below and further analyzed in Section 5.3.

Nitrogen Supersaturation (Total Dissolved Gas)

Nitrogen supersaturation, also referred to as Total Dissolved Gas (TDG), can be found in natural river conditions; however, it is further elevated when water passes through a dam's spillway and carries trapped air into deep waters where the air dissolves into the water. Spill can have the undesired effect of increasing levels of gas supersaturation concentrations downstream.²⁷ Dissolved gas supersaturation can lead to a physiological condition in aquatic biota known as gas bubble trauma (GBT) or gas bubble disease (GBD). Gas supersaturated water reduces survival of eggs and alevins, results in smaller size at emergence, increases physiological stress, and diminishes growth. As the river flow passes each of the lower Snake and Columbia River dams, sequential spill causes the concentration of dissolved gas in the river to increase, incrementally and cumulatively. Nitrogen supersaturation can affect all aquatic organisms, impacting the aquatic ecosystem structure.

Non-thermal Pollution

Non-thermal pollution can enter surface water from municipal and industrial wastewater, industrial facilities, irrigation return flows, mine runoff, agricultural and grazing runoff, untreated storm water, and septic systems. Agriculture represents the largest nonpoint source of non-thermal pollution and uses the largest amount of surface water within the Basin. Non-thermal pollution can result in direct adverse physiological effects (e.g., bioaccumulation) and habitat degradation. Contaminant pollutants can impair water

²⁴ Corps 2001a, p. C-8; Corps 2002b, Chapter 4.

²⁵ Corps 2001a, pp. C-5 – C-6.

²⁶ Corps 2001a, pp. 8-9.

²⁷ NRC 1996, p. 229.

quality and degrade aquatic habitat. Increases in non-thermal pollution can also result in changes to pH levels.

Non-thermal pollution includes excesses of organic matter, fertilizers (e.g., phosphates), pesticides (e.g., DDT, aldrin, heptachlor), herbicides (e.g., 2,4-D), sediment (sedimentation is discussed separately below), a large number of metals (e.g., arsenic, lead, mercury), acid mine drainage, and chemicals (e.g., dioxins). Metals originate from many places, including natural sources, construction, urban runoff, wastewater, coal combustion, mining, and smelting. Other pollutants include polycyclic aromatic hydrocarbons (PAHs) and chlorinated hydrocarbons. PAHs come from combustion sources (forest fires, auto exhaust, and the aluminum industry); chlorinated hydrocarbons come from sewer and industrial discharges. Insecticides come from domestic and agricultural uses. Simple grazing of cattle or other livestock near streams and rivers can introduce animal wastes that release potentially harmful chemicals and *E. coli* bacteria.

Tetrachlorinated dibenzo dioxins (TCDD) and tetrachlorinated dibenzo furans (TCDF) are persistent toxic substances that enter the environment as unintended byproducts of several industrial processes. The most significant sources are pulp mills, municipal waste incinerators, and fires involving polychlorinated biphenyl (PCB)-contaminated oil. Although they are no longer manufactured, PCBs are very persistent and are found worldwide, even in the most remote areas. Other potential sources of deposition include the open burning of household waste in barrels.

Non-thermal pollution represents a hazard to aquatic life and human health because of their toxicity at low levels, persistence, and bioaccumulation factors.²⁸ The primary concern for fish from non-thermal pollution is through ingestion of pollutants. Pollutant toxicity is difficult to describe because there are complex interactions among pollutants; many have similar toxic mechanisms or target organs, compounding their effects. Insecticides generally attack the central nervous system, affecting fight-or-flight responses and systems such as the olfactory senses. Metals can affect multiple organs and metabolic processes such as food utilization, respiration, and growth and reproduction rates, as well as behavior. In addition, some metals (lead and mercury) preferentially target the central nervous system. Copper is particularly toxic to fish and aquatic food-chain organisms. Some metals (nickel, arsenic, cadmium, chromium, and in some cases, lead) are also carcinogenic. PCBs are associated with immunological suppression, reproductive impairment, and cancer. PAHs cause a whole host of problems, including reduced growth, reduced reproductive success, immunological dysfunction, and cancer.²⁹ It is also well known that immuno-suppressed fish are more susceptible to disease and pathogenic challenges and ultimately experience an increase in mortality.³⁰

²⁸ NRCC 1981.

²⁹ NOAA 2001a and 2001b; McCain, B.B., et al. 1990; Arkoosh, M.R., et al. 1991; Arkoosh, M.R., et al. 1994, pp. 33-48; and Stein, J.E., et al. 1995.

³⁰ NOAA 2001a and 2001b.

Non-thermal pollution can alter cause changes to aquatic habitats, especially reservoir habitat. Reservoirs provide excellent growing conditions for algae. Algal blooms occur where water velocity is low, and nutrients, light intensity and temperature are relatively high. Non-thermal pollution provides the nutrients that encourage algal growth. Algal blooms reduce dissolved oxygen levels for aquatic species.

Sedimentation

Sedimentation is the result of soil erosion, and is measured in terms of turbidity and suspended sediment. Sedimentation occurs naturally from the effects of wind and water on land, including natural landslides, runoff, and flooding. Accelerated sedimentation is caused by erosion caused by human disturbances, including agriculture, grazing, logging, and urban development, as well as channel dredging for river navigation.

Agricultural irrigation contributes to sedimentation in some tributaries because return flows are often high in sediments. Dryland farming and grazing can also contribute to sedimentation through disruption of soil surfaces. Forest practices can cause stream sedimentation through construction and maintenance of roads and stream crossings, use of machinery to harvest and transport timber, and loss of vegetative cover. Landslides of various types occurring along reservoir shorelines also contribute to reservoir sedimentation.

Sediment transport downstream is interrupted by the dams. The dams impound water and reduce velocity, allowing most suspended material to settle on the bottom of the reservoir while the rest remains suspended in the water column—affecting turbidity levels. Reservoir sediments can contain mercury and other hazardous substances.

Reservoir operations such as pool level fluctuations can cause sedimentation. If the water level in a reservoir drops quickly, the increased weight of the saturated materials, along with removal of lateral support from the water, may cause slumping or mass wasting. The effect of reservoir operations on sediment mobility and subsequent movements of hazardous substances is a concern.

Dredging to maintain navigation channels can increase the velocity of the current and the movement of suspended sediments; it can also disturb sediments that may contain toxic substances that are harmful to plants and animals.³¹

Temperature/ Dissolved Oxygen

Storage of water in reservoirs can alter the normal thermal regime of a river.³² Too much storage can increase temperature because of reduced flow volumes downstream of reservoirs; it can also increase the thermal regime in shallow reservoirs. Deep reservoirs can release too much cold water in hypolimnetic deep-water releases and too much warm water during the winter. Thermal pollution from industrial discharges can also increase

³¹ Corps 2002b, Section 4.4.2.1.

³² Corps 2002b, Section 4.4.2.1.

water temperature. Temperature is a very important characteristic of water quality with the potential to adversely affect some aquatic organisms. Water temperature is one of the critical parameters for salmonids, as well as resident fish species in reservoirs.

Temperature extremes can harm fish and aquatic organisms. Salmonids and some amphibians appear to be the most sensitive to water temperatures; they serve as indicator species for water temperature and water quality. Too much cold water can delay egg development and migration of salmon. Too much warm water can stress salmon physiologically and become lethal, depending on exposure time, or can trigger premature egg hatching. Above-optimal temperatures accelerate development of eggs and alevins, cause earlier fry emergence, increase metabolism, increase primary and secondary production, increase susceptibility of both juveniles and adults to certain parasites and diseases, and increase predation on juvenile fish. Mortality of salmonids occurs at sustained temperatures of greater than 73 degrees Fahrenheit. Sub-optimal water temperature can also cause cessation of spawning, increased egg mortalities, and susceptibility to disease.³³

Adequate dissolved oxygen (DO) concentrations are important for supporting fish, invertebrates, and other aquatic life. Salmon and trout are particularly sensitive to reduced DO. The capacity of water to hold oxygen in solution is inversely proportional to temperature. For example, higher stream temperatures result in lower DO concentrations. DO concentrations can vary with length and width of river and reservoir systems, depth, and time. Mainstem changes in temperature and DO levels are associated with dry years, low flows, long retention times, and solar radiation. Tributary problems could be more closely linked to the timing, and quantity of irrigation diversions, low storage releases, altered channel geometry, increased solar radiation through loss of riparian and stream bank shading, and irrigation return flows.

Water Use and Habitat

Water use is the diversion or instream application of water to human uses, including agricultural irrigation, municipal water supply, hydropower, navigation, and waste disposal. Water use is the limiting factor for the amount of instream water. For example, storage of water for winter hydropower generation and spring flood control has substantially altered the natural runoff pattern by increasing fall and winter flows and decreasing spring and summer flows resulting in fluctuations in instream water quantity.³⁴ Water habitat is the amount of available habitat for aquatic species and is evaluated in terms of the amount stream/river and reservoir habitats. The quantity of instream water coincides with the amount of available habitat. Water quantity problems are a significant cause of habitat degradation and reduced fish production.³⁵ Withdrawing water from streams can increase temperatures, sedimentation, and smolt travel time.

³³ Federal Caucus 1999b and 2000b, Habitat Appendix, p. 134 and Hydro Appendix, p. 39.

³⁴ Federal Caucus 1999b, pp. 66-67.

³⁵ Spence et al. 1996.

Large hydroelectric dams on the mainstem and major tributary sections of the Columbia and Snake river systems present barriers to salmon, lamprey, and white sturgeon movements and alter river flow rates and patterns to the detriment of many fish populations.³⁶

"Hydropower dams on the Columbia and Snake rivers have blocked and inundated mainstem habitat, altered natural flows for fish and aquatic species, impeded passage of migrating fish, and created a series of pools where fish predators reside."³⁷

"Millions of acres of land in the basin are irrigated. Although most withdrawn water eventually returns to streams from agricultural runoff or from ground water recharge, crops consume much of the water. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May-September) and restoring it to surface streams and ground water in difficult-to-measure ways."³⁸

Water use and habitat is divided into three effects subcategories for the evaluation in this EIS. These subcategories are discussed below and further analyzed in Section 5.3.

Instream Water Quantity

The amount of water instream varies naturally throughout the year. Reduced water quantity is a major cause of habitat degradation and reduced fish production. Water withdrawals throughout the region reduce the amount of river and stream flow. The purposes of these withdrawals include consumption, storage, irrigation, and groundwater storage. Tributaries, arid areas, and areas upstream of the lower Snake River dams experience the most substantial adverse effects from water withdrawals. Water withdrawals and changes to natural return flows can affect seasonal flow patterns and increase temperatures, smolt travel time, and sedimentation. Urban watersheds with large proportions of impervious surface areas can cause changes to the natural runoff and return flows resulting in altered stream flows.

Also, water diversions for municipal uses (such as drinking water, industrial uses, or irrigation water supply) have affected many lakes, especially during drought.³⁹ Regulation of lake levels for water supply has affected near-shore aquatic and wetland plant and animal communities, as well as the spawning success of near-shore spawning fishes. Surface water withdrawals can directly dewater streams and rivers (especially in dry years), impeding access to spawning areas, uncovering eggs (causing them to dry out), increasing water temperatures, and causing direct mortality or injury by sucking fish into the water intakes. Surface and groundwater withdrawals can also lower groundwater tables, possibly affecting deep-rooting plants and stream flows. Additionally, inter-basin

³⁶ Smith et al.

³⁷ Federal Caucus 1999b, pp. 1-2.

³⁸ Federal Caucus 1999b, p. 28.

³⁹ NRC 1996.

water transfers have promoted the spread of non-native plants and animals while inhibiting natural migration routes of native species.⁴⁰

Amount of Stream/River Habitat

The quality and quantity of freshwater habitat in much of the Columbia River Basin have declined dramatically in the last 150 years. Some species of fish and wildlife associated with stream and river habitat for part or all of their life stages are affected by decreases in available habitat.

The amount of stream/river habitat is often a function of instream water quantity. Activities such as logging, farming, grazing, road construction, mining, and urbanization have changed the historical habitat conditions of the Basin.⁴¹ Sometimes creating passage obstructions, these activities can also result in making suitable habitat inaccessible and disconnected. The widespread removal of large woody debris from streams, lack of recruitment of new woody debris, and increased sedimentation from logging and other land uses have reduced the structural diversity of instream habitats (for example, the large, deep pools that are essential components of high-quality fish habitat) for fishes and other aquatic organisms in many of the region's streams.

The amount of stream and river habitat is also related to the highly regulated nature of the river system. Mainstem habitats of the Columbia, Snake, and Willamette rivers have been affected by impoundments that have inundated large amounts of spawning and rearing habitat, reducing that habitat, for the most part, to a single channel. Of the original salmon and steelhead habitat available in the Columbia River Basin, 55 % of the area and 31 % of the streammiles have been eliminated by dam construction.⁴²

Floodplains have also been reduced in size, off-channel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are affected by flow fluctuations associated with reservoir management, at least along the larger rivers and streams. "In 1998, the Council designated 44,000 miles of river reaches in the Basin as protected areas [where the Council believe hydroelectric development would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity or their habitat]."⁴³

Amount of Reservoir Habitat

The FCRPS consists of 31 major dams with hydropower facilities on the Columbia River and its tributaries. Some of these are considered run-of-river dams, others maintain large reservoirs for flood control, irrigation, recreation, and other uses. Generally, the amount of reservoir habitat is directly related to the amount of water storage. Reservoir

⁴⁰ USDA/USFS and USDO/BLM 2000a, Chapter 2 at p. 29.

⁴¹ See Section 5.2.2.1 of this FEIS.

⁴² Council 2000d.

⁴³ Council 2000d.

operations can affect water temperature, velocity, and sedimentation. Reservoirs can adversely affect certain species of anadromous fish by causing extended travel times, residualization (failure to migrate), and decreased survival rates. "The reservoirs have also substantially modified the temperature of the river and provide ideal habitat for salmon predators."⁴⁴ Fluctuations in reservoir habitat from reservoir operations can result in increases and decreases in the available aquatic habitat for those species that depend on it. Reservoir habitat can be lost temporarily or permanently as a result of irrigation and domestic use withdrawals, natural droughts, and flow modifications to the hydrosystem.

The quality of reservoir habitat depends on the surface area, the overall volume of water, and associated habitat features. Reservoirs provide both surface habitat and water column habitat for fish, other aquatic organisms, and wildlife. For example, some species of waterfowl and raptors (e.g., Canada geese and osprey) benefit from the open waters and shallow areas of reservoirs, while diving waterfowl (e.g. mergansers) and native resident fish benefit from the water column habitat. Resident fish can use different reservoir habitats during different life stages.

5.1.1.4 Fish and Wildlife

The diverse habitats of the Pacific Northwest are home to a wide variety of fish and wildlife species. Many of these species are specifically adapted to a particular niche, while others can be found across a variety of different habitats. Throughout history these fish and wildlife resources have played an important role in shaping the spirituality, culture, and economies of the Region. Different people place different values on these resources, and these values change over time. These value systems can be categorized as consumptive use, non-consumptive use, and non-use. Consumptive uses, including subsistence, are often characterized by hunting, fishing, trapping, and collecting; while examples of non-consumptive uses include wildlife viewing and nature photography. However, non-use values occur even though their holder has no intent to actually use or observe the valued resource. Some persons may maintain that they have a moral, ethical, spiritual, or religious responsibility toward other living things, or they may express empathy or equity values for fish and wildlife.

Types of non-use values include *existence* values, associated with continued existence of a resource; *option* values, associated with retaining the option to use a resource in the future; and *bequest* values, associated with maintaining the resource for future generations. Economists and other social scientists are largely unanimous in their belief that non-use values exist and that they are justifiable economic values. However, there are no easy ways to quantify the economic value, so its measurement must rely on a variety of indirect methods.

Today, many species, aquatic and terrestrial, are substantially diminished in numbers relative to historical levels. Recovery efforts focus on those species at risk of extinction, while mitigation efforts are conducted for those species impacted from the development

⁴⁴ Federal Caucus 1999b, p. 67.

of the FCRPS. Anadromous species throughout the Region face increasing pressure and continue to be listed under the ESA.

"Native salmon and steelhead ... are in decline throughout the Columbia River Basin. Recent analyses indicate that extinction risks for Snake River salmon and steelhead populations are significant. The National Marine Fisheries Service (NMFS) has listed 12 Columbia River Basin salmon and steelhead Evolutionarily Significant Units (ESU) as threatened or endangered under the Endangered Species Act (ESA)."⁴⁵

These problems extend to many of the region's resident fish as well:

"(M)any resident fish species are in decline throughout the Columbia River Basin. Bull trout have been listed as threatened and Kootenai River white sturgeon have been listed as endangered by the USFWS under the ESA."⁴⁶

The same desire to protect the Region's wildlife resources is also prevalent.

"[A]s we craft a plan, we need to protect the long-term health of our forests, wildlife, and our waterways.... [W]e hold them in trust for future generations."⁴⁷

The plight of the Region's fish and wildlife resources has been both partially caused by, and made worse through, the introduction and spread of non-native species.

"Throughout the world, [non-native] species have become a hazard of immense proportion both for economic as well as ecological reasons."⁴⁸

Changes in both terrestrial and aquatic habitat conditions, introduction of non-native species, and increasing human development and utilization have resulted in changes to many species of fish and wildlife. Figures 2.8 and 2.11 show the areas where anadromous fish, resident fish, and wildlife have been listed as threatened or endangered (see Appendix C for a more recent listing of fish and wildlife species).

Native Anadromous Fish (Naturally Spawning and Hatchery-produced)

The Pacific Northwest supports a variety of anadromous fish species. These species have a complex lifecycle spending time in both fresh and salt water. Anadromous fish are hatched in freshwater rivers and streams and then, after several years, migrate out to the ocean to mature. As adults they then return upstream to spawn. Native anadromous fish species include pink, coho, chinook, chum, and sockeye salmon; steelhead and sea sun cutthroat trout; white sturgeon, and Pacific lamprey. All but pink salmon spawn in the

⁴⁵ Federal Caucus 1999b, p. 1.

⁴⁶ Federal Caucus 1999b, p. 1.

⁴⁷ USDO/USFWS and BLM 1994, s-4. (Northwest Forest Plan).

⁴⁸ Moulton and Sanderson 1997, p. 296.

Columbia-Snake River System. In the Pacific Northwest, salmon and trout are highly prized for their commercial and sport fishery value, as well as their importance to tribal harvest, health, spirituality and tradition.

Historically salmon migrated 1,200 miles up the Columbia River into Canada, and 600 miles up the Snake River to Shoshone Falls, Idaho. Since European-American settlement of the Pacific Northwest, anadromous fish populations have declined. Annual runs of salmon and steelhead returning to the Columbia River were estimated at between 8 and 16 million fish before European-American settlement, but had declined to approximately 2.5 million fish by the early 1980s.⁴⁹ Reasons for this decline include overfishing, habitat destruction, hydropower development, changing ocean conditions, water withdrawals, and pollution.

Reductions in salmon and steelhead numbers resulted in increased risks of localized extinction of fish population segments (commonly known as stocks). These stocks were protected under the ESA as Evolutionarily Significant Units (ESUs). Many of these ESUs are listed as threatened or endangered, with few healthy wild (naturally spawning) ESUs remaining. As of 2001, there were 17 listed ESUs of salmon and steelhead in the Pacific Northwest (3 listed as endangered and 14 threatened; 12 ESUs listed in the Columbia/Snake River system—9 threatened and 3 endangered).⁵⁰ Often these ESUs are characterized by the season of adult migration (e.g., Snake River spring/summer chinook). Although not federally protected, Pacific lamprey are also considered to be on the decline in the Columbia-Snake River System. See Appendix C for a more complete listing of threatened and endangered species.

The passage of the ESA as well as of the Regional Act resulted in the creation of Federal duties to protect, mitigate, and enhance fish and wildlife affected by Federal hydroelectric projects and to ensure that those species listed under the ESA were not jeopardized by Federal actions.⁵¹ These duties have resulted in actions taken to improve habitat and hydro operations to benefit anadromous fish, as well as the creation of an extensive hatchery system.

Hatcheries have a long history of providing fish for harvest and related social and cultural purposes. Until the last decade, hatcheries in the Pacific Northwest produced fish primarily for sport, commercial, and tribal harvest. The proportion of hatchery fish found in the river system has steadily increased. Artificial production represents 70-90% of the run for some stocks (e.g., stocks of coho, chinook, and steelhead).⁵² Hatcheries are used to conserve genetic resources and help rebuild natural populations (typically called conservation hatcheries); and mitigate for lost fishing opportunities (referred to as compensation/supplementation hatcheries). Fish are produced in the hatchery and stocked, or outplanted, in different life-stages, in different watersheds.

⁴⁹ Corps 2002b, Section 4.5.1 Anadromous Fish.

⁵⁰ NMFS 2002a.

⁵¹ See Chapter 2 of this EIS for descriptions of the Acts.

⁵² Federal Caucus 1999b, p. 52.

For years, the response to declining harvest was hatchery construction to produce more fish; however, the focus of ESA efforts is to preserve and rebuild the natural populations and their ecosystems. Thus, hatcheries are no longer seen as the technical solution or the legal solution to preventing extinction. In fact, hatcheries may actually contribute further to extinction. Hatchery production allows harvest at rates too high for wild fish.⁵³ When wild fish mix with hatchery stock, fishing pressure can lead to overharvest of smaller or weaker wild stocks. With the increase in hatchery production, the portion of wild fish decreased from about 75% in the 1970s to about 25% by the mid- to late-1980s.⁵⁴ The high numbers of hatchery-produced fish may cause potential loss of desirable wild-fish genetic characteristics through interbreeding with hatchery fish in the wild; competition between hatchery-produced and naturally-spawning fish for habitat and food; and predation by hatchery-produced fish on naturally-spawning fish. Hatchery-produced fish also may transmit hatchery-borne diseases, and hatcheries themselves may release diseases into streams via water effluents.⁵⁵ Other issues also arise between the active recovery of anadromous fish and the health and status of resident fish. Although some resident fish benefit from hatchery practices, most face increased competition for resources with anadromous fish, and pressure from resource management directed at decreasing the resident fish population (e.g., northern pikeminnow). Many of these issues are the subject of ongoing research but may contribute to the overall decrease in wild fish populations.

Another impact of hatchery-produced fish is the potential unknown effect of genetic introgression into wild fish from the hatchery strays. Some proportion of hatchery fish reproduce in the wild. Fish not subject to natural selection may carry linked genes or resistant strains of disease that could lead to inbreeding depression or non-adaptive traits. By altering natural selection, humans induce genetic changes in the anadromous fish population that may further degrade wild fish when hatchery-produced and naturally-spawning fish interbreed. Therefore, when spawning occurs, a fish that might have been eliminated in the wild by natural selection is now contributing to the gene pool.⁵⁶ Theoretically, interbred fish are less adapted to and, therefore, less productive within the unique local habitats where the original native stock evolved.⁵⁷ More recently, harvest managers have instituted reforms including weak stock, abundance-based, harvest rate, and escapement-goal management.⁵⁸

Even hatcheries producing fish that are originally from a native population, intended only to supplement the run, can harm the native population. Broodstock fish are typically selected for their large size and early returns. However, these larger, more aggressive fish can compete with and consequently decrease numbers of wild fish in stocked

⁵³ Federal Caucus 1999b, p. 11.

⁵⁴ Corps 2002b, Section 4.5.1.2 Anadromous Fish.

⁵⁵ NMFS 2000b, Chapter 5.

⁵⁶ USDOE/BPA 1996c.

⁵⁷ NMFS 2000b, Chapter 5.

⁵⁸ NMFS 2000b, Chapter 5.

streams.⁵⁹ The early return runs produce early spawning, which is not always helpful in establishing a wild population. If spawning occurs before snowmelt is completed, late high flows could wash away hatchery fry. In contrast, the natural population, by spawning later in the spring, would avoid the high flows.

Where there is a lack of juvenile rearing or adult spawning habitat, hatcheries offer the only option to provide fish to an area and increase fishery opportunities. Hatchery-produced fish can have positive effects on naturally-spawning populations. In supplementation programs, native fish from the local area are used to supplement production of the wild population. This strategy reduces the rate of straying during returning runs and helps to rebuild a strong wild population.⁶⁰ With proper marking (adipose clips), it may be possible to target hatchery fish in harvest, depending on gear used or spatial separation from wild stocks. This could maintain harvest, yet take fishing pressure off native populations during recovery. The practice of marking the hatchery fish also allows creel and harvest surveys. These surveys calculate straying and return rates that can be used for future management of harvest and hatchery programs.

Finally, hatcheries can serve as genetic reservoirs of endangered stocks until habitats or passage to blocked habitats can be improved. Hatchery programs can be structured to support the long-term goals of the ESA wild population recovery plan and provide sustainable fisheries.⁶¹

Figure 2.9 shows the hatcheries and the areas where they have been used to help to increase the number of fish. The role of hatcheries in the future of Pacific Northwest salmon and steelhead is currently unclear; it will depend on the values people place on fish production and biological diversity.⁶² For more information on anadromous and resident fish hatchery facilities, please see Appendix G.

Before the development of the Columbia and Snake Rivers, salmon could migrate up and downstream relatively unimpeded. The creation of dams resulted in barriers to migration, longer migration periods, failure to migrate, increased susceptibility to disease, and increased predation. Facilities and programs have been developed and implemented to assist in anadromous fish passage throughout the Columbia and Snake River system. At the dam, anadromous fish may pass through the hydroelectric turbines and/or pass through spillways; and they may be diverted to bypass systems that direct them away from spillways and turbines. Fish passage has been designed to help both juvenile and adult fish migrating up and downstream. Some fish ladders, which help adult fish move upstream, were built when the dams were constructed. Hatchery-produced anadromous fish are also caught in fish traps used in the hatchery programs. Juvenile fish migrate downstream past dams either through juvenile bypass systems or by being caught and transported by barge or truck. Juvenile fish transportation is a means of conveying fish

⁵⁹ Ford, M.J., and J.J. Hard 2000.

⁶⁰ Federal Caucus 2000b, p. 28.

⁶¹ Oregon Chapter of the American Fisheries Society 2000.

⁶² NMFS 2000b, Chapter 5.

past multiple dams and reservoirs to reduce the cumulative effects of dam- and reservoir-related mortality. Juvenile transportation is used to assist out-migrants, but its overall success in terms of returning adults is unclear.

"Evaluations of transportation conducted over the past 25 years have shown that in nearly all studies, return (juveniles surviving to return as adults) rates are higher for transported fish than those that migrated in-river Nevertheless, overall smolt to adult returns (SARs) are still generally lower than they were prior to completion of the lower Snake River dams and John Day Dam on the Lower Columbia River. This has led some to conclude that juvenile fish transportation is ineffective Overall, direct survival of transported migrants is high, estimated at greater than 98%. Behavior and survival of transported fish following release below Bonneville Dam is similar to that of in-river migrants. Some people believe that indirect mortality of transported fish is high (i.e., many of the fish that survived during transportation die later; delayed transportation mortality), but this is a subject of ongoing research."⁶³

NMFS has used large volumes of voluntary spill as an interim passage strategy, pending development of more effective alternatives.⁶⁴ In general, moderate levels of spill provide increased Fish Passage Efficiency (FPE; passage via non-turbine routes) at relatively low risk. Voluntary spill for fish passage is provided at each of the eight Federal mainstem dams in the spring, limited by interim dissolved-gas limits established by the states of Oregon and Washington. Fish spill is provided at Bonneville, The Dalles, and Ice Harbor dams for 24 hours a day, and for 12 hours a day at John Day, McNary, Lower Monumental, Little Goose, and Lower Granite dams. Voluntary spill is also provided during the summer at Bonneville, The Dalles, John Day, and Ice Harbor dams.

Currently, flow augmentation programs help restore more natural seasonal flow patterns during the time that juvenile salmon and steelhead are migrating downstream. A flow augmentation program, first called for by the Council and later increased under NMFS' 1995 and 1998 BiOps, aimed to restore more natural flow patterns during juvenile salmon and steelhead migration. The 1995 and 1998 BiOps included two flow management strategies: to limit the winter and spring drafts of storage reservoirs to increase spring flows and the probability of full reservoirs at the beginning of summer; and to draft from storage reservoirs during the summer to increase summer flows.⁶⁵ The 2000 BiOp introduced a third flow management objective: to provide minimum flows during fall and winter months in order to support mainstem spawning and incubation of listed chum salmon below Bonneville Dam.⁶⁶

⁶³ Federal Caucus 1999b, Hydro Appendix, p. 11.

⁶⁴ NMFS 1995; NMFS 1998a.

⁶⁵ NMFS 1995; NMFS 1998a.

⁶⁶ NMFS 2000b, Section 9.6.1.2.1 Flow Management Objectives in Mainstem Columbia and Lower Snake Rivers.

Studies show no direct correlation between controlled releases and survival of spring chinook juveniles. Controlled releases may increase survival of fall migrants.⁶⁷ As a result of ESA consultations between the Action Agencies (BPA, the Corps, and the Bureau) and the Services (NMFS and USFWS), numerous changes have been made in FCRPS operation and configuration. These changes have improved survival for the listed fish migrating through the Snake and Columbia rivers. Increased spill at all FCRPS dams allows smolts to avoid turbine-related mortality. Increased flow in the mainstem Snake and Columbia rivers provides better inriver conditions for smolts. Adding new barges and modifying existing barges has also improved the transportation of smolts from the Snake River.

In 2001, voluntary spill for fish passage was altered, in response to near-record low-flow conditions and the power emergency declared by BPA. To reduce the adverse affects on fish passage of 2001 reductions in spill operations, available spill was targeted at those dams that had the lowest fish passage survival and during time periods when a significant portion of the runs were available to benefit. Analysis provided by NMFS indicated that the majority of the benefit of voluntary spill might be achieved at reduced spill levels compared to those called for by the BiOp.⁶⁸

In addition to spill, flow, and transportation improvements, the Corps implemented many other improvements to project operations and maintenance at all Columbia and Snake River dams. These improvements (such as operating turbines at peak efficiency; new extended-length screens at McNary, Little Goose, and Lower Granite dams; and extended operation of bypass screens) are discussed in greater detail in the 1995 FCRPS BiOp.⁶⁹ It is reasonable to expect that the improvements in operation and configuration of the FCRPS will benefit all listed Columbia River Basin salmonids and that the benefits will be greater, the farther upriver the ESU.

Fish harvest prior to European-American settlement of the region was estimated at 4.5 to 5.6 million fish annually. With the arrival of settlers and development of canning technologies, commercial fisheries, and recreational fisheries, the annual fish harvest dramatically increased. Eventually, the combined ocean and freshwater harvest rates for Columbia River spring/summer chinook exceeded 80- 90%, which continued to the stocks decline.⁷⁰ As those runs decreased harvest shift to fall chinook salmon, which has provided the largest contribution to Columbia River salmon catch from 1890 to today. The mainstem production areas for fall chinook are mainly confined to the Hanford Reach of the Columbia River and to the Hells Canyon Reach of the Snake River.⁷¹ The Hanford Reach is the last free-flowing reach of the Columbia River in the United States above the Bonneville Dam, and home to increasing the Hanford Reach upriver bright wild fall chinook.

⁶⁷ Olsen, D. and J. Richards 1994.

⁶⁸ USDOJ/Bureau/Corps/BPA 2002b, Chapter 3.

⁶⁹ NMFS 2000b, Chapter 5.

⁷⁰ Federal Caucus 1999b, Harvest Appendix, p. 3.

⁷¹ Federal Caucus 1999b, p. 29.

Given the variable oceanic migratory patterns and life history traits of salmon stocks, harvest management occurs within a framework of somewhat interconnected state, tribal, Federal, and international law with the goal of equitable allocation of fish stocks among interests while maintaining conservation mandates. Some harvest reforms have occurred in recent years, with an objective of meeting the conservation needs of weaker naturally-spawning stocks present in mixed-stock fisheries. ESA listings, which affect nearly all salmon fisheries on the West Coast, have served to accelerate these reforms.⁷² Generally, harvest rates have been reduced in mixed-stock areas, resulting in harvesting in more terminal areas—where stocks can be selectively caught.⁷³

Recently, Columbia River adult returns have increased, allowing for an increase in harvest opportunities for sport and commercial fishers. In 2001, the first spring chinook commercial fishery since the late 1970s occurred. Steelhead returns to the Snake River have been at or above historic records, increasing harvest opportunity for fishers. As a result, the harvest rate on some salmon stocks has increased.

Native Resident Fish

Native resident fish are endemic freshwater fish species that live and migrate within rivers, streams, and lakes throughout the Region. In unblocked areas these species mix with anadromous fish, however, they are also found in areas presently and historically blocked to anadromous fish. Most native resident fish thrive in cold or cool flowing water, although some do well in warmer reservoir waters.

Some native resident fish species, including bull trout, redband trout, mountain whitefish, burbot, and white sturgeon, are in decline. Although trout and sturgeon are economically important, they account for a relatively minor portion of total fish numbers. Since the mid-1960s white sturgeon have lacked adequate population recruitment, causing them to be listed as endangered in 1994.⁷⁴ Bull trout are estimated to have historically occupied about 60% of the Columbia River Basin; however, in 1998 they were estimated to occur in only 4% of its estimated historical range.⁷⁵ By 1999 all five of the distinct population segments of bull trout had been listed as threatened under the ESA.⁷⁶ Dams, water pollution and disruptive land use practices have blocked spawning migrations of resident fish, modified habitat, and affected species composition.⁷⁷ Specifically, cold-water resident species such as trout and mountain whitefish have declined since the construction of dams.⁷⁸ Also, a change in prey organisms might be a reason for the

⁷² Federal Caucus 1999b, Harvest Appendix, p. 8.

⁷³ Federal Caucus 1999b, p.8.

⁷⁴ USDO/USFWS 1994.

⁷⁵ USDO/USFWS 1998b.

⁷⁶ USDO/USFWS 1998c; USDO/USFWS 1999b; USDO/USFWS 1999c.

⁷⁷ USDO/USFWS 1998c; USDO/USFWS 1999b; USDO/USFWS 1999c.

⁷⁸ Corps 2002b, Section 4.5.2.1 Species Composition.

decline of cold-water resident species.⁷⁹ See Appendix C for a more complete listing of threatened and endangered species.

Other native resident species (e.g., the northern pikeminnow, largescale sucker, and bridgelip sucker) are found in high numbers, especially in reservoirs. For example, age one and older bridgelip sucker, redbelt shiner, largescale sucker, and northern pikeminnow accounted for about 70% of all fish sampled in 1979 and 1980 in Lower Granite reservoir.⁸⁰ Species such as the northern pikeminnow have been and are being actively harvested for the benefit of anadromous species.⁸¹

Native Wildlife

Wildlife typically includes mammals, birds, reptiles, and amphibians. Mammals are often categorized as furbearers, small mammals, big game, and non-game. Birds can be divided into several groups such as waterfowl, raptors, shorebirds, colonial nesting birds, passerines, and upland game birds. For this EIS, the term wildlife is treated broadly to include other organisms not traditionally classified as wildlife—such as mussels and snails. This discussion focuses on terrestrial wildlife since most aquatic species of wildlife are affected by the same water quality issues that affect fish.

Native wildlife species in the region vary in degrees of health and abundance. Some species are listed as threatened or endangered, others are substantially diminished, while still other populations are healthy and increasing. Some wildlife species require undisturbed habitats, while others flourish in modified habitats. While development of the hydrosystem harmed some species of wildlife, other benefited. Waterfowl, for example, gained new shoreline feeding and wintering habitat when reservoirs filled behind dams.

Many species continue to be adversely affected by economic growth, urbanization, and habitat fragmentation. Declines in plants and terrestrial vertebrates are attributable to a number of human causes, including conversion of habitat to agriculture, urban development, grazing, timber harvest, introduction of exotic plant and animal species, recreation, high road densities, fire exclusion, and mining. In coniferous forests, logging has greatly reduced forest structures. Populations of associated wildlife species have correspondingly declined—such as Northern spotted owl and marbled murrelet. Both late-successional and younger forests provide habitat for large mammals such as mule deer, cougar, bear, and elk.⁸² Fragmentation has isolated some animal and plant habitats and populations, and reduced their ability to disperse across the landscape, resulting in potential, long-term loss of genetic interchange.⁸³

⁷⁹ Corps 2002b, Section 4.5.2.1 Species Composition.

⁸⁰ Corps 2002b, Appendix B: Section ES.2 Lower Snake River Resident Fish.

⁸¹ Corps 2002b, Section 4.5.2.3 Aquatic Food Chain.

⁸² USDOE/BPA 1997b, p. 43.

⁸³ USDA/USFS and USDO/BLM 2000b, Chapter 2 Terrestrial Species.

Most abundant species are either species that easily adapt to changing habitats (e.g. fox, skunk) or are managed as part of a sport hunting and trapping program (e.g. elk, mule deer, beaver). The ESA has protected some native wildlife species experiencing declining numbers by listing them as either threatened or endangered and by designating critical habitat. These actions are expected to ensure the survival and recovery of these species, resulting ultimately in their delisting. Bird species currently listed as threatened or endangered include the bald eagle, spotted owl, and marbled murrelet. Listed mammals include the Canadian lynx, woodland caribou, grizzly bear, Columbian white-tailed deer, and gray wolf.⁸⁴ See Figure 2.11 for a map of sightings for the listed threatened and endangered wildlife and Appendix C for a more complete listing of threatened and endangered species.

Non-Native Species

Declines in fish and wildlife can be attributed to the introduction, whether intended or accidental, of non-native (exotic) species.⁸⁵ The introduction of exotic species is second only to habitat loss as the reason for species decline. These introduced species prey on, compete with, harbor and transmit disease, and alter the habitat of endemic species. Regional non-native species include fish (e.g., American shad, walleye, smallmouth bass), mammals (e.g., opossum, eastern cottontail, nutria), amphibians (e.g., bullfrog), birds (e.g., ring-necked pheasant, Hungarian partridge, Chukar), mollusks (e.g., zebra mussels, oyster drill, New Zealand mudsnail), and crustaceans (e.g., European green crab, Chinese mitten crab).

Desirable non-native species, such as Chukar and ring-necked pheasant, have become established game species, generating hunting revenues and resulting in specific habitat management goals to increase their numbers. Some non-native species (e.g., bass, catfish, walleye, brook trout, brown trout) introduced for sport fishing now prey on, potentially interbreed with, and compete with juvenile trout and salmon. Some (carp) have been implicated in harboring and transmitting diseases to salmonids. Some, such as the juvenile shad, may provide food sources for juvenile salmonids. However, juvenile shad may also provide food sources for other predators such as the northern pikeminnow, bass, catfish, and walleye, during seasons when juvenile salmon are not as plentiful. This may result in higher predator populations when juvenile salmonids migrate downstream and may increase predation rates and juvenile salmon mortality. Carp cause significant impacts on habitat by rooting up vegetation and stirring up muddy water that affects aquatic plants and other organisms.⁸⁶ These exotic species, along with large influxes of juvenile hatchery fish, maintain predator populations at unnaturally high levels, increasing predation on salmon.

Other undesirable non-native species, such as the zebra mussel, can alter entire ecosystems. In the decade since it was first sighted in the U.S., the zebra mussel has been

⁸⁴ Information from USDOE/BPA 2000a, Chapter V: Affected Environment, Table V-6, V-7.

⁸⁵ USDA/USFS and USDO/BLM 2000b, Chapter 2 Terrestrial Species.

⁸⁶ Kaczynski, V.W. and J.F. Palmisano 1993.

described as "the biggest natural threat to existing freshwater ecosystems of our time."⁸⁷ Its presence causes a decrease in phytoplankton and zooplankton, resulting in increased water clarity. Water-quality impacts include increased soluble phosphorus and inorganic nitrogen, and decreased dissolved oxygen—to the point of violating water quality standards.⁸⁸

There have been attempts to regulate and prohibit the introduction of undesirable non-native species both locally and federally. In 1990 Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act,⁸⁹ and in 1996 ODFW adopted specific rules to regulate and prohibit non-native wildlife.⁹⁰

Compared to other parts of the country, Pacific Northwest freshwater fish communities are relatively sparse in terms of the numbers of species; Oregon has fewer than 70 and Washington less than 50. In the Columbia River, introduced species account for more than 35% of the 80 species of fish. In less than a century, introductions have increased the diversity of fishes in the Pacific Northwest by one-third, from what they were during the previous 10,000 – 12,000 years.⁹¹ However, many of the introduced species have contributed to the continued decline of native fish, such as salmon and steelhead.

While it is difficult to measure the results scientifically, BPA has funded and implemented many fish and wildlife mitigation and recovery actions.

- *Implementing the Council's Columbia River Basin Fish and Wildlife Program directed at protection, mitigation, and enhancement of fish and wildlife affected by the construction and operation of the Federal hydrosystem.*
- *Funding of those activities under ESA specified in the NMFS and USFWS Biological Opinions, and research, monitoring, evaluation, education, and enforcement actions.*
- *Funding of hatcheries requested, planned, and operated by those Columbia River tribes possessing treaty fishing rights; and fisheries improvement projects for the remaining tribes in the Basin.*
- *Fish and wildlife projects protecting over 500,000 acres of habitat.*
- *Fishing net replacement programs to allow tribal fishers to catch more fish from strong stocks in mixed stock fisheries.*
- *Conservation hatcheries, including captive broodstock facilities, to maintain species on the brink of extinction.*

⁸⁷ O'Neill, C.R., Jr. 1996, p. 62.

⁸⁸ Effler, S.W. and Siegfried, C. 1994.

⁸⁹ The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 U.S.C. §§ 4701–4751 (2000).

⁹⁰ Importation, Possession, Confinement, Transportation and Sale of Nonnative Wildlife (Wildlife Integrity Program), OAR 635-056-0000 (1996).

⁹¹ Palmisano, J.F. 2002a.

- *Funding the power share of the Corps' Columbia River Fish Management Program and in-lieu fishing sites.*
- *Direct funding of the Lower Snake River Compensation Plan hatchery and evaluation program.*
- *Adopting funding principles in rate setting processes to ensure adequate funds are available for mitigation projects.*
- *Using water from Non-Treaty Storage in Canada for flow mitigation.*

5.1.1.5 Ocean and Climate Effects

The 20th century was the warmest century in the past 1,000 years. Globally, the current trend of very warm years continues. Nine of the 10 warmest years have occurred since 1990, including 1999 and 2000; only 1998 was warmer than 2001. Although the rise has not been continuous, average global temperatures have risen by more than 0.6 °C over the past 100 years.⁹² Potential rapid increases in greenhouse gases and related freshwater and ocean warming are issues of concern, as are the historic cyclic climatic and ocean-condition effects on salmon survival in freshwater and marine environments. Changes are forecast to dramatically alter the freshwater ecosystem, benefiting some warm-water species and degrading the habitat for many cold-water species. For example, precipitation that had occurred as snow and effectively stored could occur as rain in the future and run off immediately. Long-term trends in Columbia River streamflow (1858 to 1998) show a decline of about 19% in average flow as a result of natural conditions (although there is no similar trend since 1900).⁹³

In the Columbia River Basin, annual average temperature has warmed about 1.0 °C over the last century. However, the rapid changes in warming in this century relative to the previous nine centuries are trivial, compared to the astonishing changes that global warming models project for the near future: each coming decade may successively add nearly as much warming as the entire 20th century. Because such events are outside of the evolutionary experience of salmonid populations, they will be ill-adapted to both the rate of change and the climatic conditions. Effects of climate change on salmonid populations, already clearly sensitive to climatic variation within our historical baseline, will be both unpredictable and large.

Changes in marine survival also appear to be related to these sudden shifts in the climate of the ocean and atmosphere. In the ocean, fish may be unable to adapt rapidly to the anticipated changes, potentially contributing substantially to reduced ocean survival. Because fish are cold-blooded, and their metabolism is a function of water temperature, their growth will decrease if the water warms and food supply does not increase. Growth

⁹² Material in the next three paragraphs is drawn from the following sources: Welch, D.W. 2002; Welch, D.W., Whitney, F., Bertram, D., Harfenist, A., and Tucker, S. 1999; Welch, D.W. 1999. (Appendix F of this EIS); Welch, D.W. In press. pp. 4, 15.

⁹³ ISAB 2001.

of most of the salmon stocks studied has in fact decreased over time,⁹⁴ directly affecting the number and viability of the eggs. Although global warming is a very gradual process, gradual changes accrue to "trip" major changes in an ecosystem. For instance, when water temperatures warm one degree or two, the change may not have much impact. But when that one degree is enough to cross the threshold where ice turns to liquid water, the change may have greater impact, as in the Antarctic where krill feed on algae that live and grow in tiny tubules in the ice. Today the Antarctic krill population is only about one-fifth of what it was 20 years ago.⁹⁵

Open-ocean salmon research conducted from 1990-1995 indicates that global warming will present salmon with great survival difficulty in the long term. The West Coast has already seen significant reductions in marine survival stretching from Oregon to Alaska, with the greatest losses occurring in southern regions. Oregon coastal coho and Keogh River steelhead experienced a large drop in ocean survival during the 1990s. These rivers have no hydro system-operation impacts, and the Keogh River is considered pristine, with no known changes in freshwater habitat. The ocean survival of Oregon coastal coho salmon has decreased in the 1990s to one-tenth of the survival recorded in the 1960s. Thus, the changes in ocean habitat are now returning only one adult for every ten that would have returned in earlier, more productive, times.

In British Columbia, many southern stocks of coho, chinook, and steelhead have also seen ocean survival decrease sharply since 1990, bringing some stocks to the verge of extinction in less than a decade. In addition, recent changes in the ocean survival of Alaskan salmon have sharply reduced catch levels. In each region, the primary cause of the sharp declines has been changes in ocean survival. These changes in marine survival are very alarming. They have occurred extremely swiftly, and have rapidly made formerly healthy populations unsustainable—even with the termination of all fisheries.

Ocean conditions are largely beyond human ability to manage. However, it is important to understand and measure the magnitude of marine condition effects on salmon because it is important to understand the partitioning of survival between the freshwater and marine systems⁹⁶ and because ocean conditions are recognized as a major cause of poor survival and declining populations. The relative success of restoration efforts in freshwater habitats cannot be accurately estimated if survival in freshwater is confounded with ocean survival.⁹⁷ Mortality related to ocean conditions may in fact overwhelm the effects of any action taken in the freshwater portion of the salmon life-cycle, resulting in

⁹⁴ Bigler, B.S. et al. 1996.

⁹⁵ Trivelpiece, W.Z. 1997.

⁹⁶ Percy, W.G. 1996a.

⁹⁷ Consider, for instance, this scenario. If ocean conditions improve in several years and coho survival increases, how will we know how much credit to give to the actions of a plan? This partitioning of survival concept furthered by Dr. Percy was also a key recommendation of the Ocean Survival workshop in Newport, OR, in March 1996.

misinterpretation of the effects of management actions taken in the hydro corridor or Basin tributary streams.⁹⁸

According to Whitney,⁹⁹ a fundamental assumption of the Northwest Power Planning Council's Fish and Wildlife Program (which has become the basis for much of the research, monitoring and for the dominant rationale for actions taken within the hydrosystem corridor and Columbia River tributaries) is that the number of adults recruited is primarily a simple, positive response to the number of smolts produced. (Stated another way: human-induced losses of natural production can be mitigated by actions to increase the number of smolts surviving to below the last dam.) In fact, there is substantial evidence that the long history of hatchery development, coupled with mixed-stock fisheries, is a large factor in the decline of Columbia River stocks. Certainly, for many stocks, there is no simple relationship between numbers of smolts produced and adults returned. Salmon spend most of their lives and gain 99% of their weight while residing in the marine environment. This fact does not argue for abandoning actions within the hydrosystem, but strongly argues for the importance of greater understanding of all life stages.

Projected global warming is sufficient to move the temperature limits that determine where some species of salmon feed entirely out of the Pacific Ocean and well up into the Bering Sea. If this occurs, then within this century, several species of Pacific salmon would no longer be able to thrive and grow successfully in the Pacific Ocean. In at least some stocks, recent changes in ocean survival are much larger than changes in freshwater survival. If the ocean habitat continues to deteriorate as over the last two to three decades, then threatened salmon populations may become unsustainable despite concerted efforts to restore or improve freshwater habitat. Climatic changes anywhere near projected levels may prevent fisheries scientists from being able to effectively provide credible assessment and management advice in a sufficiently timely manner to prevent major fishery collapses. Simply put, the changes will be beyond our ability to manage and therefore are outside the scope of this EIS. For more information on Global Warming and Ocean Conditions, please see Appendix F.

5.1.2 Economic and Social Environments

The Pacific Northwest recently experienced rapid population growth in comparison to the nation as a whole, and this is expected to continue. The recession during the 1980s had contributed to outward migration; however, enhanced economic prospects in the 1990s reversed this trend and more people moved into the Region. A recent downturn in the economy, resulting in high unemployment rates, has slowed regional economic growth.

⁹⁸ To emphasize this relationship, it is important to understand that if survival in the ocean is on the order of 5%, a one-to-two percent change in survival will be reflected in a 20 to 40% change in adult returns. However, when in-river survival during smolt outmigration to the ocean is of the order of 50%, a one-to-two percent change in freshwater survival will produce only a 2-4% change in adult returns. Source: Ryding and Skalski 1998.

⁹⁹ Whitney, R.R., et al. 1993.

Only a few decades ago, economic growth was fueled by natural resources industries such as agriculture, fishing, mining, and forestry, and inexpensive hydropower—important in attracting energy-intensive industries. Most rural communities remain economically and culturally tied to the natural resource industries, especially agriculture. Now, consistent with national trends, the regional economy has evolved a more diverse base, with notable growth in technology, transportation, trade, and service sectors. The region's natural location on the Pacific Rim and its relative proximity to Asian markets provides a continuing advantage that has also influenced present-day economic development.¹⁰⁰

With declines in rural areas and expanding urban economies, the disparity in earnings and unemployment rates between urban and rural areas has increased. Still, the natural resource industries play important roles in the region's economy. They provide relatively stable jobs in rural areas, they create jobs in transportation, forward processing and related industries, and they contribute to foreign exchange earnings.

Growing populations and increased regional development has resulted in higher demand for electricity. These increases have had negative effects on the Region's fish and wildlife populations, as well as its cultural and historic resources. These negative effects have impacted the Region's many Native American Indian tribes. Increased pressure on the hydrosystem has resulted in higher funding costs required to protect, mitigate, and enhance natural and cultural resources.

An increasingly urban population is demanding increased recreational opportunities and environmental quality. The tourism industry provides economic stimulus in less populated regions and creates economic activity in the service and trade sectors. At the same time, rural development is threatening the qualities that make rural places attractive for recreation, retirement, and new business.

The urban and rural areas are closely linked in the Pacific Northwest. Today, some parts of the region—especially larger urban areas—are experiencing problems with congested roads, overburdened infrastructure, and concerns about air and water quality. Many of the region's residents value the quality of life afforded by smaller cities, clean air and water, outdoor activities, and open spaces. Increasingly, more people are leaving the traditional suburbs for homes in more rural areas. Sustaining the quality of life and managing the effects of a quickly growing population have become important to many rural residents.

Table 5.1-2 shows data on population, value of output, income and employment for the nation and for each of the four states with an important share of their economic activity in the Basin.

¹⁰⁰ This paragraph paraphrased from USDOE/BPA 1995c, Appendix O Sec. 2.1.1.

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Table 5.1-2: Summary of Socioeconomic Measures for the United States, and by State

Measure	Year, Units	United States	Washington	Oregon	Idaho	Montana
Population	1997, thousands	267,636	5,610	3,243	1,210	879
Gross Regional Product	1996, billion dollars	\$7,631.0	\$159.6	\$87.0	\$27.9	\$18.5
Employment	1996, employed civilian labor force	126,708	2,699	1,619	587	423
Unemployment Rate	1996, % of civilian labor force	5.40%	6.50%	5.90%	5.20%	5.30%
Income	1997, billion dollars	\$6,851.0	\$149.9	\$79.1	\$24.8	\$17.6
Income per Capita	1997, dollars per person	\$25,598	\$26,718	\$24,393	\$20,478	\$20,046

Full-time and Part-time Employment Shares by Industry: 1996					
Farm, Agricultural Services, Forestry, Fishing	3.2%	4.3%	5.4%	8.0%	6.9%
Mining	0.6%	0.2%	0.2%	0.6%	1.4%
Construction	5.4%	5.7%	6.0%	7.7%	6.5%
Manufacturing	12.9%	11.7%	13.6%	12.2%	5.9%
Transportation and Public Utilities	4.8%	4.5%	4.6%	4.5%	5.1%
Wholesale Trade	4.7%	5.0%	5.2%	4.8%	4.0%
Retail Trade	17.2%	17.6%	18.3%	18.9%	20.6%
Finance, Insurance, Real Estate	7.5%	7.4%	6.6%	5.6%	6.3%
Services	31.0%	29.5%	30.2%	27.1%	31.6%
Government	14.5%	16.6%	13.4%	16.0%	16.8%

Source: Council (2000a), Human Effects Analysis of the Multi-Species Framework Alternatives, Appendix A.

The following discussion for this section of the existing economic and social environments is described by these broad categories:

- Commerce,
- Recreation,
- Economic Development,
- Funding Costs,
- Tribal Interests,
- Cultural and Historic Resources, and
- Aesthetics.

These subsections are meant to provide a brief description of the affected environment. For more discussion on the effect areas listed above see Section 5.3.3, the table discussions on Existing Conditions and Status Quo for each effect area.

5.1.2.1 Commerce

This section describes existing conditions for regional economic activities that could be affected by implementation of any of the Policy Directions

Power and Transmission

In the Pacific Northwest, the total firm energy resources are about 21,000 aMW.¹⁰¹ Major power resources include hydro (55%), coal (19%), and nuclear (5%), totaling about 80 percent of the Region's power resources. Almost 10 percent of the Region's energy needs are met by importing power from other regions. The Columbia River and its tributaries are extensively developed for hydroelectric power, with more than 250 Federal and non-federal dams constructed since the 1930s. The current trend in energy development shows growth in the number of CTs being constructed (see Appendix E). However, the Region has also seen an increase in renewable energy development, especially wind.

The Bonneville Power Administration is a self-funding Federal agency, under the U.S. Department of Energy, that markets wholesale electrical power and operates and markets transmission services in the Pacific Northwest. It pays for its costs through power and transmission sales. Both power and transmission are sold at cost, and BPA repays any borrowing from the U.S. Treasury with interest.

The power comes from 31 Federal hydro projects—operated by the Corps or the Bureau, one non-federal nuclear plant and several other non-federal power plants. The hydro projects and the electrical system are known as the Federal Columbia River Power System (FCRPS). Figure 2.14 and Appendix E shows the major hydro sites in the Region. About 45 percent of the electric power used in the Northwest comes from BPA. Figure 2.2 shows BPA's service territory.

¹⁰¹ See Figure 2-5.

BPA's transmission system, known as the Federal Columbia River Transmission System (FCRTS), accounts for about three-quarters of the region's high-voltage grid, and includes major transmission links with other regions. The FCRTS is comprised of approximately 15,000 miles of high voltage transmission lines, 285 substations, and other related facilities. Included in this system is BPA's portion of the Pacific Northwest/Pacific Southwest Intertie (PNW/PSW Intertie), which has a combined north-south capacity, on five high voltage lines, of about 4,800 MW (the normal capacity is somewhat less south-north—3,675 MW). BPA owns about 80 percent of the portions of the Intertie located north of California and Nevada. The PNW/PSW Intertie provides the primary bulk transmission link between the two regions. BPA's transmission system also includes interconnection with British Columbia (BC), Canada, at the international border. These lines, which comprise the Northern Intertie, have a total north-south transfer capability of 3,150 MW (2,000 MW south-north). These interconnections allow the PNW and BC to undertake many mutually beneficial arrangements. BPA uses its transmission system to deliver power to its customers and makes excess capacity available to others. Transmission system maintenance is a critical component of maintaining capacity and reliability of the power grid.

BPA's customers include its "preference" customers (publicly owned utilities), investor-owned utilities, Federal agencies, and direct service industry customers (primarily aluminum smelters). Under a Residential Energy Exchange mechanism BPA equalizes, at the wholesale level, the rate paid by residential and small farm customers of investor-owned utilities with rates charged the publicly-owned utilities. BPA also sells or exchanges power with utilities in Canada and the western United States taking advantage of differences in power costs and timing of demand. Revenues BPA earns help it fulfill public responsibilities that include low-cost and reliable power and investments in energy conservation and renewable resources. BPA also funds the region's efforts to protect and rebuild fish and wildlife populations in the Columbia River Basin.¹⁰²

The sustained peak capacity of the Federal-based system is approximately 17,000 MW. However, the firm power capability of the FCRPS is about 8,000 aMW. In 2001, BPA's customers needed 3,000 MW beyond what the Federal-based system could provide. To serve this need BPA augmented the FCRPS with purchase power and load buy-downs. Under most conditions the generating capability of the FCRPS exceeds BPA's firm loads and any surplus power is sold. BPA's ability to forecast is often hampered by tremendous uncertainty as a result of the volatility of the electricity prices and the huge year-to-year swings in runoff on the Columbia River. See Table 5.1-3 for information concerning BPA power resources.

¹⁰² In 2000 BPA became the marketing agent for the Bureau of Reclamation's Green Springs project in southern Oregon—outside the Columbia Basin. BPA has no Regional Act mitigation responsibilities for that project.

Table 5.1-3: BPA Power Resources for Calendar Year 2002

Sustained peak capacity	17,462 MW
hydro: 13,898 MW (80%)	
nuclear: 915 MW (5%)	
firm contracts & other resources: 2,649 MW (15%)	
Firm energy (12-month average)	9,871 aMW
hydro: 6,647 aMW (67%)	
nuclear: 972 aMW (10%)	
firm contracts & other resources: 2253 aMW (23%)	

The surplus sales are an important source of revenue and help keep BPA's rates down. BPA sells its surplus energy to a variety of customers, including investor-owned utilities, power marketers, and other public agencies. Sales to California, which often has higher electricity prices than the Pacific Northwest, are also an important source of revenue.

Recently, electricity demand has increased faster than supply in the western United States. Demand has increased with population growth and adoption of computer technologies, but supply development has been constrained by environmental regulations and uncertainty about market structure and prices. As a consequence, regional power generation capacity is less able to meet demand in peak demand periods, and more frequent shortages appear likely in the future. Rolling blackouts have occurred in California. The responsibilities of the FCRPS in exporting electricity and in protecting fish and wildlife came into sharp conflict during the summer of 2000, when fish spill was decreased to generate more power for export.

In addition, the winter of 2000 – 2001 saw natural gas prices reached record levels. These events increased the value of hydropower generation significantly. Electricity spot prices reached unprecedented levels, and California's electricity market deregulation faced close scrutiny by Federal and state regulators. Electricity prices under these circumstances are likely to remain high, and shortages likely to be more frequent, until the new generation capacity is developed at a rate that meets or exceeds demand growth. Natural gas consumption by power plants is expected to more than double in the region by 2010.¹⁰³

This situation continued to deteriorate in the summer of 2001. The winter of 2000-2001 was one of the driest on record since 1929. A lack of water supply forced Federal agencies to transport up to 90% of Snake River anadromous fish migrants, and the agencies were unable to provide normal system benefits for users through most of 2001. For BPA, this situation means that it will be more difficult to provide low-cost power and protect fish and wildlife as in normal years.

¹⁰³ State of Washington 2001, p. 14.

Transportation

The Columbia-Snake River Inland Waterway is a 465-mile-long water highway formed by the eight mainstem dams and lock facilities on the lower Columbia and Snake rivers. The waterway provides inland waterborne navigation up and down the rivers from Lewiston, Idaho, to the Pacific Ocean. This system is used for commodity shipments from inland areas of the Northwest and as far away as North Dakota. The navigation system consists of two segments: the downriver portion, which provides a deep-draft shipping channel, and the upriver portion, which is a shallow-draft channel with a series of navigation locks. The four lower Snake dams account for 140 miles of the waterway. This upper reach is maintained at a depth of 14 feet. Commercial shallow-draft traffic on the Snake River is primarily by barge or tow boat.

The Corps maintains the navigation channel in the Columbia and Snake rivers from the estuary to Lewiston, Idaho. The Corps uses dredging and other methods to maintain the shipping channel, and is proposing a navigation channel-deepening project.¹⁰⁴ There are potential substantial adverse effects resulting from this action: for example, the creation of dredge spoils islands where Caspian terns and other birds nest. These birds prey on juvenile salmon. NMFS and USFWS are presently in consultation with the Corps on deepening the navigation channel by dredging it from 40 to 43 feet deep.

The presence of the Columbia-Snake River Inland Waterway has led to the development of a sizable river-based transportation industry in the Region. The Waterway has 36 deep and shallow water ports. Riverside facilities managed by port districts and various other public and private entities are located next to the pools created by the system of dams and locks.

A few companies account for the majority of vessels operated, as well as the majority of traffic. Total annual shipments using any part of the lower Snake system recently weighed about 4 million tons. Upriver tonnage is about one-tenth the downriver amount. About three-quarters of the cargo are wheat and barley. Most of the remaining downriver traffic is forestry products, and most of the upriver cargo is petroleum products and chemicals. Rail and road transport would not be able to transport commodities as inexpensively as the existing water transportation system. The transportation savings have been estimated to range between \$24 and \$35 million annually.¹⁰⁵ Figure 2.16 shows the major barging routes, railroad tracks, and interstate and state highways in the Region.

Railroads provide an important mode to transport goods within the Columbia Basin. Major railroads serving the Columbia Basin include: the Burlington Northern Santa Fe Railroad (BNSF), Union Pacific Railroad, Camas Prairie Railroad, and the Montana Rail Link. Both BNSF and the Union Pacific link the Pacific Northwest to the Mid-West. The BNSF runs along the north side of the Columbia River, while the Union Pacific runs along the south side. "Both BNSF and Union Pacific provide extensive trackage in all

¹⁰⁴ Corps 2002a.

¹⁰⁵ Corps 1999c, Appendix I Economics, Table 8-1.

four states.¹⁰⁶ The Camas Prairie Railroad and Montana Rail Link provide local service in Idaho, Washington, and Montana.

Over the past decade, grain shipments by rail have remained constant at the Port of Portland, and increased at the Port of Vancouver, although it has declined in the Puget Sound Area. Wheat and barley are a major portion of total grain traffic, but more than half of this grain involves corn from the Mid-West. An increasing amount of this corn moves through the Port of Kalama on the Columbia River. Grain arriving at lower Columbia River ports is unloaded from rail cars and barges and transferred to deep-water vessels for export to other markets.¹⁰⁷

Trucks are also used for moving goods, particularly petroleum and chemical products. Used in conjunction with other forms of transportation (rail and barge), trucks move goods to and from lower Snake and Columbia River ports and rail depots. The highway infrastructure serving the Region includes Federal, state, and county highways. The major interstate highways are 5, 15, 84, 82, and 90. The major state highway is 395, however others include 2, 26, 93, 95, 97, and 101.

Agriculture, Ranching, and Forest Products

Agriculture, ranching, and forest products are important industries for the Pacific Northwest, especially in rural areas. Table 5.1-4 presents data on agriculture, ranching, and forestry by state for the Region. See also Figure 2.10 for a map showing general land uses across the Pacific Northwest.

Table 5.1-4: Data on Agricultural, Ranching, and Forestry by State

	Idaho	Montana	Oregon	Washington
Number of Farms, 1999	24,500	28,000	40,500	40,000
1992 Land Use, 1000 acres				
Cropland	4,799	13,941	3,720	6,500
Grassland pasture	20,219	47,364	22,456	7,590
Forestland	18,033	18,592	26,614	17,985
Irrigated Land, 1997, 1000 acres	3,494	1,994	1,949	1,705
Farm receipts, 1998, million \$				
Crop receipts	1,735	934	2,330	3,424
Livestock receipts	1,585	865	762	1,730
Government payments	196	357	100	257
Total receipts, million \$	3,320	1,799	3,091	5,154

Source: USDA Agricultural Statistics 2000

¹⁰⁶ Corps 2002b, Section 4.9.2 Railroads.

¹⁰⁷ Corps 2002b, Section 4.9.2 Railroads.

There are 7 to 9 million acres of irrigated land in the Columbia River Basin used for both agriculture and grazing. Major agricultural products include alfalfa and other hay, wheat, corn, potatoes, peas, apples, grapes. Agriculture is still the second largest industry in Washington. The food-production industry, combined with agricultural production, is the largest employer in Washington.¹⁰⁸ Irrigation water use tends to be focused in areas with suitable land and climate. The share of Columbia Basin water diverted for irrigation is small (about 6%), but the share of water diverted from some sub-basins is much larger. Important irrigated areas include the Upper Snake River, the Columbia Basin Project, and irrigation from the Yakima, Willamette, Deschutes, and John Day rivers.

Some irrigated areas depend on water levels in Federal reservoirs for irrigation diversions. For example, the reservoir behind the Grand Coulee Dam irrigates over 500,000 acres. Other mainstem reservoirs are also important for irrigation. About 167,000 and 125,000 acres are irrigated from John Day and McNary reservoirs, respectively. More than 300,000 acres of irrigated land are served out of the lower Snake reservoirs.¹⁰⁹ About 37,000 acres from Ice Harbor alone, are irrigated using surface water diverted. In addition, many wells benefit from the raised groundwater levels caused by reservoir storage nearby.

There are also about 16 million acres of dry (non-irrigated) agricultural land in the Basin.¹¹⁰ However, less than 10 million acres is normally planted in dryland crops at any given time. Dryland crops are primarily small grains such as wheat or barley, beans, and some hay. Value of production per acre is typically half or less of irrigated values. Dryland crops are scattered throughout the Basin with notable concentrations in eastern Washington and Oregon and the Snake River plain.

There are approximately 45 million acres of rangelands in the Basin, of which about 25 million acres are Federal lands.¹¹¹ Additional grazing occurs on some forestlands, mostly on the eastside of the Cascades. Most Federal rangelands are managed by BLM and the USFS, with some grazing use on Indian reservations. Most grazing use is for cattle, although sheep and horses are also grazed. Management and characteristics of the Federal grazing lands in the Basin east of the Cascades are described in detail in the ICBEMP Supplemental Draft EIS.¹¹²

There are about 65 million acres of forestlands in the Basin, of which 42 million acres are Federal. Most Federal forestlands are managed by the USFS, although large amounts of forestland are also managed by BLM, NPS, and other Federal agencies. Management and characteristics of the Federal forestlands in the Basin east of the Cascades are described in detail in the ICBEMP Final EIS (2000). Timber harvest on Federal

¹⁰⁸ Hertha Lund, Washington Farm Bureau. Comment letter submitted with respect to the DEIS. See Appendix K of this EIS.

¹⁰⁹ Corps 2002b, Section 4.11.1 Irrigated Agriculture.

¹¹⁰ Land use information is from Council 2000a, Section 4.

¹¹¹ Land use information is from Council 2000a.

¹¹² USDA/USFS and USDO/BLM 2000a.

forestlands has declined in recent years. Most timber harvest is occurring on private forestlands. See Figure 2.13 for the different land ownership across the Region.

Declining and less predictable Federal timber availability, along with technological and other changes in the forest products industry, have affected the industry. Lack of timber availability has resulted from two major factors: (1) actual reductions in the amount of timber caused by declining forest health; and (2) the challenges and complexities of meeting current regulations and policies in relation to broader issues such as ecosystem health, declines in anadromous fish runs, and concerns for the health of other plant and animal species. These effects have contributed to decreasing employment opportunities for forest products; those decreases in turn have contributed to economic and social hardships in communities highly dependent on Federal timber. Declining timber availability has affected people directly through job losses and indirectly through effects on Federal government revenue sharing, with reduced funds for schools and roads.¹¹³

The rural way-of-life became the focus of intense public debate as timber-dependent communities suffered job losses in the traditional lumber and wood products industries. Rural areas also experienced declines in the agriculture and food-processing industries, caused by efficiency and productivity gains. Many rural areas are located away from a well-developed infrastructure, face serious periodic economic downturns, and pose significant challenges for economic and social policy. Rural areas continue to lose their economic base because of resource depletion, land use and environmental laws, and changes in markets and technology. Low-cost energy and transportation have helped sustain agriculture and forestry in rural areas.

Commercial Fishing

Potentially affected commercial fisheries are primarily salmon fisheries, both in-river and ocean. The in-river fisheries include the Columbia and Snake River system. Columbia Basin salmon are also harvested off the coast of the northwestern U.S., Canada, and Alaska. Salmon range up and down the coast in what is defined as a mixed-stock fishery, with increases in harvest levels only when abundance is high. Total economic consequences (personal income including multiplier effects) of the Columbia River commercial fishery under early 1990s conditions have been estimated to be about \$33 million.¹¹⁴ Decreased fish abundance in recent years (and therefore declines in harvest) has reduced the present value of the commercial fishing industry.

Columbia River salmon are caught by ocean commercial net and troll fisheries from California to Alaska. The ocean fisheries also catch salmon from many non-Columbia River stocks. Ocean fisheries are very difficult to manage: the life history of salmon (e.g., migratory patterns and natural population levels); multiple jurisdictions, laws, and treaties involved; and the natural mixing of salmon populations from different freshwater

¹¹³ USDA/USFS and USDO/BLM 2000a, Chapter 2 p. 184.

¹¹⁴ Derived from information in Corps 1999a.

origins all need to be considered.¹¹⁵ The freshwater commercial fishery of the Columbia River system includes in-river sport charter boats, the non-Indian gillnet fishery (operating in the zone from the estuary to Bonneville Dam), and the treaty Indian gillnet fishery (operating in the mainstem Columbia River between Bonneville Dam and McNary Dam).¹¹⁶ While in the river, the fishery is subject to Federal, state and tribal jurisdictions, laws (e.g., ESA), treaties, and management strategies. Run size, catch and income vary from year to year, but gross annual value of the in-river fishery has been estimated to be about \$15 million.

Harvest seasons and catch have been reduced compared to historical levels. For example, the commercial and sport harvest of chinook salmon off the Washington and northern Oregon coasts has declined from nearly 600,000 fish in 1974 to an average of about 15,000 fish since 1994.¹¹⁷ There also have been similar declines evidenced in the commercial river harvest.¹¹⁸ The general decline of wild salmon stocks had resulted in no commercial in-river spring chinook fishery since 1977. However in 2000, in-river commercial harvest of adult spring Chinook resumed. There has also not been an official commercial fishery for summer chinook since 1967, although summer chinook were incidentally harvested during the sockeye salmon harvest until about 1973.¹¹⁹

Harvest strategies to date have been focused on reducing overall effort. There has been a trend to reduce harvest rates in mixed-stock areas in favor of harvests in more terminal areas where the stocks can be segregated and more selectively caught.¹²⁰ Strategies to implement terminal fisheries or other targeted harvest approaches are still under development. Also, hatcheries have been operated to support anadromous fish populations for harvest. Changes in harvest regulations have been in the form of restrictions, shortened seasons, area closures, special gear regulations, license moratoria, and buyouts of fishing fleets.

The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase harvest or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat had been increasingly degraded, reducing the capacity of the salmon stocks to produce numbers in excess of their spawning escapement requirements.¹²¹ In 1999, the United States and Canada signed the Pacific Salmon Treaty, focusing on a cooperative, conservation-based approach that results in more equitable sharing of salmon catches between Canada and the United States.¹²²

¹¹⁵ Federal Caucus 1999b, Harvest Appendix, p.6.

¹¹⁶ Federal Caucus 1999b, Harvest Appendix, p.5.

¹¹⁷ Federal Caucus 1999b, Harvest Appendix, p.8.

¹¹⁸ Federal Caucus 1999b, Harvest Appendix, p.8.

¹¹⁹ Federal Caucus 1999b, Harvest Appendix, p.8.

¹²⁰ Federal Caucus 1999b, Harvest Appendix, p.7.

¹²¹ NMFS 2000b, Chapter 5.

¹²² The Pacific Salmon Commission 1999.

Other Industry

The regional economy has experienced some transition over the last decade or so, evolving from being primarily natural resource-based to a diverse economy with growing trade and service sectors. The largest industry sectors (and their relative contributions to the regional employment) include services (25.0%); trade (21.1%); government (16.4%); manufacturing (11.7%); fire, insurance and real estate (6.0%); and construction (4.7%). Of these sectors, services show the highest economic growth, and provide the highest per-capita income. In general economic activity is greatest in metropolitan areas.

Mining is not currently a major industry in the Pacific Northwest, although historically it was a major contributor to the regional economy.¹²³ Mining activities have include hard-rock mineral mining, oil and gas extraction, sand and gravel mining, and recreational suction dredge, placer, and pan mining.¹²⁴ Today, sand and gravel mining account for most of the mining activity in the Region. Sand and gravel mining (consisting of deep water dredging, gravel bar scalping, and gravel pit excavation) has been important to local economies for construction.¹²⁵ Some mining is located in areas where flood activity of nearby rivers has caused huge amounts of sand and gravel to accumulate over time. Substantial areas of mineral deposits still remain for potential future exploitation.

Mining, aluminum products, and other natural-resource-based and water- and energy-dependent industries are facing increasing regulation, operational costs, and foreign competition. These factors have resulted in a general decline of these industries. In contrast, services and government sectors are increasing. The regional economy continues to grow and diversify as the human population increases. Information-based technologies and services continue to grow fastest, followed by trade, government, and manufacturing. Natural-resource-dependent industries will continue to face increasing costs and foreign competition.

5.1.2.2 Recreation

Recreation is a very important component of the economy of the Pacific Northwest. The variations in habitats and vast amounts of public lands make the region available to a wide array of recreational activities. Many of these recreational opportunities are located in rural areas removed from population centers.¹²⁶ In fact, National Forest lands in Idaho, Oregon, and Washington received, respectively, 15, 37 and 25 million visitor days in 1997.¹²⁷ Recreational activities generate revenue and support a recreation and tourism based economy in many areas. These local economies also benefit from providing recreational-related goods and services (e.g., food, lodging, supplies, gasoline).

¹²³ Rost, Bob 1998. The history of mining activity and its environmental impacts in Oregon is similar to the experiences of the other Pacific Northwest states.

¹²⁴ Spence et al. 1996, Chapter 6.

¹²⁵ USDA/USFS and USDO/BLM 2000a, Chapter 2 p. 185.

¹²⁶ Corps 2002b, Section 4.13 Recreation.

¹²⁷ USDA 2000, Table 12-38, Page XII-28.

Outdoor recreation has also become an important use of the Federal hydroelectric system, as recreational use is authorized at all of the Federal projects. Numerous reservoirs and their shorelines provide many opportunities for recreation. The Corps and Bureau are responsible for providing recreation facilities at their projects; and often these agencies cooperate with state or local governments to provide recreation facilities such as swimming beaches, boat ramps, marinas, and campgrounds. Most reservoir recreation is concentrated in the summer months. For example, annual use at the four most downstream reservoirs was recently estimated to be about 10 million days annually, with usage of all Federal reservoirs above McNary at about 8 million days annually. Annual use at the four lower Snake dams is about 2 million days. Recreation can be divided in to two main categories for the purposes of discussion: Sport Fishing and Hunting; and Other Recreation.

Sport Fishing and Hunting

The Pacific Northwest has plentiful hunting and trapping opportunities for big game (deer and elk), upland game (pheasants and rabbits), furbearers (beaver and mink) and waterfowl (ducks and geese). Opportunities for recreational fishing for resident fish (such as trout and bass), and anadromous fish (such as salmon and steelhead) are also abundant. For many decades, recreational fishing has been supported by hatchery production to help maintain available harvest levels. For the past decade there have been hundreds of thousands of hunters and anglers and millions of dollars spent annually in support of these recreational activities.¹²⁸

Recreational fishing for salmon and other anadromous fish is an important economic activity in of the Pacific Northwest. Ocean sport fishing is also an important activity. Economic value of freshwater sport fishing for anadromous fish under the restrictive fisheries regulations of the early 1990s (compared with the 1970s - 1980s) has been estimated to be about \$3 million annually. The Pacific Fisheries Management Council has estimated personal income effects of ocean sport fishing in Oregon and Washington in 1993 to be around \$12.5 million annually, down from \$20 million or more in the 1980s due to recent harvest restrictions to protect weak stocks of coho and chinook salmon. The value of sport harvest fluctuates according to the allowable catch, which is dictated by the abundance of fish runs and associated local harvest regulations.

Other Recreation

Other recreation includes both water-based and land-based recreational activities. Water-based recreation consists of activities such as boating, waterskiing, windsurfing, rafting, kayaking, canoeing, and swimming.¹²⁹ Many boat launch ramps, beaches, marinas, and

¹²⁸ See websites for examples of the number of hunters and sport fishers. Oregon: <http://www.dfw.state.or.us/index.html>; Washington: <http://www.wa.gov/wdfw/huntcorn.htm>; Idaho: <http://www2.state.id.us/fishgame/>. Last visited January, 2003.

¹²⁹ The U.S. Department of Interior, through the National Park Service, manages a portion of Lake Roosevelt and associated lands at Lake Roosevelt National Recreation Area (LRNRA). Mr. Preston Slegger, Regional Environmental Officer within the Agency, submitted comments detailing the specific

other facilities have been developed to support these activities. For example, there are 33 developed recreation sites on the lower Snake River reservoirs alone. These sites include 29 boat ramps with 59 launch lanes, 9 campgrounds with approximately 435 individual campsites, and 49 day-use facilities. There are also 22 access or primitive recreation areas where camping is allowed. More than 25 million people visited the John Day reservoir during a 10-year period from 1989 through 1998.¹³⁰ In 1998, the lower Snake River area at the Lower Granite Dam reservoir had more than one million visitors. Even the the least-visited reservoir behind Lower Monumental Dam had more than 157,000 visitors.¹³¹ Land-based activities such as picnicking, camping, mountain biking, horseback riding, wildlife viewing (a non-consumptive use of wildlife), hiking, skiing, and ecotourism are also popular throughout the Region.¹³² These activities are supported by miles of trails and roads, as well as numerous interpretive and visitor centers. "According to the Washington Department of Fish and Wildlife, wildlife watching already brings \$1.7 billion into the state economy each year and creates 21,000 jobs. The potential for continued economic growth—and conservation—is enormous."¹³³

5.1.2.3 Economic Development

Industrial, Residential, and Commercial Development

Industrial, residential, and commercial development are important economic activities in the Basin. Between 1990 and 2000, the Region experienced about a 21% growth in population.¹³⁴ This growth has fueled the development in the industrial, residential, and commercial sectors. There are about 1.5 million acres of urban lands in the Basin. Almost half of this amount (600,000 acres) is concentrated in the Lower Columbia River area. See Figure 2.12, which shows the counties by distribution of population. Table 5.1-5 summarizes some data on value of construction, and home construction and sales specific to residential development in the Region.

Table 5.1-5: Data on Value of Construction, Housing Units and Existing Home Sales by State

	Idaho	Montana	Oregon	Washington
Construction Contracts, million \$, 1998	2,015	935	5,046	8,431
1000s Private Housing Units Authorized, 1998	11.7	2.6	25.9	45.7
Existing home sales, 1000s, 1998	29.7	18.3	63.1	159.2

Source: USDC, Statistical Abstract of the United States, 1999

impacts to recreational use and facilities at the LRNRA under certain circumstances. This information is located in Appendix K of this EIS.

¹³⁰ Corps 2000, Section 10.2.3.2 Existing Recreation Use and Value.

¹³¹ Corps 2002b Section 4.13.1.2 Visitation.

¹³² Corps 2002b Section 4.13.1 Recreation and Table 4.13-2.

¹³³ Mlodinow, S. 2002.

¹³⁴ Data taken from US Census Bureau, <http://www.census.gov> (Idaho: <http://quickfacts.census.gov/qfd/states/16000.html>; Montana: <http://quickfacts.census.gov/qfd/states/30000.html>; Oregon: <http://quickfacts.census.gov/qfd/states/41000.html>; Washington: <http://quickfacts.census.gov/qfd/states/53000.html> (last visited January, 2003).

Major urban areas have undergone significant growth in high-tech industries and corresponding economic development, while rural areas continue to rely on traditional industries experiencing little economic growth.¹³⁵ Industrial, residential, and commercial development is largely market-driven. However, water availability and many land use and environmental laws and regulations have shaped development. For example, the ESA, as well as state-sanctioned or mandated programs, has had some influence in plan development in special-status species habitat. In fact over the past decade, the uses of habitat conservation plans have become more common.

Employment and the Regional Economy

Employment in the Pacific Northwest has undergone substantial change over the past three decades. Generally, the economy of the Basin is evolving away from its current level of dependence on agriculture, range, and timber, toward trade and services, including information-based technologies. Total employment in the four-state region was recently about 5.5 million persons. Services, trade, and government activities accounted for most regional employment and the shares of employment in these sectors have been growing for the last few decades.¹³⁶ The services, retail trade, and government sectors were the largest employers in 1998. These changes broadly reflected changes in the United States economy where employment in the farm and manufacturing sectors has declined, and the largest increases have been in the services and retail trade sectors. In 1996, the employment mix for some of the key job areas in the region was about 3% farming, 2% forestry/fishing/farm services, 18% construction/manufacturing, and 5% transportation/utilities. In 1997, agriculture, forestry, fisheries, lumber, paper, mining, and electric and gas utilities accounted for less than 10% of employment.¹³⁷

Employment in Washington, Oregon, and Idaho increased in most sectors from 1969 to 1998, but the *percent* relative to the total regional employment declined for farming (from 6% to 3%), manufacturing (from 19% to 12%), and transportation (from 5% to 4%), while it increased from 1% to 2% for agriculture (other than farming), forestry, and fishing; and construction from 5% to 6%.¹³⁸ Employment in the services sector increased from 17% to 29%, while retail trade employment increased from 15 % to 17%.¹³⁹ These increases were at a faster rate than the national average. Recently a downturn in the economy, resulting in the Pacific Northwest having some of the highest unemployment rates in the country, has slowed regional economic growth.

¹³⁵ Corps 2000, Section 10.4.3 Study Area Overview.

¹³⁶ Council 2000a, Section 3.2.4.1 Current Regional Economic Conditions; and Quigley, T.M. and S.J. Arbelbide 1997.

¹³⁷ Extracted from Council 2000a, Appendix A, Table A-1.

¹³⁸ Corps 2002b, Section 4.14.1.1 Employment.

¹³⁹ Corps 2002b, Section 4.14.1.1 Employment.

5.1.2.4 Funding Costs

For a complete discussion of funding costs, both from ratepayers and other sources, please see Section 2.3.2.3 Current Policies—Conflicting Priorities: Managing the Money Resource. See also Appendix H for a detailed list of BPA fish and wildlife projects.

5.1.2.5 Tribal Interests

The federally recognized Indian tribes of the Columbia River Basin encompass many different cultures, habits, geographic locations, and relationships to natural resources. While there are over 50 tribes in BPA's service area, BPA works with the 13 tribes¹⁴⁰ of the Columbia River Basin, the area within which most of BPA's mitigation and recovery actions for the FCRPS are implemented. Four of the thirteen tribes have adjudicated treaty fishing rights on the lower Columbia River—the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe of Idaho, and the Yakama Nation. The other nine tribes also have fishing and hunting rights. These tribes include the Burns Paiute Tribe of the Burns Paiute Indian Colony, Coeur d'Alene Tribe, Confederated Salish and Kootenai Tribes of the Flathead Nation, Shoshone-Bannock Tribes of the Fort Hall Reservation, Shoshone-Paiute Tribes of the Duck Valley Reservation, Kalispel Indian Community of the Kalispel Reservation, Kootenai Tribe of Idaho, Spokane Tribe of the Spokane Reservation, and the Northwestern Band of the Shoshoni Nation. A non-federally recognized Native American Indian community likely to be affected is the Wanapum Indian Community.¹⁴¹ Each of these tribes is unique. However, many tribes share common bloodlines, traditions, religious practices, and languages. Figure 2.13 shows a map of the Indian Reservation lands and other land ownership in the region today.

Native American cultures within the Pacific Northwest developed over thousands of years. By the early 19th century, Native American Indians had developed different languages and dialects. They had also adapted in a variety of ways to living in the unique environments of the Pacific Northwest. The region's abundant natural resources supported their subsistence-based economies. Established trade, political and social networks, and other alliances connected the region's different cultures.

As tribes were federally recognized and moved to reservations in the mid-19th century, many different bands were forced to live together on reservation lands often located away from their traditional lands. Throughout the 19th and 20th centuries, their traditional way of life was further threatened by increasing pressure to assimilate into the non-Indian culture. Restrictions were placed on traditional, cultural, and religious practices, such as harvesting foods and medicines, observing religious practices and ceremonies, speaking native language dialects, and living in extended families.

¹⁴⁰ The Cowlitz Tribe has recently been federally recognized, but are not yet very active in mitigation efforts. The 50 tribes are named in Appendix B: Mission Statements and Statutory Tables.

¹⁴¹ For more information on the individual tribes please see Corps 2002b, Section 4.8.1.1 Tribal Summaries.

Many Native American Indians continue to live on or near Reservation lands. The tribes exercise sovereign governmental authority over tribal members and land on their respective reservations. Their tribal governments remain their primary form of representation in family and community life. Northwest Indians also hold and exercise rights to important activities and resources in areas beyond their respective reservation boundaries. These off-reservation rights typically include fishing, hunting, gathering activities, and use of sacred and religious sites. Through their reserved treaty fishing rights, Northwest tribes have access to their usual and accustomed places along the riverbanks during the fishing season. As the dams were constructed in the lower Columbia River, many of the usual and accustomed fishing sites were flooded. Congress provided compensation for this loss, both monetary and in the form of in-lieu fishing sites.

Numerous fish, wildlife, and plant species—salmonids, lamprey, sturgeon, whitefish, sculpin, deer, cous, Indian carrots, chokecherries, and tules—retain cultural significance to American Indian tribes. Salmon are a major food source and trading commodity for most Columbia Basin tribes. Pacific Northwest Indians revere salmon, including steelhead, as "divinely-provided traditional food," and "as ... designated lead fish essential on the tables at community dinners."¹⁴² "A large catch of fish (enough to both sell and give away) brings social esteem to both the fisherman and the skilled salmon handlers who prepare and serve the catch."¹⁴³ However, due to settlement and development of the Basin by non-Indians over the last century, as well as climatic changes, there has been a dramatic decline in the amount of salmon harvested and consumed by tribal peoples.

The loss of salmon has altered traditional tribal economies, and reduced wealth, health, and well being. Today, to the relatively limited extent the resource permits, tribal people continue to fish for ceremonial, subsistence, and commercial purposes employing—as they always have—a variety of technologies. Tribal members fish from wooden scaffolds and from boats; they use set nets, spears, dip nets, and poles and lines. The tribes still maintain a dietary preference for salmon, and its role in ceremonial life remains preeminent. Salmon are important and necessary for physical health and for spiritual well-being. Today, perhaps even more than in the past, the Columbia River treaty tribes are brought together by the struggle to save their fishing rights and by shared spiritual traditions such as the first salmon feast.

Some other tribes in the Basin have slightly different priorities. Some "upriver" tribes today have less ability to harvest salmon than they once did. They focus on resident fish and wildlife. These upriver tribes are concerned that downriver operations for salmon are harmful to upriver resident fish species.

Alongside fish, wildlife have also played an important role historically in tribal life. Today, tribes continue to exercise their rights to harvest wildlife on both their

¹⁴² Corps 2002b, Appendix N.

¹⁴³ Corps 2002b, Appendix N.

reservations and ceded lands for ceremonial and subsistence use. For most tribes, deer and elk are the primary species for subsistence use. Other species, such as small game and fowl, are pursued depending upon tribal tradition, individual need, and opportunity. Tribal hunters tend toward modern means of harvest using firearms.

Wildlife populations have generally tended to decline as a result of non-Indian settlement and development that reduced both habitat quantity and quality. With settlement also came increased wildlife diseases and hunting. Disease affected some species, such as big horn sheep, drastically. Unregulated hunting resulted in other species, such as pronghorn and moose, becoming much rarer. Targeted extermination practically eliminated other species, such as grizzly bears and gray wolves, from the Region. Not all species, however, have necessarily declined, and members of some tribes have begun to shift their harvest activities accordingly.

Socioeconomic conditions for tribal members are not on par with their non-Indian neighbors, as tribal members cope with high poverty, unemployment, and death rates. The depressed tribal economies are principally caused by declines in tribal fisheries and the loss of tribal lands. Table 5.1-6 shows these rates and the per-capita income for the four states and selected tribes in the Columbia Basin.

With the decline of fish and wildlife resources, many of the Northwest tribes have focused on other economic enterprises. Many have developed recreation and tourism industries that include camping and other outdoor recreation like golf; large resorts and hotels; and cultural centers and museums. Some have created opportunities for non-Indians to hunt and fish on reservation lands, and have also recently exerted strong leadership roles in natural resource preservation and management, as well as in the protection of cultural resources. Several tribes have constructed large casinos, which generate large sums of money for tribal members. Much of the development on the reservation are done through tribal construction and engineering firms. There has also been a recent push for power generation development to serve the reservations. Many of the tribes continue to be involved in agriculture, ranching and the forest products industry. All of these enterprises will likely play an increasingly important role in improving the socioeconomic condition for many tribal members.

Tribal water rights may play a significant role in tribal economies in the future. Reservations typically include express or implied water rights sufficient to fulfill the purposes of the reservation. More often than not, a tribe's reserved water rights will be senior to other rights in a watershed. Through basinwide adjudications, such as those for the Yakima and Snake rivers, tribal water rights are being quantified, thus allowing tribes greater freedom to use or market their water. As tribes exercise their historic rights, the large blocks of water they control may play a major role in shaping future development and fish and wildlife mitigation and recovery actions.

Table 5.1-6: Poverty Rates, Unemployment Rates, Per Capita Income and Mortality Rates for All Citizens, including Tribal Citizens, of the Columbia Basin

States/Tribes	Poverty (Percent)	Unemployment ¹ (Percent)	Per Capita Income ²	Rate of Death (per 100,000 population)	Ratio of Tribal Death Rate to State Death Rate
Washington	10.9	5.7	\$13,400	477.1	
Yakama	42.8	23.4	\$5,700	965.8	2.0
Colville	28.9	20.2	\$8,000	823.5	1.7
Spokane	33.0	17.3	\$7,800	557.0	1.2
Kalispel	31.4	13.5	\$7,800		
Oregon	12.4	6.2	\$14,900	487.2	
Umatilla	26.9	20.4	\$7,900	491.1	1.0
Warm Springs	32.7	19.3	\$4,300	721.4	1.5
Burns Paiute	42.8	50.0	\$4,600	*	*
Idaho	9.7	6.1	\$11,500	440.4	
Kootenai	28.1	30.3	\$8,300	**	**
Coeur d'Alene	27.7	17.8	\$6,100	519.6	1.2
Nez Perce	29.4	19.8	\$8,700	628.0	1.4
Shoshone-Bannock	43.8	26.5	\$4,600	1,033.7	2.3
Shoshone-Paiute ³	44.2	25.2	\$5,200	***	***
Montana	16.1	--	\$11,200		
Flathead Salish and Kootenai	27.4	16.4	\$8,800		

¹ In winter, tribal unemployment can reach 80%.
² Includes Duck Valley Sho-pai in Nevada.
³ Census data is before income taxes, after transfers
* Data included in Warm Springs Indian Health Service Unit.
** Data included in Indian Health Service Unit serving Nez Perce.
*** Data not separately available.
Note: This table includes data on the 13 Federally recognized tribes, as of Fall 2000.
Sources: Council, 2000a: Human Effects Analysis, 2000, as summarized from U.S. Bureau of the Census, 1990, Portland Area Indian Health Service, 1994. American Indian and Alaska Native Mortality: Idaho, Oregon and Washington, 1989-1991, Census of Population Social and Economic Characteristics American Indian and Alaska Native Areas. 1990 CP-2-1A

The sovereign status of Indian tribes has long been recognized. Principles outlined in the Constitution, treaties, Executive Orders, statutes, regulations, and Federal court jurisprudence continue to guide national policy towards Indian nations. Working within a government-to-government relationship with Federally recognized Indian tribes, BPA consults with the tribal governments to assure that tribal rights and concerns are considered prior to BPA taking actions, making decisions, or implementing programs that may affect tribal resources. BPA fully respects tribal law and recognizes tribal governments as sovereigns, with rights to set their own priorities, develop and manage

tribal resources, and be involved through the consultation process in Federal decisions or activities which have the potential to affect these rights.¹⁴⁴

Native American Indians have been substantially affected by the loss of salmon and the declines of many game and plant species on which tribes depended. The ability of the Federal government to meet trust responsibilities as it pertains to fish harvest may be limited by the diminished resident and anadromous fish populations.¹⁴⁵ Most of the upriver anadromous fish opportunities have been lost. In the process of complying with the ESA, the Federal agencies have implemented actions specifically designed to benefit listed species, including salmon. This focus is consistent with treaty and trust responsibilities. Historically, there were assurances of mitigation that Congress either did not authorize or appropriate as anticipated by the tribes. As a result, many tribal members may be skeptical of mitigation and recovery promises. The increasing number and complexity of decisionmaking processes for fish and wildlife mitigation and recovery has further disenfranchised tribes as resource co-managers and sovereign entities. Many tribes have had to deplete their tribal economic and staff resources as they try to maintain presence in the numerous processes. Yet many of the processes address decisions that are critical to the tribes, such as competing resource uses. The results of decisions made in these processes could change tribal harvest, traditional practices, and the socioeconomic condition of Native American Indians. With the shrinking of tribally influenced areas and over-extension of tribal government, Native American Indian culture, especially traditional knowledge and practices pertaining to natural resource management, may also be further fragmented and lost.

5.1.2.6 Cultural and Historic Resources

Federal agency responsibilities regarding cultural and historic resources are defined by law, primarily the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA) and American Indian Religious Freedom Act (AIRFA). Generally, these acts protect prehistoric, historic, and cultural resources from actions that would otherwise damage them. Some of the acts also ensure access to sites, especially those of cultural or spiritual value.

Archaeological sites in the Pacific Northwest are typically represented by open campsites; pit-house (semi-subterranean dwellings) villages; rock shelters; pottery; rock art (petroglyphs/ pictographs); lithic (stone) quarries and workshops; burial grounds and cemeteries; and isolated rock cairns, pits, and alignments. In order to gain protection under the ARPA, archaeological sites must be over 100 years old. Historic resources are broadly defined to include "any prehistoric or historic district, site, building, structure, or object included in or eligible for the National Register of Historic Places."¹⁴⁶ These resources must usually be over fifty years old to be eligible for inclusion in the Register.

¹⁴⁴ See Chapter 2 of this EIS for a discussion of BPA's Tribal Policy.

¹⁴⁵ USDOE/BPA, Corps and Bureau 1995, Section 4.3, p. 4-206.

¹⁴⁶ National Historic Preservation Act. Section 106 Regulations, 36 CFR Sec. 800.16 Definitions.

In the Pacific Northwest, historic resources can include the remains of farms, towns, trading posts, villages, mining sites, military forts, burial sites, abandoned settlements, and transportation and industrial facilities. The historic property or resource may include artifacts, records, and material, or any other remains related to the property or resource.¹⁴⁷ Historic resources also include properties of religious and cultural importance to Native American Indian tribes. Sites that are potentially eligible for the National Register of Historic Places, but which have not been evaluated as to eligibility, are still protected under the NHPA.

American Indians recognize archaeological and historic sites as important resources; however, they also emphasize their interests in traditional cultural properties. Native American Indians view their entire heritage, including beliefs, traditions, customs, and spiritual relationships to the earth and its natural resources as sacred cultural resources. Traditional cultural properties are places and resources composed of both cultural sites and natural elements significant in contemporary, traditional, social, and religious practices, which often help preserve traditional cultural identities.

There are many cultural and historic resources within the Pacific Northwest. Many states lack accurate information about site locations, elevations, characteristics, densities, and depths of deposit; the location of many resources are unrecorded. Around the hydropower system, there is evidence that both archaeological and historic sites are more numerous, generally larger, and more complex, along the former riverbanks.¹⁴⁸ The losses of cultural and historic resources in the region have been extensive. Many sites have been inundated by reservoirs or covered by sediment as a result of the construction of the FCRPS. Losses involve social and cultural resources and include some of the remaining, permanently and intermittently occupied settlements and places where ceremonial traditions were practiced.¹⁴⁹ The major impacts on cultural and historic resources are from high water flows, wave action, and human activities (e.g., vandalism).¹⁵⁰ Also, unrecorded sites are exposed as a result of ongoing operations at hydro projects.¹⁵¹

Current efforts related to cultural and historic resources include funding of resource mitigation, and recording of Traditional Cultural Properties, oral histories, and place names. Recorded sites continue to be formally evaluated for inclusion in the National Register of Historic Places.¹⁵² Local, state, and Federal regulations for cultural and historic resources provide some further protection. Even with this protection, additional losses of historic and cultural resources continue to occur. These losses can result from residential, commercial, and industrial development; and recreational activities.

¹⁴⁷ Definitions adapted from Governors, Pacific Northwest States 2000. Recommendation for the Protection and Restoration of Fish in the Columbia River Basin.

¹⁴⁸ Corps 2000, Section 4.20, p. 53.

¹⁴⁹ Corps 2000, Section 4.20.6, p. 56.

¹⁵⁰ Corps 2002b, Appendix N.

¹⁵¹ Corps 2000, Section 4.20 Cultural Resources.

¹⁵² Corps 2000, Section 4.20 Cultural Resources.

5.1.2.7 Aesthetics

The Pacific Northwest is world-renowned for its aesthetic resources. Oftentimes, aesthetics is described in terms of scenery, however, sounds and smells are also aesthetic parameters. Scenery is the product of both natural processes and human culture, combined in various proportions that change over time.¹⁵³ Aesthetics is a value judgment: an attribute that someone finds aesthetically pleasing may be displeasing to someone else. What people find aesthetically pleasing can also vary over time. Many people value undisturbed land, air, and water while others prefer developed landscapes. Landscape aesthetics, including viewing scenery, is an important concern for nearly 20% of the region's population.¹⁵⁴ Aesthetics is also important to the ever-increasing number of visitors and the economies that depend on them. Approximately 26% of the landscape has been transformed by humans to the degree that the overall images are no longer near natural in appearance, but are culturally dominated.¹⁵⁵

Public demand for good visibility is high. The vast majority of landscape settings within the Pacific Northwest have excellent air quality.¹⁵⁶ However, monitoring data from the U.S. Forest Service and National Park Service indicate that some Class I areas (as defined under the Clean Air Act) are impaired.¹⁵⁷ There are also increasing concerns about regional haze, especially in the Columbia River Gorge National Scenic Area.

The diverse landscape of the Columbia River Basin provides a variety of scenic attractions. Mountain landforms in the Cascades and the Northern Rockies are extensive and include massive volcanic cones, nonvolcanic snowcapped peaks, and forested ridges. The interior of the Basin is dominated by plateau-type landforms and greener stream valleys. Water features vary within and between these types of terrain. The mountain areas offer numerous lakes, glaciers, high-gradient streams, and waterfalls. Streams and lakes are less numerous in the dry interior, but the water bodies that are present tend to be visually prominent.

Water quality parameters with an aesthetic impact include odor, color, turbidity, oil and grease slicks, foam, litter and other debris, algae, aquatic weeds, and dead fish. The general appearance of a water body is an important factor in its acceptance for recreational use; these parameters are closely related to demand for recreation.

5.2 GENERIC ENVIRONMENTAL EFFECTS

The objective of Section 5.2 is to set the stage for the detailed analysis in 5.3 of the environmental consequences from implementing the alternative policy directions. This

¹⁵³ Eckbo, G. 1969.

¹⁵⁴ Eckbo, G. 1969.

¹⁵⁵ USDA/USFS and USDO/BLM 1997b, p. 1960.

¹⁵⁶ USDA/USFS and USDO/BLM 1997b, p. 1964.

¹⁵⁷ USDOE/BPA 2002f, Section 3.17 Cumulative Effects.

section describes broad categories of actions taken for fish and wildlife mitigation and recovery and the generic effects of these actions on the natural, economic, and social environments.

5.2.1 Understanding Generic Environmental Effects

This subsection describes categories of implementation actions, types of environmental effects, defines common terms, and outlines generic environmental effects and potential mitigation.

5.2.1.1 Categories of Actions

Implementation actions for fish and wildlife are commonly sorted into four categories:

- *habitat* (the environment in which fish and wildlife live),
- *harvest* (commercial, sport, or other take of fish and wildlife),
- *hatcheries* (artificial production of fish), and
- *hydro* (actions involving operations or changes to dams or other water control facilities).

These four "Hs" have become the commonly accepted categories for fish and wildlife mitigation and recovery efforts under any Policy Direction.

- **Habitat.** Habitat actions include a large number of land and water management activities to improve survival of targeted species, such as habitat acquisition, habitat enhancement, and predator and introduced species control. Actions include *passive* restoration, by allowing natural regeneration, and *active* restoration, by physically modifying the habitat. These two types of restoration can have very different effects on the natural and socioeconomic environments. Often, both types of actions will be used to achieve habitat goals.

Habitat actions are also classified according to the type of habitat affected:

- *Uplands* are not hydrologically affected by changes to downslope aquatic bodies. Habitat actions in uplands are taken to both improve habitat quality for wildlife and reduce polluted runoff to downslope aquatic systems benefiting fish.
- *Riparian* areas are hydrologically connected to rivers and streams by groundwater or flooding. Habitat actions in riparian areas include avoidance and removal of human disturbances, reforestation and vegetation improvements, and active physical improvements such as land shaping.
- *Wetlands* can be seasonally or permanently wet. Habitat actions include actively creating wetlands, allowing active and passive restoration of degraded wetlands, and protecting existing wetlands.
- *River channels and streambeds* habitat actions include active modifications such as riprap removal, addition of woody debris or spawning gravels, and dredging management.

- *Aquatic* habitat is the water environment itself. Actions can include water acquisitions for instream use and pollution control. Other actions that affect aquatic habitat are often classified as hydrosystem activities.¹⁵⁸
- **Harvest.** Harvesting (taking fish or wildlife by various tribal, commercial, or recreational means) decreases abundance, which can affect the survival rates of the harvested species and/or their predators. Categories of harvest actions include ocean and river harvest reductions, shifts to terminal harvest or other more selective harvest practices, changes in harvest timing, and changes in recreational harvest, including fishing and hunting regulations.¹⁵⁹ For controlling unwanted predators of target species, actions include changes in recreational harvest regulations and incentives, such as bounties.
- **Hatcheries.** Hatcheries include production facilities, supplementation hatcheries,¹⁶⁰ genetic conservation facilities, and fish farms. Hatchery actions include closing hatcheries, building new ones, and reforming hatchery production practices. Hatcheries modify populations of targeted species by direct changes to population recruitment at specific life stages. Hatcheries may also affect naturally-spawning populations by causing interactions and competition for space, food, and reproduction with hatchery-produced fish.¹⁶¹
- **Hydro.** Hydrosystem actions include changes in operations and modifications to hydrosystem facilities. The main purpose of hydrosystem actions is to increase survival for targeted fish species by improving aquatic habitat and migration conditions. These actions include improvements in the amount and timing of flow, temperature and other water quality parameters, spill, and in-reservoir storage for resident fish. Hydrosystem actions can also include modifications to the physical hydrosystem such as dam breaching and fish passage improvements.¹⁶² Dam breaching options can include privately-owned dams as well as the four lower Snake River dams, and the John Day and McNary dams.

¹⁵⁸ For a detailed assessment of the quality and quantity of freshwater habitat in the Columbia River Basin, current management, and alternative management strategies, please see the Federal Caucus' 1999b, 2000b, and the accompanying Appendix on Habitat.

¹⁵⁹ For a brief history of salmon harvest in the region, current harvest management, and alternative harvest management strategies, please see the Federal Caucus' Conceptual Plan and Basinwide Strategy papers and the accompanying Appendices on Harvest (Federal Caucus 1999b, 2000b).

¹⁶⁰ Supplementation is an artificial propagation intended to reestablish a natural population or increase its abundance (Federal Caucus 1999b, p. 100). A conservation hatchery program, by contrast, uses artificial propagation to recover Pacific salmon by maintaining the listed species' genetic and ecological integrity (Federal Caucus 1999b, page 92).

¹⁶¹ For a historical perspective on regional hatcheries, an assessment of current management, and alternative management strategies, please see the Federal Caucus' Conceptual Plan and Basinwide Strategy papers and the accompanying Appendices on Hatcheries (Federal Caucus 1999b and 2000b), as well as Brown, Bruce 1995 and Lichatowich, J. 1999.

¹⁶² For a more detailed assessment of the effects of hydropower on listed and other species, the current management of the system, and alternative management strategies, refer to the Federal Caucus' Conceptual Plan and Basinwide Strategy papers and their accompanying Appendices on Hydropower (Federal Caucus 1999b, 2000b). USDOE/BPA, Corps, and Bureau. 1995 also provides background.

It is important to recognize that there are certain actions under each of the Hs that are likely to be impractical or infeasible for a multitude of reasons. Below are some examples of possible limits of the four "H"s.

- **Habitat:** restriction of all human access to essential habitat for fish and wildlife
- **Harvest:** ban on all harvest (commercial, recreational, tribal)
- **Hatcheries:** closure of all hatchery facilities
- **Hydro:** removal of all dams and other human-made blockages.

See Chapter 4, discussion of Reserve Options, for the more extreme applications of the four Hs above.

5.2.1.2 Categories of Environmental Effects

An implementation action is generally undertaken to address a particular need and to achieve a desired or intended outcome. That action may also have associated "side" effects: outcomes that were not the primary objective of the action, but that occur nonetheless. It is important to understand the distinction between these two types of effects before proceeding to the discussion of environmental consequences.

Intended effects are those changes to the human environment that are targeted as an implementation action, including the sequence of effects that is supposed to occur to achieve the desired outcome.

- **Example:** Water is released from one of the reservoirs to increase flow (and thus velocity) in the river. This change allows juvenile anadromous fish to move more quickly toward the ocean, increasing in-river survival. Increased survival is the intended effect.
- **Example:** A riparian area is reforested (replanting along the banks of rivers and streams) to improve streambank stability, increase shading, and contribute to in-stream woody debris. These changes reduce erosion, moderate water temperature, increase hydrologic complexity, and provide cover for fish in the stream. All of these are intended effects.

Associated effects are effects that may occur as a result of achieving the intended effects. When fish and wildlife implementation actions are taken to improve conditions for one or more species, associated environmental effects may occur for other fish and wildlife species or for humans. These effects are sometimes unwanted and undesirable.

- **Example:** Water is released from a reservoir with the intended effect of increasing flows to help juvenile anadromous fish migrate to the ocean. At the same time, this action may lower reservoir levels. The associated effects of lowering water levels in the reservoir include exposing cultural resources and decreasing resident fish habitat, and reducing navigation and recreational activities. Increasing flows may also result in the associated effects of increased levels of undesirable gas (nitrogen) supersaturation and sedimentation, including turbidity in the water downstream.

This example illustrates a fundamental concept underlying this environmental analysis: that there are many complex relationships among actions and effects. If actions taken to achieve resource improvements had only intended effects, the environmental analysis would be straightforward. However, actions often have many associated effects and the environmental analysis becomes much more complex.

There are often trade-offs among actions; and any given implementation action may have the effect of limiting the potential for other actions.

- **Example:** A dam is breached. The *intended* effect is to improve migration and survival for anadromous fish. The *associated* effect is the exposure of cultural resources and loss of resident fish habitat. The *trade-off*, however, is that the dam can no longer be used to control operations on the river. Therefore the hydro actions for fish and wildlife that could have been implemented at that dam have been eliminated. If different river flow patterns or reservoir levels are needed to facilitate fish and wildlife recovery efforts, those outcomes cannot be achieved by changing operations at the dam: the option of operating the dam is gone.

Table 5.2-1 illustrates the optimum hydro actions that would be best for different types of river uses. The optimum conditions for one resource are clearly not optimal for others. Before implementing an action to benefit one use, the trade-offs need to be considered.

Table 5.2-1: Optimum Operations Conditions for Each River Use¹⁶³

River Use	Optimum Condition
Anadromous Fish	Streamflows as close to "natural" river conditions as possible, with mainstem reservoirs well below spillway levels
Cultural Resources	Stable reservoir elevations year-round
Flood Control	Reservoirs drafted in early spring to capture snowmelt inflows
Irrigation	Full reservoirs April through October (growing season)
Navigation	No reservoir drawdowns below minimum operating pool (MOP)
Power	Eliminate or reduce nonpower operating constraints on the system. Ramp flows up and down quickly to produce peaking power
Recreation	Full reservoirs for long summer season (May-October) and stable downstream flows
Resident Fish	Stable reservoirs year-round, with natural river flows
Water Quality	Natural river flows with minimal spill
Wildlife	Draw down reservoirs year-round to expose maximum acreage for long-term habitat recovery. Allow flows as close to natural conditions as possible

¹⁶³ USDOE/BPA, Corps, and Bureau (1995), p. 4-2. How all of these effects are taken into account in making fish and wildlife policy can be reviewed in Sections 5.2 and 5.3. Future site-specific projects will use this analysis of effects to determine each project's viability and provide specific details to where and how the effects will take place.

5.2.1.3 Analytical Perspective

Sections 5.2.2 and 5.2.3 review the environmental effects data from two perspectives:

- **Generic effects for land, water, and actions taken for fish and wildlife are reviewed from the fish and wildlife perspective.** The fish and wildlife perspective is concerned with improvement of fish and wildlife resources, and are discussed in relation to the effects human activities have on fish, wildlife and their habitats. Land and water categories include the overwhelming share of direct effects on fish and wildlife. Most of the adverse effects described below result from human activities or actions that reduce fish and wildlife resources.

- **Generic effects for air, the economic environment, and the social environment are reviewed from the human perspective.** The human perspective is concerned with human improvements, including economic and social values associated with fish and wildlife, and are discussed in relation to the effects that actions taken for fish and wildlife have on people. Most of the adverse effects from the human perspective result from (1) impacts to air quality, (2) losses of fish and wildlife, (3) funding costs of actions taken to rebuild, recover, or protect fish and wildlife populations, or (4) economic and social costs.

Sections 5.2.2 and 5.2.3 address the general nature of environmental effects in six fundamental areas: land, water, fish and wildlife, air, the economic environment, and the social environment. Each subsection provides the following:

- a list of some human activities (whether done for fish and wildlife or human needs) that **cause** an effect,
- a brief description of the possible **adverse effects** that are linked with the particular effect,
- a discussion of the **degree** (context and intensity) of those effects,
- a list of potential **mitigation measures** (actions that will lessen, eliminate, or compensate for the effects), and
- a **discussion** that provides more background information and examples of the intended and associated effects of each activity.

"Effects," "mitigation," "context," and "intensity" are used as they appear in the CEQ Regulations for implementing the procedural provisions of the National Environmental Policy Act. Definitions are found in 40 C.F.R. 1508.8, 1508.20 and 1508.27, respectively.

"Effects" include the following:

(a) Direct effects, which are caused by the action and occur at the same time and place

(b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in these regulations are synonymous. Effects include the ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

"Mitigation" includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by reporting, rehabilitating, or restoring the affected environment.

(d) Reducing or eliminating the impact over time by presentation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

"Context" includes:

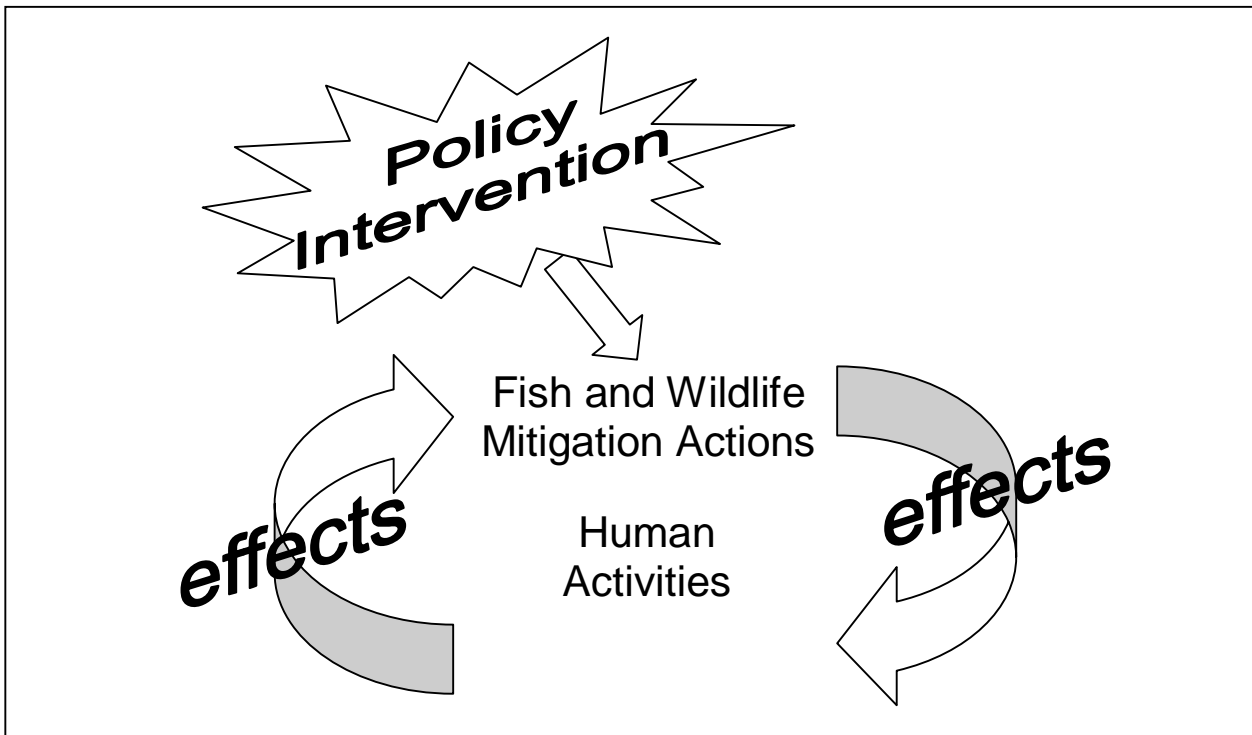
Actions will be implemented in a frame of reference that includes society as a whole, the affected region, the affected interests, and the locality. This means that the significance of a given action may vary with the setting of the action. Both short-term and long-term effects are relevant.

"Intensity" includes:

The intensity of an effect refers to its degree of severity. We consider whether it affects public health or safety, whether it helps or harms a unique resource, whether the effects are likely to be highly controversial, the degree of risk, and the extent to which it supports or adversely affects protected species or resources.

Effects are strongly shaped by how actions are implemented, how human behavior is affected, and by how people respond to the actions. Scientists, elected officials, or other individuals or groups may react by seeking to adjust the policy or the actions in order to improve the intended effects or to mitigate the associated effects, thus beginning a new round of action-effect-reaction. Figure 5-1 illustrates this iterative process.

Figure 5-1: Actions-Effects-Reactions Illustration



5.2.2 Generic Environmental Effects on Fish and Wildlife from Common Human Activities

5.2.2.1 Land¹⁶⁴

Human Activities

The types of land use activities that affect fish and wildlife and the quality and quantity of their habitat include:

- forestry;
- agriculture, including irrigation, cropping, and grazing;
- mining;
- recreation;

¹⁶⁴ Consequences discussions are drawn directly from existing regional studies. For more information and background, please see: Federal Caucus 1999b and 2000b; Council 2000a; Corps 1999a; USDA/USFS and USDO/BLM 2000a, 2000b, 2000c, and 2000d; USDO/USFWS 1998b; USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

- industrial, residential, commercial development;
- road management;
- introduction of exotic species;
- use of land for power generation and transmission facilities.

Possible Adverse Effects

Adverse effects to fish and wildlife and their habitat include:

- direct loss of, or disturbances to, fish and wildlife habitat;
- effects on the quality of fish and wildlife habitat; and
- direct loss, or disturbance of fish and wildlife (including attractive nuisances).

Context and Intensity

Many factors influence the degree of human activity effects on land habitat. The degree of effects is a function of the types, intensity, and amount of land use. These components are themselves a function of economics and social values. Table 5.2-2 lists some of the factors that influence the effects of human activities on fish and wildlife.

Table 5.2-2: Some Factors That Shape Effects of Land Use and Terrestrial Habitat Values on Fish and Wildlife

Factors Leading to Effect	Effect
Market factors such as population growth, demand for land use products, supplies of products from other regions, technology, tastes and preferences, other cultural factors, and environmental regulations	Types and amounts of land uses, intensity of these uses
Public land use policies, pricing of forest products, and grazing	Amounts and intensity of grazing and forestry
Sport fishing and hunting regulations	Recreational fishing and hunting land use
Federal, state, and tribal water doctrines and laws	Amount and characteristics of irrigated land use
Economic conditions, local zoning, and development regulations	Characteristics of development and land use practices

Possible Mitigation Measures

Forestry actions used to reduce potential adverse effects on fish and wildlife habitat include:

- preservation (non-use) of forest lands and stream corridors to allow natural habitat development;
- regenerating vegetation quickly following disturbance;
- modifying harvest practices, tailoring harvest methods to slope and soils, and closing; controlling access; or obliterating forest roads to control use and erosion, and to foster forest regeneration and productivity;

- harvest techniques that retain some of the original forest features such as seral stages, snags, downed wood, large trees, and preferred species;
- creating forest patterns, ages, structures, and compositions to support local wildlife with the preferred habitat qualities;
- developing more sustainable wildlife habitat by silvicultural techniques, including controlled burns; and
- forest stewardship to improve forest health and habitat representation.

Agriculture actions to reduce potential land use conflicts with fish and wildlife habitat include:

- using modified cultivation practices, conservation or no-till agriculture;
- development of small ponds to retain water;
- management of cropland or shifting crop type to improve wildlife values;
- reduce or eliminate harmful pesticides, fungicides, and herbicides;
- land retirement and restoration of land back to native habitat; and
- manage water storage and conveyances reducing impacts to fish and wildlife.

Livestock grazing actions commonly used to reduce livestock effects on fish and wildlife habitat are:¹⁶⁵

- fencing or herding livestock out of sensitive and riparian areas for as long as necessary to allow vegetation and streambanks to recover;
- separate pastures using different management objectives and strategies for riparian areas;
- strategic placement of watering sources on uplands;
- eliminating livestock management facilities and activities (trailing, bedding, watering, salting, loading) from riparian areas;
- seasonal or rotational grazing, changed grazing intensities, or deferred grazing (adding more rest to the grazing cycle to increase plant vigor, allowing streambanks to heal, or encouraging more desirable plant species composition, and limiting grazing intensity to a level that will maintain desired species composition and vigor);
- controlling the timing of grazing to: (a) keep livestock off streambanks when they are most vulnerable to damage; and (b) coincide with the physiological needs of target plant species;
- changing from cattle to sheep to obtain better animal distribution through herding;

¹⁶⁵ Chaney, E., W. Elmore, and W.S. Platts 1990.

- land acquisition and retirement (permanently excluding livestock from riparian areas at high risk and with poor recovery potential when there is no practical way to protect them while grazing adjacent uplands); and
- constructing wastewater and sedimentation ponds used to retain and treat degraded runoff from feedlots or intensively grazed uplands.

Mining actions to reduce fish and wildlife habitat effects include:

- using best management practices (BMP) for mining;
- avoiding construction of mining structures, support facilities and roads within riparian areas;
- reclaiming and restoring habitat destroyed by mining (including dredging by early miners);
- eliminating solid and sanitary wastes in riparian areas;
- prohibiting or minimizing impacts from surface occupancy for mineral, oil, gas, and geothermal exploration and development activities; and
- minimizing erosion from surface mining and spoils.

Recreation actions include:

- changing sport fishing and hunting regulations;
- educating the public;
- controlling intensity or rotating use;
- locating recreational activities away from fish and wildlife habitat; and
- improving regulations and enforcement.

Industrial, residential, and commercial development actions to reduce effects on fish and wildlife habitat include:

- restricting development in sensitive habitats;
- using acquisitions or conservation easements for sensitive habitats;
- limiting public access or use of habitats;
- changing land use practices to reduce or capture and treat runoff;
- public outreach, including backyard wildlife education;
- developing lands responsibly, designing greenways and leaving native habitat;
- utilizing effective storm water collection infrastructure and management;
- improving laws governing refuse, reuse, and recycling; and
- "fireproofing" the rural/wildland interface.

Road management actions to reduce fish and wildlife habitat effects include:

- retention of roadless areas;

- closing, controlling access to, or reclaiming rural roads;
- road maintenance improvements (mitigation needs may be accomplished quickly by focusing on projects in heavily roaded watersheds¹⁶⁶);
- providing fish passage;
- providing underpasses for wildlife;
- minimizing roads in riparian areas;
- installing and maintaining fish-friendly culverts;
- regulating traffic during wet periods;
- outsloping of roadway surfaces;
- road drainage improvements;
- sediment source stabilization through seeding and planting;
- avoiding disruption of natural hydrologic flow paths; and
- avoiding sidecasting of soils and snow.

Introduction of exotic species actions to reduce fish and wildlife habitat effects include:

- eliminate or reduce undesirable exotic species, specifically species that have the ability to alter the existing habitat; and
- manage desirable exotic species to minimize effects on native species.

Power generation and transmission actions to reduce fish and wildlife habitat effects include the following:

- spanning riparian, wetlands, and other sensitive areas;
- scheduling construction and maintenance to avoid critical time for sensitive species;
- reseeding/revegetating immediately to protect habitat quality;
- using non-chemical (e.g., mechanical) vegetation management practices;
- installing low-maintenance transmission facilities;
- maximizing use of existing rights-of-way and roads;
- developing and implementing avian protection practices;
- siting generation facilities conscientiously; and
- using air-cooled instead of water-cooled thermal generation.

¹⁶⁶ Lee et al. 1997.

Discussion

Specific land use practices have effects intended to further human interests and associated effects that can impact and limit fish and wildlife and their habitat. The following discussion identifies those intended and associated effects.

Forestry Practices (including timber harvest) can contribute to adversely affecting fish and wildlife through the direct loss or alteration of their habitat. Modifications to cover, food sources, or roosting and breeding areas can affect wildlife health, diversity and abundance. Increased disturbances (e.g. noise and human presence) also impact fish and wildlife habitat use.

Vegetation removal, site disturbance, and soil compaction associated with timber harvest can alter hydrologic and sediment regimes and may increase the hazard of landslides.¹⁶⁷ Canopy removal can alter the amount, frequency, and intensity of precipitation delivery to the forest floor.¹⁶⁸ These changes also may lead to increased amounts of sediment introduced into streams and mobilization of sediments within the stream channel.

Forest management activities can alter processes that create and maintain riparian and aquatic habitats, and result in reductions of habitat complexity and the diversity of aquatic species.¹⁶⁹ Forest practices in riparian areas can be detrimental because of modifications to streamside canopy levels (causing a change in stream temperature and substrate composition) and the removal of large trees that reduce potential contributions of large woody debris to increase stream habitat complexity.¹⁷⁰ Potential adverse effects also include introduction of pollutants (fuels, fertilizers, pesticides, and herbicides) into watercourses while conducting harvest, site preparation, and stand maintenance activities.¹⁷¹ Hydrologic changes that alter normal stream conditions could result in fish mortality or reduce reproductive success.

Fire management and suppression can have both intended and adverse associated effects on fish and wildlife and their habitat. Fire can be used to improve forest health and create specific seral stages to benefit targeted species. Used properly, it can help reduce the potential for widespread habitat destruction. Burn treatments for forest fuel reduction and other ground-disturbing activities associated with the suppression of wildfires can also remove coarse wood, reduce large wood recruitment, reduce canopy cover, and increase the likelihood of erosion.¹⁷² The use of chemical fire retardants in wildfire

¹⁶⁷ USDA/USFS and USDO/BLM 1998; and Murphy, M.H. 1995

¹⁶⁸ Troendle, C.A. and W.K. Olsen 1993.

¹⁶⁹ Elmore, W. and R.L. Beschta 1987; USDA/Forest Ecosystem Management Assessment Team 1993; USDA/USFS and USDO/BLM 1998.

¹⁷⁰ Chamberlin, T.W., et al. 1991; Murphy, M.H. 1995; Spence, B.C., et al. 1996; USDA/USFS and USDO/BLM 1998.

¹⁷¹ Chamberlin, T.W., et al. 1991; Murphy, M.H. 1995; Spence, B.C., et al. 1996; USDA/USFS and USDO/BLM 1998.

¹⁷² Spence et al. 1996; Rieman, B.E. and J. Clayton 1997.

suppression can have direct and indirect adverse impacts on fish, including direct mortality.¹⁷³

Agriculture can have both intended and associated effects on fish and wildlife and their habitat. Intended effects can come from the different agricultural programs designed to benefit wildlife and their habitat, such as planting wildlife food plots and taking land out of production. The associated effects of cropland, pastureland, and irrigation can sometimes provide habitat benefits (food sources, microhabitats, and open spaces), and improved agricultural management can increase these benefits. For example, the use of hedgerows intended to separate fields and reduce the effects of wind, can result in the creation of microhabitat used by an increased diversity of species. Associated effects of agriculture on wildlife and their habitat can also result in the direct loss of native habitat. Conversion from native habitat to cropland results in a near-complete loss of the original native species that once occupied that land.

Agricultural practices can also affect fish and other aquatic organisms by degrading water quality, reducing water quantities impacting available habitat. Water quality can be affected by increases in stream temperature or increasing sedimentation from riparian, and upland sources¹⁷⁴; and decreasing instream water quantities due to the irrigation of land (see discussion in Section 5.2.2.2 Water). Increased sediment loads reduce primary production in streams. Draining or filling wetlands for increased production result in the direct loss of aquatic habitat. Persistent degraded conditions adversely influence resident fish populations.¹⁷⁵

Water storage and conveyance action activities affect land use and fish and wildlife by the dedication of land for facilities, and by shoreline area management. Water conveyance facilities can also be an impediment to wildlife travel.

Livestock grazing can have negative intended effects on wildlife as those species that either compete with or predate on livestock are removed. Associated effects on fish and wildlife result by increasing competition for food and space, degrading habitat, and directly trampling plants or nests. Impacts on stream and riparian areas resulting from grazing are dependent on the intensity, duration, and timing of grazing activities, as well as on the capacity of a given watershed to assimilate imposed activities, and the pre-activity condition of the watershed.¹⁷⁶ Livestock grazing impacts are most severe where riparian areas are non-functional, where range management programs are ineffective at ensuring that terms and conditions of grazing permits are met, and where compliance with permit terms and conditions is low.¹⁷⁷

¹⁷³ Spence et al. 1996; Rieman, B.E. and J. Clayton 1997.

¹⁷⁴ Armour, C.L., et al. 1991; Platts, W.S. 1991; USDOI/BLM 1992; Chaney et al. 1990.

¹⁷⁵ Meehan, W.R. 1991.

¹⁷⁶ Platts, W.S. 1989; Odum, E.P. 1981.

¹⁷⁷ USDOI/USFWS 1998b.

Livestock allowed in streams or along streambanks, can damage salmonid spawning and rearing habitat. Livestock trampling contributes to reduction of plant life, shading, and loss of important streambank characteristics such as overhangs. Grazing can contribute to a reduction of important riparian habitat. Livestock walk or stand in streams, disrupting fish and other aquatic organisms, and degrading water quality. Fish vulnerability to direct effects of grazing is greatest during early development stages.¹⁷⁸ Heavily grazed watersheds usually exhibit less water holding capacity, potentially resulting in increased runoff velocities, which in turn can result in excessive erosion and sedimentation of streams.

Some wildlife can benefit from the associated effects of grazing. The installation of watering sites and mineral licks, intended for livestock, benefit wildlife as well. Keeping land in pasture also benefits those wildlife species requiring open habitat.

Mining activities can result in positive and negative associated effect on fish and wildlife. Positive associated effects can include the reclamation and creation of habitat, especially aquatic, as mining activities cease. However, there are many negative associated effects. Increased sedimentation (including leachate from abandoned mines), chemical contamination, stream channel modification and destabilization, destruction of riparian vegetation, and hydrologic impacts from associated roads are all major negative associated effects from mining activities.¹⁷⁹ Mining activities also result in the acidification of surface waters.¹⁸⁰ In addition, suction dredge mining can potentially entrain fish embryos, juvenile salmonids, and smaller mature fishes (such as sculpin) into the dredge works.¹⁸¹

Mining impacts are most severe when these activities are located near or upstream of fish spawning and rearing areas; and when they occur in watersheds already degraded by past activities and where management emphasis is on resource extraction.¹⁸² Impacts on streams from past mining activity may still affect habitat quality; these impacts can persist for decades.¹⁸³

Recreational use can have both positive and negative intended and associated effects on fish, wildlife, and their habitats. Positive intended effects include habitat protection and enhancement for targeted species, such as waterfowl and songbirds. These effects can result from monies collected from recreational use and equipment fees and licenses. These monies can also be used to support the research and management of selected species. Negative intended effects result from the direct harvest of fish and wildlife, through legal and illegal hunting, trapping, and fishing. Another negative intended effect

¹⁷⁸ USDO/USFWS 1998b.

¹⁷⁹ Lee et al. 1997.

¹⁸⁰ USDO/USFWS 1998b.

¹⁸¹ Harvey et al. 1995.

¹⁸² USDO/USFWS 1998b.

¹⁸³ Lee et al. 1997; MBTSG (Montana Bull Trout Scientific Group) 1998.

is the introduction of a more "desirable" species, which adversely affects native species through competition, predation, and hybridization. The retention of land for recreational activities such as backpacking, horseback riding, recreational vehicle use, and road and trail development have the positive associated effects of preserving fish and wildlife habitat from other more damaging development. However, there is still a negative associated effect with increasing opportunities for recreational uses including recreational facilities such as ski areas and interpretive centers. Recreation development (for example, for parking or other facilities) may result in a loss of habitat, disruption of normal fish and wildlife activities, and deposition of trash (that is, fishing line or food debris that is a hazard to fish and wildlife).

Another negative associated effect on native fish and wildlife comes from the accidental introduction of exotic species. For example, recreational boating has led to the introduction of numerous non-native plants, such as Eurasian watermilfoil, and concern is growing about the potential introduction of zebra mussels.

Another negative associated effect of recreation on fish and wildlife can be caused when anglers wade into streams, destroying anadromous fish nests; by poaching; or through displacing disturbances from recreational noise.¹⁸⁴ Recreational use has the potential to affect aquatic habitat by: (1) altering upland and riparian soil and vegetation conditions that may lead to increased erosion and runoff, loss of cover and food resources, and reductions in water quality; and (2) instream changes that affect stream morphology, water quality, streamflow, substrate, and debris.¹⁸⁵ Recreational impacts are most severe where dispersed or developed facilities are located in nonfunctional riparian areas.

Industrial, residential, and commercial development may result in the negative associated effect of decreasing food sources, modifying habitat, introducing toxic chemicals that can injure or kill fish and wildlife, introducing exotic species, and influencing the hydrology and sediment transport processes, stream temperatures, nutrient cycling, and stream biota.¹⁸⁶ Another negative associated effect on fish and wildlife may result from injury or death from automobiles, boats, and other vehicles. An increasing regional population seeking to live near lakes has affected previously undeveloped rural areas.¹⁸⁷ Positive associated effects can result from increased food availability as increased populations of people generating waste and supplying fish and wildlife with other food sources. However, some might argue that an increase in artificial food sources is a negative associated effect as well.

Road management activities (the construction, use, maintenance, and decommissioning of roads, and the installation, use, replacement, and maintenance of culverts and bridges) can result in negative and positive associated effects on fish and wildlife. Road system

¹⁸⁴ USDA/USFS and USDO/BLM 1998.

¹⁸⁵ USDA/USFS and USDO/BLM 1998.

¹⁸⁶ Spence et al. 1996.

¹⁸⁷ USDA/USFS and USDO/BLM 2000a, Chapter 2 p. 29.

impacts are most severe where riparian areas are non-functional and roaded, where roads and road crossings occur on steep, unstable slopes, and where road densities are greater than 1.36 miles per square mile. The primary negative associated effects from these activities are short-term increases in fine sediment deposition and turbidity downstream of projects.¹⁸⁸ Decommissioned roads may continue to contribute sediment for a few years before sediment levels are effectively decreased.¹⁸⁹ Abandonment of roads includes a risk of increased sediment following rehabilitation activities and sediment inputs from poorly monitored, eroding, abandoned roads. Roads can also alter subsurface and surface water flows that, in turn, may alter both peak and base stream flows.¹⁹⁰

Other negative associated effects from roads include non-management-related impacts such as noxious weed introductions, illegal transplants of predatory or competing non-native fishes, increased harvest pressure and potential for poaching, dispersed recreation impacts, and potential introduction of toxicants from spills and roadside application of herbicides.¹⁹¹

Positive associated effects from road management can include the creation of microhabitats benefiting amphibians, reptiles, and insects (e.g. water in ditches alongside roads or pools of water in the roads). Other wildlife, such as birds and reptiles can benefit from the heat retention of roads in colder weather. Culvert replacement or upgrading should improve fish passage, decrease scouring effects of flood flows, and improve the transport of bedload and debris, though this is largely a mitigation measure. Improved conditions, following the upgrading or replacement of culverts, may occur within days or months. Road decommissioning should improve watershed and habitat conditions, provided that drainage patterns are reestablished.

Introduction of exotic species can have effects on fish and wildlife, and the quality and quantity of their habitat. Most of the effects are negative associated effects and can come from most of the types of land uses previously discussed. For specific discussions on these effects see Recreational Use; Industrial, Residential, and Commercial Development; and Road Management, above and Section 5.2.2.3 Fish and Wildlife.

Power generation (non-hydro) and transmission have negative and positive associated effects on fish, wildlife, and their habitats. These activities affect habitat and fish and wildlife by dedicating land for facilities and by managing the land after construction of facilities.

Negative associated effects from power generation include the loss and degradation of habitat from construction of facilities, and increased human activity resulting in fish and wildlife disturbance and death. Another negative associated effect comes from the

¹⁸⁸ USDO/USFWS 1998b.

¹⁸⁹ USDO/USFWS 1998b.

¹⁹⁰ NMFS 1997; Jones, J.A. and G.E. Grant 1996.

¹⁹¹ USDA/USFS and USDO/BLM 1998.

reduction of air quality, including the creation of acid rain. Positive associated effects can result in maintaining habitat and reducing further development. For example, the construction of wind farms results in the preservation of larger open spaces.

Negative associated effects from transmission facilities also include habitat loss or degradation due to construction. Other negative associated effects from transmission can include the disturbance, injury, or death of fish and wildlife during construction, operation, and maintenance of transmission facilities. Positive associated effects from transmission include increased nesting, hunting, and roosting habitat for many species of birds. Also, the vegetation maintenance of the transmission corridors provides early successional habitat for songbirds and migration corridors for some mammals. This maintenance also increases species diversity.

Relationship Between Land Use and Water

In general, land management actions that disturb ground and remove vegetation have the following relationships with down slope aquatic resources:¹⁹²

- (1) reduce connectivity (i.e., the flow of energy, organisms, and materials) among streams, riparian areas, floodplains, and uplands;
- (2) elevate watershed sediment yields, leading to pool filling and elimination of spawning and rearing habitat;
- (3) reduce or eliminate instream replenishment of large woody debris that traps sediment, stabilizes streambanks, and helps form pools;
- (4) reduce or eliminate vegetative canopy that minimizes temperature fluctuations;
- (5) cause streams to become straighter, wider, and shallower, which has the tendency to reduce spawning and rearing habitat and increase temperature fluctuations;
- (6) alter peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior;
- (7) alter water tables and base flows, resulting in riparian wetland and stream dewatering; and
- (8) contribute to degraded water quality by adding toxicants through mining and pest control.

Any of the land use activities described above can affect fish and wildlife, and their habitat quality and quantity as it pertains to water quality and habitat. These relationships and their intended and associated effects are discussed below.

¹⁹² NMFS 1998b; USDA/USFS and USDO/BLM 2000d.

5.2.2.2 Water¹⁹³

Human Activities

The types of activities that affect water use and value of habitat are as follows:

- diversions and beneficial and consumptive uses of water;
- reservoir operations;
- hydropower operations; and
- land use activities that affect water quality (see Section 5.2.2.1 for a non-exclusive list of land use activities).

Possible Adverse Effects

Adverse effects to fish and wildlife and their habitat include:

- impacts to water quality and flow from land use activities;
- water withdrawals that reduce flow and water quantity and remove organisms from aquatic systems
- impacts to water quality, velocity, and flow through river and reservoir operations for multiple uses;
- loss of riverine habitat caused by reservoir inundation;
- loss of reservoir habitat due to hydro operations; and
- impediments to fish passage caused by dams and other structures and the slack water behind them.

Context and Intensity

Many factors influence the degree of effect human activities have on water use, water quality, and aquatic habitat, as illustrated in Table 5.2-3.

Table 5.2-3: Some Factors That Shape Effects of Water on Fish and Wildlife

Factors Leading to Effect	Effect
Factors affecting land use See Table 5.2-1	Water-induced erosion, degraded runoff, non-point source pollution and sedimentation
Reservoir levels and normal operating range, inflow, spill operations, bypass facilities in place, fish transportation, flows through turbines, turbine efficiency	Fish passage survival; conditions for resident fish spawning, rearing, and foraging
Reservoirs built	Amount of riverine habitat lost
Operations for hydropower, flood control, irrigation, fish and wildlife, other purposes	Downstream flow, water quality, and saturated gas conditions; sedimentation, riparian floodplains

¹⁹³ Consequences discussions are drawn directly from existing regional studies. Also see Federal Caucus 1999b and 2000b; Council 2000a; Corps 2002b; USDA/USFS and USDO/BLM 2000b; and USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

Factors Leading to Effect	Effect
Growth and types of development, water pollution laws, pollution control technology	Amount and characteristics of point-source water pollution, water withdrawals
Agricultural markets, agricultural costs, irrigation technology and costs, water conveyance technology and costs, water conservation and screening incentives	Amount of irrigation, irrigation efficiency, amount of diversion, and mortality of aquatic life

Possible Mitigation Measures

Impacts from **diversions and beneficial and consumptive uses of water** can be improved by the following:

- reducing water withdrawals;
- retiring irrigated land;
- fallowing of irrigated land in dry years to maintain downstream flows;
- using irrigation-water conservation techniques to reduce diversions and return flows, often with water quality and quantity benefits for the aquatic system; and
- screening irrigation diversions to avoid direct mortality of juvenile salmonids.

Reservoir operation impacts to fish and wildlife can be reduced by:

- decreasing nitrogen supersaturation:
 - lower reservoir crest levels;
 - build more reservoir storage capacity; and
 - draft reservoirs deeper for flood control, leading later to reduced spill;
- reducing temperature:
 - adjusting pool elevation to allow cold water releases (but the relationships are complex and differ among projects: storage pools are deep and stratify thermally during the summer, while run-of-the-river pools typically have more uniform temperature distribution);
 - using techniques to provide adequate shade to help control temperature (stable flows and periodic flooding without drawdowns help maintain riparian vegetation for shading);
- minimizing water quality impacts from navigation and recreational boating.

Hydropower operation impacts to fish and wildlife can be reduced by

- improving adult fish passage;
- improving collection and transport past dams (e.g., barging and juvenile bypass systems);
- increasing spill;
- improving turbine efficiency; and

- decreasing nitrogen supersaturation:
 - control spill through increased power generation, the use of storage, surface bypass, and other means;
 - modify facilities to reduce the potential for supersaturated water, such as installing deflectors;
 - use juvenile bypass or transportation systems to keep fish away from areas with supersaturated water;
 - remove dams.

Impacts from **land use activities that affect water quality** can be reduced by the following:

- reduce sedimentation (see Section 5.2.2.1 for examples of possible mitigation for sediment-creating land use activities).
- reduce water temperature by:
 - reducing irrigation return flows (which are often warmer than receiving water) through irrigation water management or land retirement;
 - retaining riparian vegetation shade;
 - reducing water withdrawals;
 - using conservation irrigation techniques; and
 - using air-cooled CTs.
- reduce non-thermal pollution by:
 - fencing out livestock and providing alternative watering sources on uplands to reduce livestock effects on aquatic systems;
 - seasonal or rotational livestock grazing, reduced grazing intensities, deferred grazing, and land acquisition and retirement;
 - strategies to avoid polluted surface water runoff from agriculture, including such changes in farming practices as modified cultivation practices, conservation tillage, no-till agriculture, development of tailwater ponds to retain water, increased use of organic farming techniques, and cropping changes to reduce or capture impaired runoff;
 - using BMPs to prevent offsite water quality degradation from feedlots;
 - using strategies to reduce degraded irrigation return flows, including irrigation land retirement, lease or purchase of irrigation water, and irrigation water conservation;
 - using wastewater and sedimentation ponds to retain and treat degraded runoff from uplands;

- capping contaminated sediments with clean material (contaminated sediments are rarely dredged because dredging disperses the pollutants and creates a disposal problem); and
- filtering or distilling out metals and organic contaminants in water (the processes are expensive and typically sterilize the water of all living organisms).

Discussion

Diversions and Beneficial and Consumptive Uses of Water can result in associated effects on fish and wildlife from changes in water quantity and quality. Negative associated effects can stem from draining wetlands or dewatering streams for irrigation, which can result in the mortality of fish and other aquatic species. Diverting water from natural stream habitat into constructed channels for agriculture also has negative effects on fish, wildlife, and their habitats. These diversions reduce habitat connectivity for fish and other aquatic species. These same constructed channels can impede wildlife movements and diminish natural sources of water. The withdrawal of water for other beneficial and consumptive uses can cause negative associated effects related to water quality. Water returning to the rivers and streams after being put to a beneficial use (e.g., irrigation return flows and discharge from industrial or other sources) can alter stream temperatures or increase pollution.

Hydropower Operations and Reservoir Operations can have both intended and associated effects on fish, wildlife, and their habitats. Hydropower and reservoir operations have positive intended effects for fish and wildlife. For example, hydropower operation is tailored to insure adequate flows in the Vernita Bar area helping to maintain strong healthy populations of fall chinook salmon (upriver brights). It should be acknowledged, however, that many intended effects are from mitigation actions. Structural improvements, such as adult and juvenile anadromous fish passage (e.g., fish ladders, juvenile bypass systems, and fish friendly turbines), and operational changes, including modifications of flow and spill regimes, are intended to improve conditions and survival for anadromous fish. These mitigation actions also have associated effects that are both negative and positive. A negative associated effect from the structural improvements includes increased anadromous fish predation and mortality related to sudden pressure changes and disorientation. Positive associated effects from these structural improvements included increased prey base for fish and avian predators and dam passage for resident fish. Operational changes also result in positive associated effects. These include increased dissolved oxygen levels, prey availability, resident fish passage, and habitat availability downstream. Negative associated effects include increased total dissolved gas supersaturation, water temperature, and anadromous fish predation. As spill increases, the incremental benefits of increasing spill diminish. At higher spill levels, the risk of undesired effects also increases, including risks to both juvenile and adult migrants (as well as resident species) from gas supersaturation and adverse hydraulic conditions.

Dam and reservoir operation also have negative intended effects on fish, wildlife, and their habitat. Historically, choices were made to give a priority to power, irrigation, flood control, navigation, and recreation over the needs of anadromous fish. Today operational choices are made that are intended to negatively affect strong fish stocks in order to benefit listed fish. Another intended effect on fish is reservoir operations designed to allow for continued recreational fishing opportunities.

Associated effects of dam and reservoir operations can be both positive and negative. Positive effects arise from reservoir operations that result in maintained levels benefiting resident fish and wildlife. For example, the creation and operation of reservoirs has resulted in increased resident fish populations like the northern pikeminnow and smallmouth bass. The documented adverse effects of hydroelectric project development on fish and aquatic life are numerous and generally irreversible, and occur to some degree regardless of the mitigation measures applied to reduce the level of effects.¹⁹⁴ During their downstream migration, juvenile anadromous fish can be harmed by the hydrosystem in several ways.¹⁹⁵ Adverse associated effects include loss of fish passage, loss of spawning habitat, disruption of hydrologic connectivity (both laterally and longitudinally), changes in stream water temperature, increased salmon predation, altered patterns of nutrient cycling, and reduction in water quality and natural channel functioning. The creation of reservoirs has also resulted in increased migration times further affecting anadromous fish survival.

As previously stated, dam and reservoir operations have negative associated effects on fish, wildlife, and their habitat through the reduction of water quality. One effect on water quality comes from increased nitrogen supersaturation, also known as total dissolved gas, which is associated with spill. As spill increases so does the amount of dissolved gas resulting in negative effects on fish.

Flow augmentation can result in increased turbidity, the amount of non-thermal pollution, and alter the temperature regime. Negative associated effects from flow are often tied to reservoir management. Increased water turbidity caused by disturbance of existing sediments behind the dam and reservoir bank erosion from reservoir operations can have adverse effects on fish and wildlife. However, some level of sediment may be important to certain organisms. For example, turbid conditions during spring freshets may be helpful to migrating juvenile salmon and sturgeon. Sedimentation reduces survival of eggs and alevins, reduces primary and secondary productivity, interferes with feeding, causes behavioral avoidance and breakdown of social organization, and fills pools or adds new, large structures to channels.¹⁹⁶ Sediment can also contain non-thermal pollutants harmful to fish, wildlife, and their habitat. They represent a hazard to aquatic

¹⁹⁴ USDOJ/USFWS 1998b.

¹⁹⁵ NRC (National Research Council) 1996.

¹⁹⁶ Spence et al. 1996.

life and human health because of their toxicity at low levels, persistence, and bioaccumulation factors.¹⁹⁷

Water temperatures can increase or decrease downstream as a result of water released from reservoirs. Cold water releases are meant to lower water temperature for salmonids, although it can also cause increases in sedimentation. Other water releases can cause temperature increases as warm water is released from the reservoir. These temperature increases can result in higher fish mortality.

Land Use Activities that Affect Water Quality have positive and negative intended and associated effects. For a complete discussion see Section 5.2.2.1 above.

5.2.2.3 Fish and Wildlife¹⁹⁸

Human Activities

The previous two sections explained how human use of land and water affects fish and wildlife. Fish and wildlife life-cycle diagrams (Figures 5-2, 5-3, 5-4, 5-5, 5-6, and 5-7) were created to illustrate where in the life cycles different effects occur and have the most impact. The interaction of land and water effects with the life cycles is central to the analysis conducted in Section 5.3 below.

Land and water use activities are not the only human activities that affect fish and wildlife. Other human activities that affect fish and wildlife include the following:

- commercial harvest, including tribal and non-tribal;
- recreational hunting and fishing;
- fish hatcheries and other artificial production facilities;
- introduction and spread of exotic plants and animals; and
- fish and wildlife management activities.

Possible Adverse Effects

Some examples of major adverse effects at particular life-cycle stages of fish and wildlife are shown in the diagrams on the following pages. Many of these effects were discussed in Sections 5.2.2.1 and 5.2.2.2, including hunting, recreational fishing, and quality and quantity of habitat. Other adverse effects include:

- direct harvest mortality, including commercial fish harvest and recreational hunting and fishing;
- incidental (bycatch) harvest mortality;

¹⁹⁷ NRCC (National Resource Council of Canada) 1981; Eisler, R. 1986.

¹⁹⁸ Consequences discussions are drawn directly from existing regional studies. Also see Federal Caucus 1999b and 2000b; Council 2000a; Corps 1999a; USDA/USFS and USDO/BLM 2000a and 2000b; and USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

- poaching;
- reduced genetic diversity by harvest;
- competition with hatchery fish for food and space;
- artificial selection and breeding with hatchery-produced fish, leading to long-term changes in genetic characteristics of stocks;
- competition for space or food, predation, or replacement of valuable food sources by exotics;
- maintenance of unnaturally high predator populations by large influxes of juvenile hatchery and exotic fish;
- interference with movement and migration;
- mortality due to delayed migration;
- disease; and
- habitat loss.

Context and Intensity

Many factors can influence the effects of human activities on fish and wildlife. Many of these factors are related to land and water effects; these factors were noted above in Tables 5.2-2 and 5.2-3, respectively. Additional factors include harvest (hunting and fishing), hatcheries, and introduced species as shown in Table 5.2-4. In addition, many social, cultural, and economic factors interact with habitat, harvest, hatcheries, and hydro to determine their consequences for fish and wildlife, as discussed in Section 5.2.3.

Table 5.2-4: Some Factors That Shape Effects on Fish and Wildlife

Factors Leading to Effect	Effect
Land use and terrestrial habitat	Amount and quality of terrestrial habitat; see Table 5.2-1
Water use and aquatic habitat	Amount and quality of aquatic habitat; see Table 5.2-2
Commercial fishing seasons, regulations, economics, size of the fishing fleet	Direct and incidental fish mortality
Recreational fishing seasons, regulations, gear restrictions	Direct and incidental fish mortality
Recreational hunting seasons, regulations	Direct and incidental wildlife mortality
Poaching (illegal hunting and fishing) and illegal trade	Direct and incidental fish and wildlife mortality
Number of fish produced by hatcheries, timing and location of releases; types of hatcheries	Interaction of hatchery and wild fish, extent of cross-breeding and introduction of disease
Types, locations, and densities of exotic plant and animal species	Interactions between exotic and native species; localized native species extinctions

**Figure 5-2: Examples of Major Adverse Effects:
 Anadromous Fish Life Cycle**

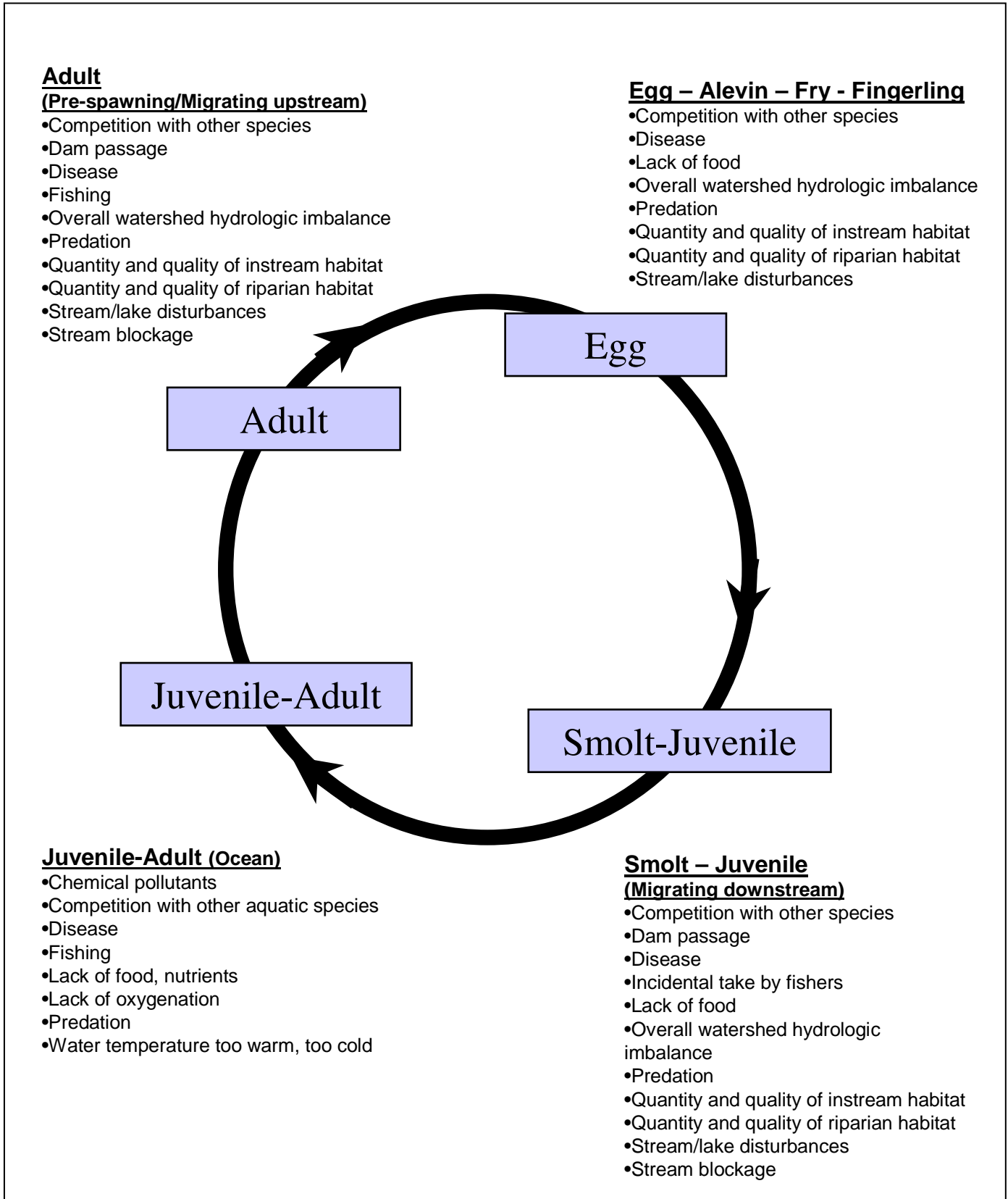
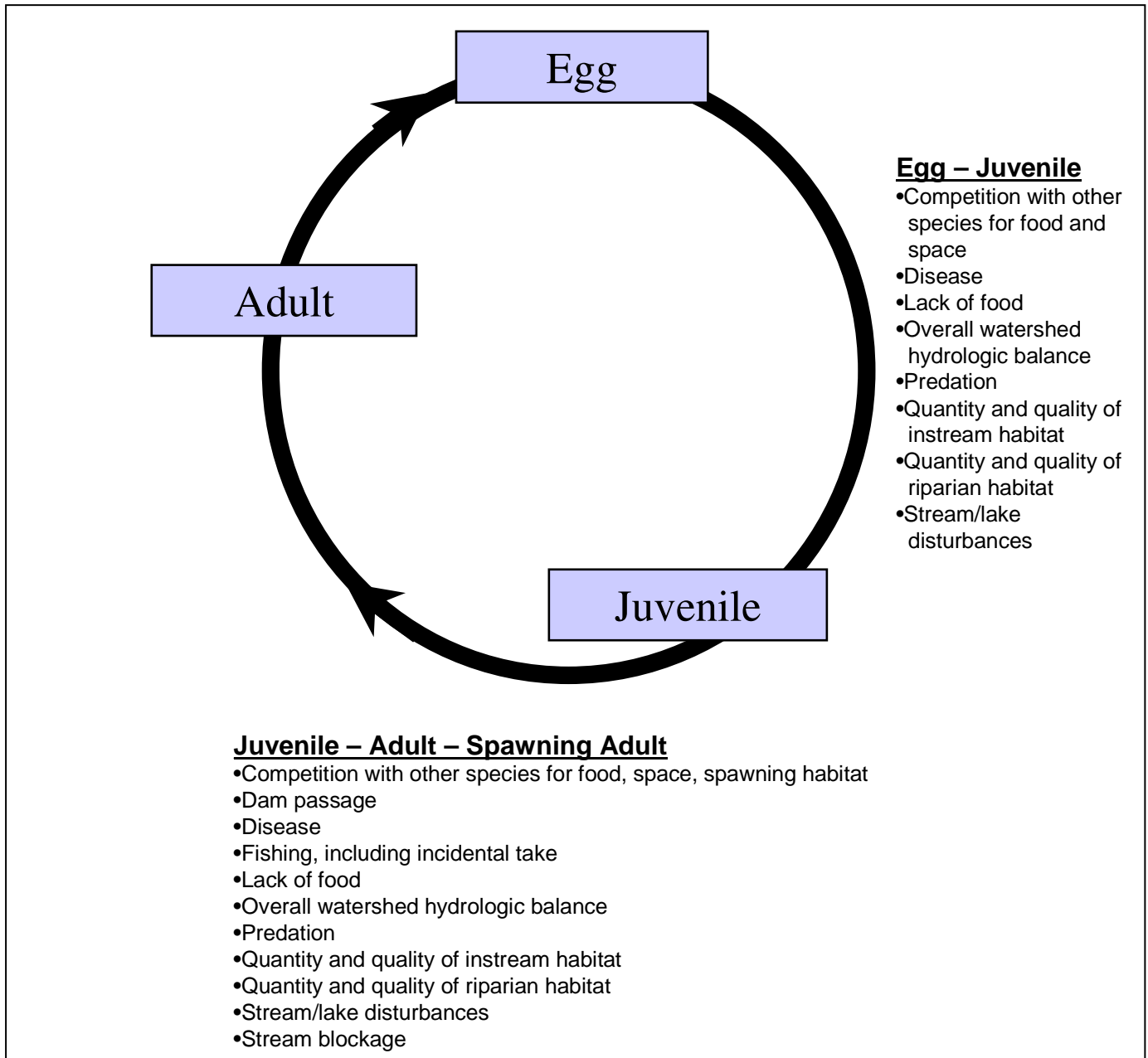
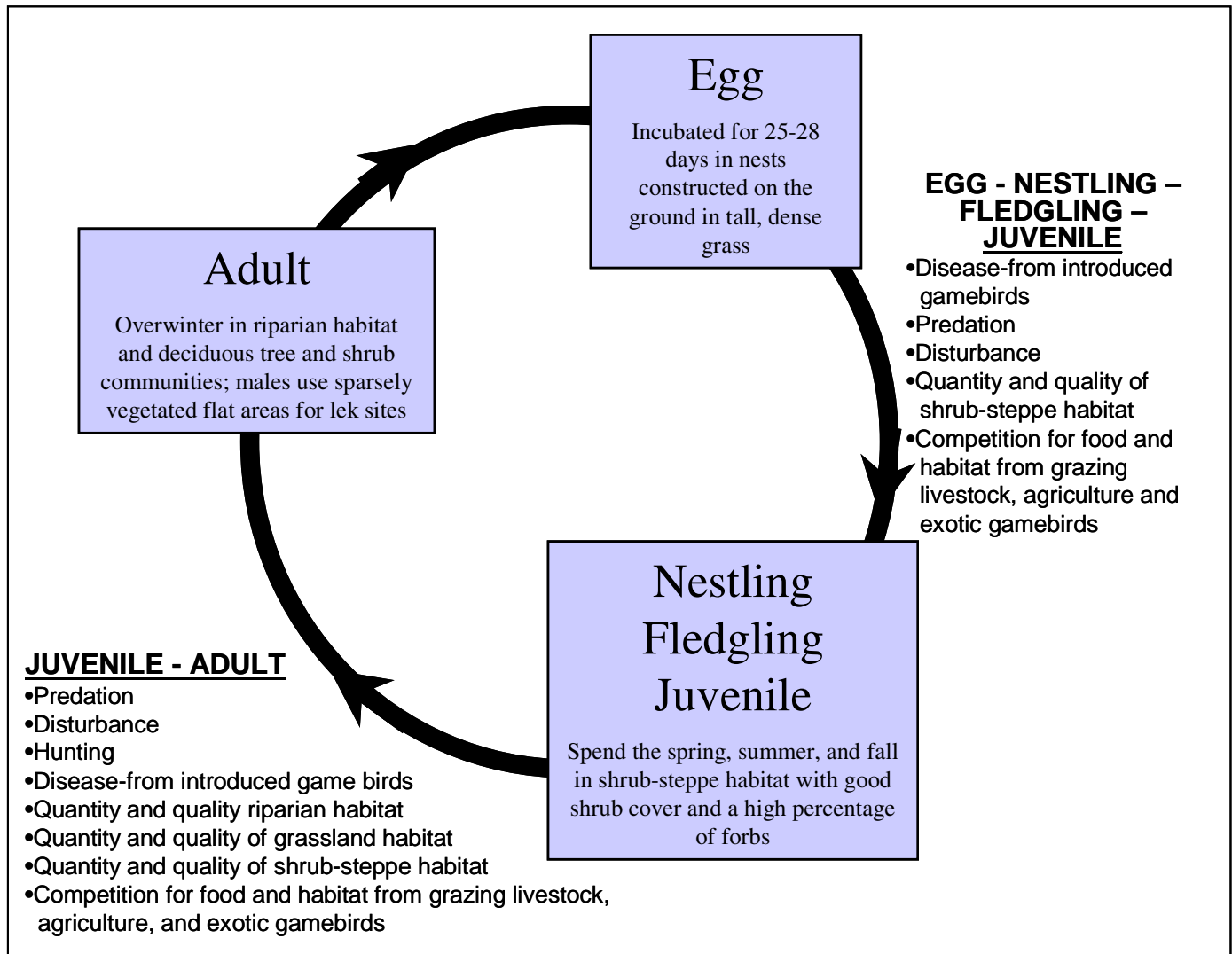


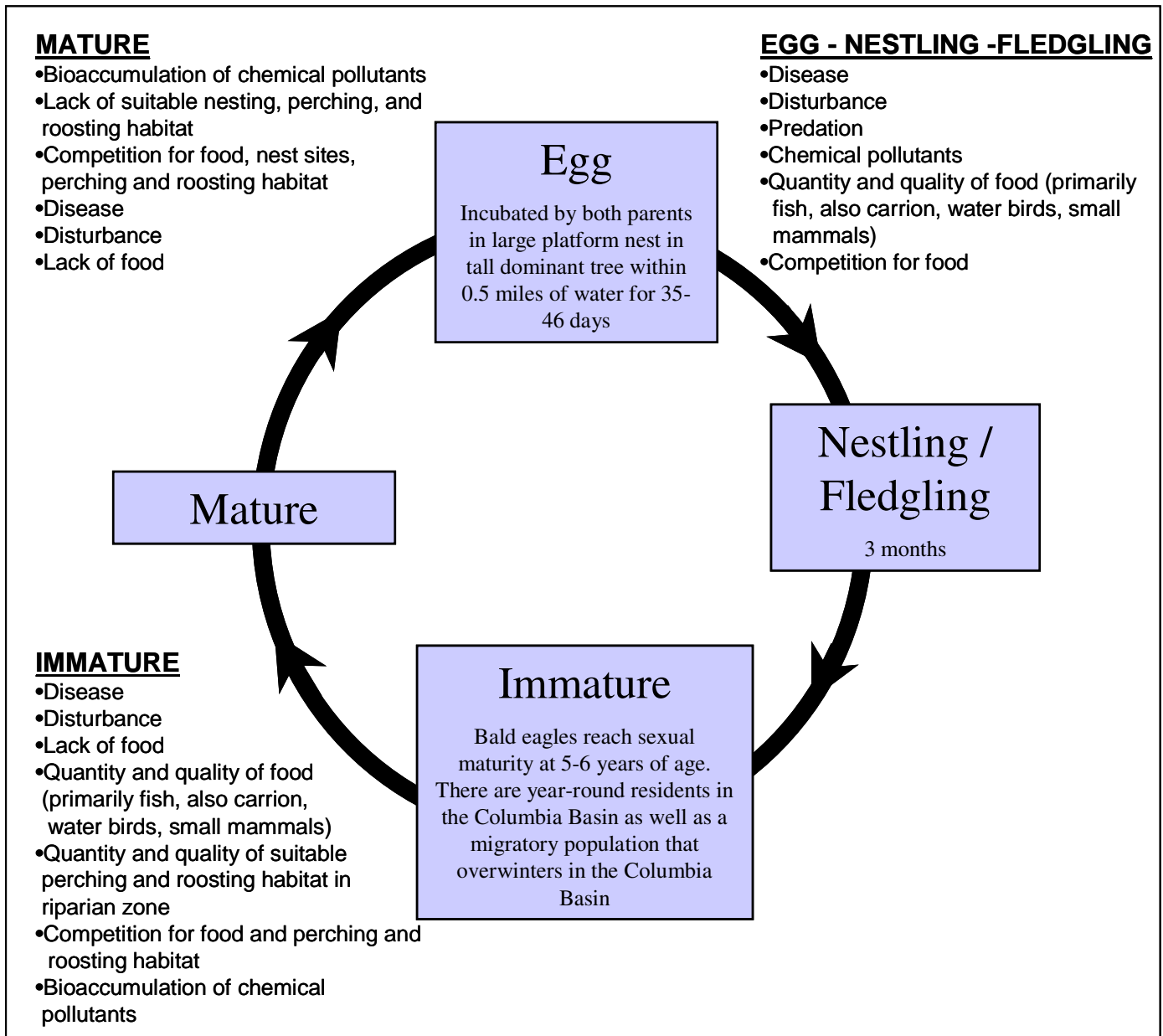
Figure 5-3: Examples of Major Adverse Effects:
Resident Fish Life Cycle



**Figure 5-4: Examples of Major Adverse Effects:
 Life Cycle of Sharp-tailed Grouse**



**Figure 5-5: Examples of Major Adverse Effects:
 Life Cycle of the Bald Eagle**



**Figure 5-6: Examples of Major Adverse Effects:
 Life Cycle of Migratory Nesting Waterfowl**

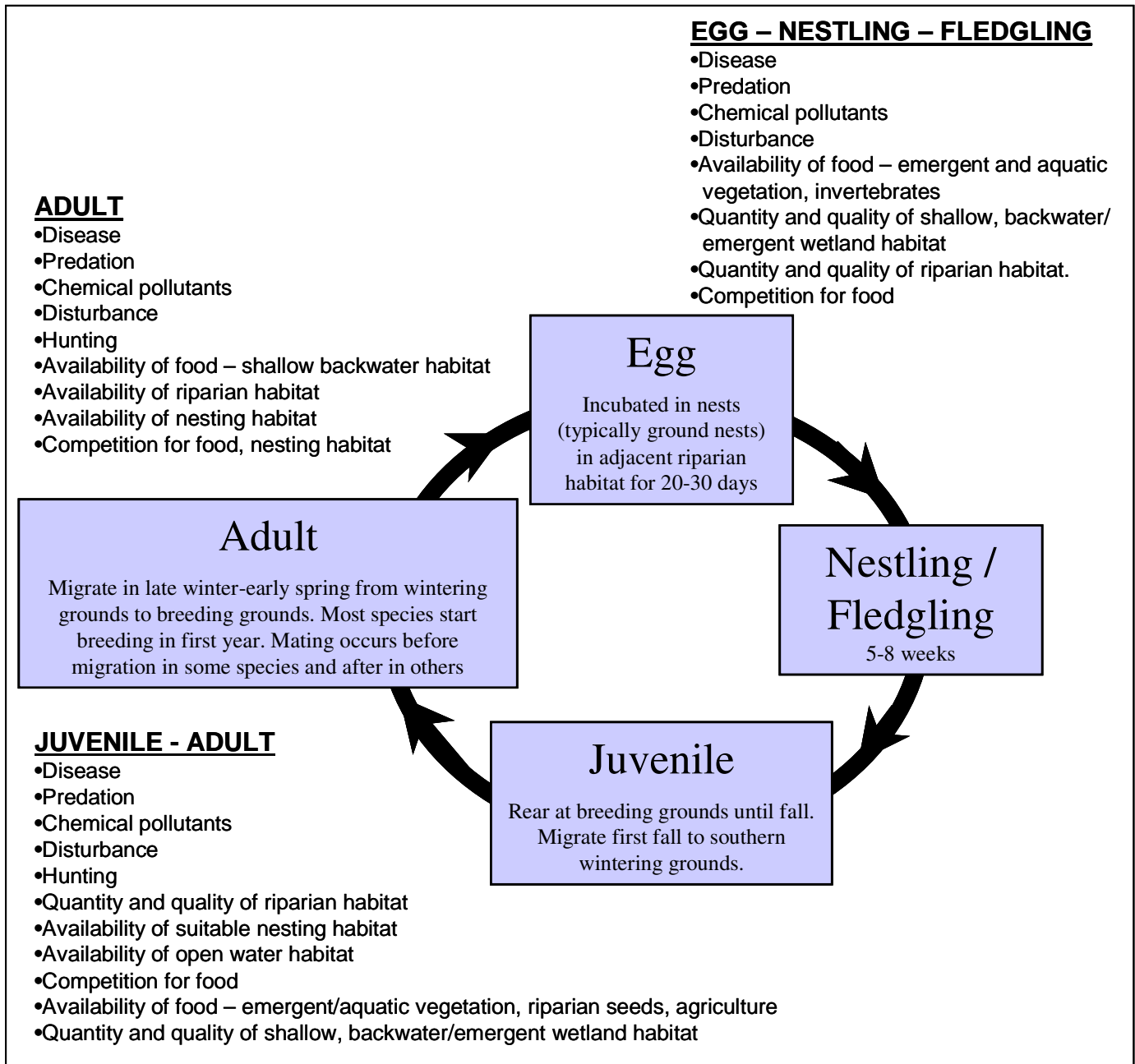
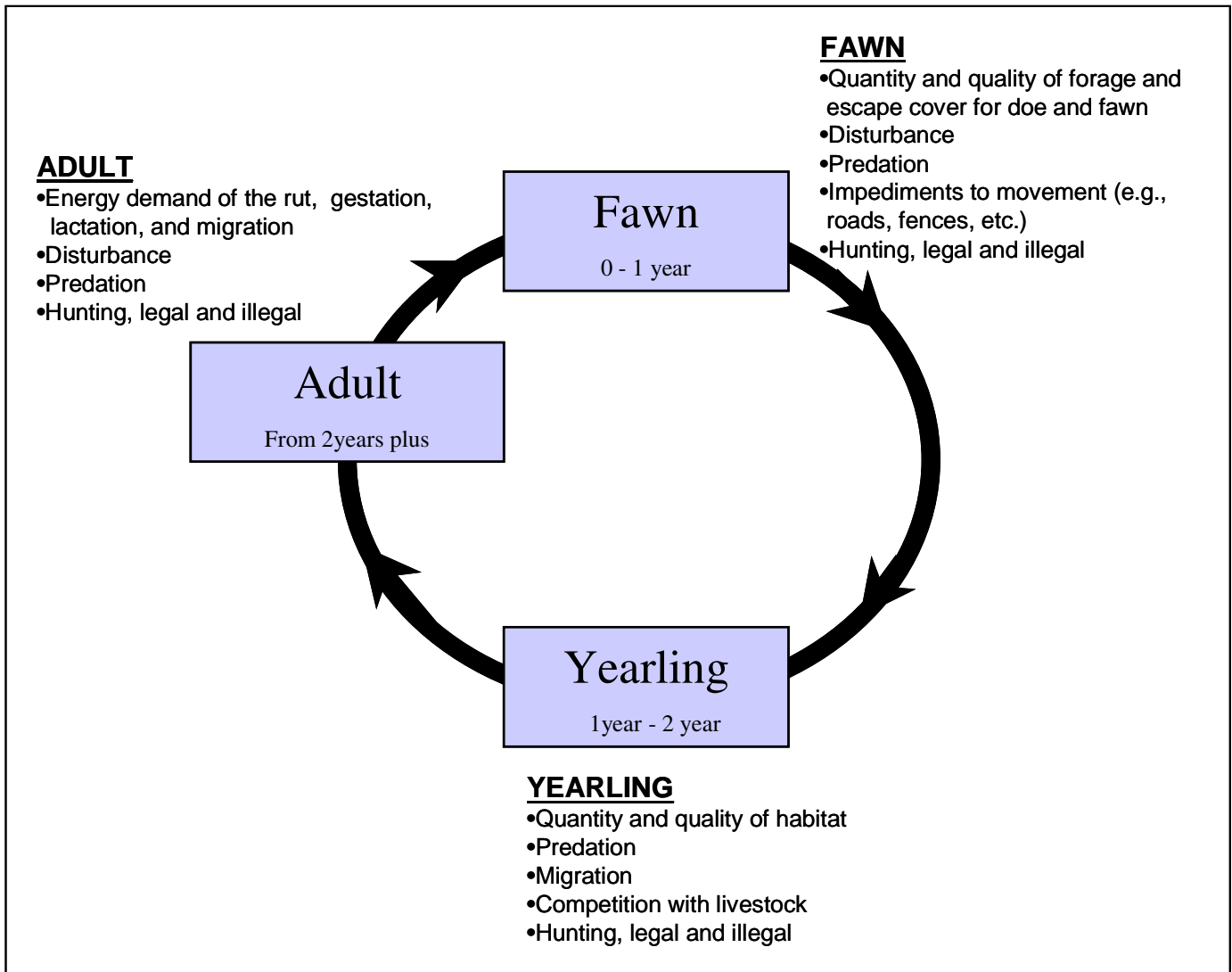


Figure 5-7: Examples of Major Adverse Effects:
Life Cycle of Deer



Possible Mitigation Measures

Commercial harvest impacts to fish and wildlife can be reduced by:

- reduction of the fishing season;
- reduction of catch limits;
- change of fishing gear regulations;
- increased enforcement of regulations;
- development of selective fishery techniques;
- change of international fishing treaties;
- buy-out of fishing permits;
- development of terminal fisheries;

Recreational hunting and fishing impacts to fish and wildlife can be reduced by:

- reduction of hunting and fishing seasons;
- reduction of bag/catch limits;
- changes of gear regulations (such as flies only or barbless hooks);
- increased enforcement of regulations;
- controlled hunts and selective harvests.

Hatchery impacts to fish can be reduced by:

- phase-out hatcheries;
- shift to conservation hatcheries;
- employ management techniques such as supplementation to provide eggs and juveniles for outplanting;
- mark hatchery fish for better identification when harvested;
- eliminate hatchery production of non-native fish; and
- use stream-specific brood stock and regulate the timing and location of releases.

Impacts from **exotic species** on fish and wildlife can be reduced by:

- increase regulations and penalties for importing exotic species;
- actively manage the spread of introduced species;
- eliminate hatchery production of non-native species; and
- focus on enhancing habitat with native vegetation.

Impacts from **fish and wildlife management** on other non-targeted fish and wildlife can be reduced by:

- reducing spill intended for anadromous fish to benefit resident fish;
- eliminate stocking of non-native species (e.g., brown trout, chukar); and
- shift to an ecosystem management approach.

Discussion

Commercial harvest may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events. Harvest has both intended and associated effects on fish and wildlife. A negative intended effect of commercial fish harvest is the reduction in fish populations through actual harvest. Negative associated effects from harvest include incidental catch of non-target fish species (bycatch), reduction in genetic diversity, and the mortality of marine mammals. A positive associated effect of fish harvest can include a reduction in species competition through lower populations.

Recreational hunting and fishing can have both intended and associated effects on fish and wildlife. Similar in nature to commercial harvest, a negative intended effect is the reduction of fish and wildlife populations through increased mortality. A positive intended effect, correlated to fish and wildlife management activities, includes a increase in fish and wildlife as hunting and fishing is used as a management tool to improve species health (see Fish and Wildlife Management Activities, below). Negative associated effects on fish and wildlife include injury, incidental mortality, and behavioral disturbances. Positive associated effects include the reductions of density related pressures, like disease, and increased genetic diversity.

Hatcheries have both intended and associated effects on fish and wildlife. Negative intended effects on fish result from the main purpose of hatcheries: to produce fish for harvest. A positive intended effect is increased stock viability, an intended purpose of the conservation hatcheries. There are numerous negative associated effects on fish and wildlife. The negative associated effects on fish include the contribution to extinctions of wild runs, inbreeding and the promotion of deleterious genes, increased competition for food and habitat, increased predation on wild fish, disease spread to wild fish, reduction in war quality from increased effluent, and shifts in migration timing. Negative associated effects on wildlife include reductions in water quality from increased effluent, and predator controls at hatchery facilities.

Exotic Species can have both intended and associated effects, both positive and negative, on native fish and wildlife. A negative intended effect from exotic species is the elimination of undesirable native species. Positive intended effects from exotic plant species include the increase in forage for native herbivores and cover for other species. Some negative associated effects from introduced species on native fish and wildlife are the elimination of or competition with native species, spread of disease, hybridization, reduced genetic diversity, maintenance of an artificially high predator base¹⁹⁹, impacts to the quality and quantity of habitat.

Fish and Wildlife Management Activities are taken to meet the needs of humans, whether it is for consumptive (e.g., commercial harvest, recreational hunting and fishing)

¹⁹⁹ Predator levels are kept artificially high when introduced prey species increase. This in turn can result in increased predation of the native prey species.

or non-consumptive (e.g., bird watching, existence value) uses. Wildlife management activities include habitat improvements such as winter range burning, reconnecting habitat, and reducing fragmentation; water developments; and snag management. Fish management activities include streambank restoration, fish reintroductions, conservation hatcheries, and retention of instream woody debris. These activities can have both intended and associated effects on fish and wildlife. Negative intended effects include the intentional removal of targeted, unwanted species (e.g., northern pikeminnow bounties, culling ungulate herds, dewatering stream). Positive intended effects can include increases in species and genetic diversity, abundance of targeted species, and quality and quantity of habitat. Positive intended effects can also be increases in habitat diversity and connectivity. Some negative associated effects on fish and wildlife are the death of non-targeted species, reductions in the quantity and quality of habitat, and increased competition, predation, and stress between targeted and non-targeted species. For example, instream habitat restoration projects may cause short-term sedimentation.²⁰⁰ Surveys and population sampling, such as smolt traps and electrofishing, will result in harassment and may result in injury or death of individual fish. Many of the intended and associated effects on fish and wildlife from fish and wildlife management activities are the same as those previously discussed in the effect categories above.

5.2.3 Generic Environmental Effects on Humans from Actions Taken for Fish and Wildlife Mitigation and Recovery

MAJOR SUBJECTS: This section focuses on the potential effects from fish and wildlife mitigation and recovery efforts on humans, including the following areas:

- *Air Quality*
- *Economic Environment*
- *Social Environment.*

5.2.3.1 Air Quality²⁰¹

Fish and Wildlife Actions

The types of fish and wildlife actions that can affect air quality include:

- reservoir drawdown or breaching; and
- changes in hydrosystem operation resulting in air emissions from replacement power; and
- wildlife range burning.

²⁰⁰ Consequences discussions are drawn directly from existing regional studies. Also see Federal Caucus 1999b and 2000b; Council 2000a; Corps 1999a; USDA/USFS and USDO/BLM 2000b and 2000c; and USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

²⁰¹ Consequences discussions are drawn directly from existing regional studies. Also see Federal Caucus 1999b and 2000b; Council 2000a; Corps 1999a; USDA/USFS and USDO/BLM 2000; and USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

Possible Adverse Effects²⁰²

Possible adverse effects are listed below.

- **Reservoir drawdown and breaching** can result in the following effects:
 - dust blowing from exposed reservoir sediment (some of which may contain heavy metals and other potentially toxic materials);
 - increased emissions and dust from deconstruction activities;
 - increased emissions from rail and truck traffic as a result of the loss of navigation;
 - increased air emissions from thermal generation to replace lost hydropower (however, these increased emissions could be limited by relying on energy conservation and renewable energy resources, such as wind.); and
 - reduction in visibility from increased photochemical smog and particulate matter.
- **Changes in hydrosystem operations** can result in increases in the following emissions as a result of increased thermal generation:
 - particulate matter can have adverse health effects; it can also discolor paint, corrode metal, and reduce visibility;
 - heavy metals can permanently damage the brain, kidneys, and developing fetuses. Some heavy metals bioaccumulate and render fish and wildlife unhealthy to eat;
 - CO in low concentrations results in flu-like symptoms, and is lethal in high concentrations;
 - SO₂ causes corrosion, respiratory irritation, and reduced visibility;
 - NO_x have effects similar to SO₂, and can also slow plant growth and reduce crop yield;
 - CO₂, characterized as a greenhouse gas, absorbs heat radiated from the earth, contributing to global warming; and
 - some PAHs are probable human carcinogens and may cause other detrimental human health effects.
- **Wildlife range burning** can result in the following effects:
 - increased particulate matter from wind erosion after fire treatments can have adverse health effects; it can also discolor paint, corrode metal, and reduce visibility; and
 - increased CO₂ due to burning organic material contributing to global warming.

²⁰² USDOE/BPA, Corps, and Bureau 1995, Section 4.2.3.

Context and Intensity

Most factors influence the amount, location, and severity of air quality effects; some of these factors are listed in Table 5.2-5. The types, amount, and location of new generation capacity are also important; these factors are shown in Section 5.2.3.2, Table 5.2-6.

Table 5.2-5: Some Factors That Shape Effects on Air Quality

Factors Leading to Effect	Effect
Replacement power for lost or reduced hydropower generation	Emission characteristics of new generation
Which dams are breached	Location of most upstream navigation port and amount of new transportation and air emissions required, amount and location of exposure of reservoir bottoms and particulate air effects, amount and location of air quality problems caused by deconstruction
Shift to rail and truck transportation to replace lost navigation	Selection and location of new mode of transportation, and type and location of air pollution
Type and timing of restoration of former reservoir bottoms, weather conditions during exposure, success of restoration	Particulate matter exposure levels and duration
Wildlife range burning	Degraded air quality in terms of particulate matter and CO ₂

Possible Mitigation Measures²⁰³

Appropriate mitigation measures for adverse air quality effects vary according to the source of the air emission.

Mitigation **for particulate matter from exposed sediments**, may include:

- reseeded as soon as practical;
- remove and treat heavy metal sediment;
- land contouring and management to reduce wind erosion; or
- watering to reduce wind erosion.

Mitigation **for products of thermal generation (most likely combustion turbines)**, may include:

- power facility location;
- substitute renewable power sources for thermal generation;
- use of modern air pollution control technology; and
- carbon sequestration.

²⁰³ USDOE/BPA, Corps, and Bureau 1995, Section 4.2.3.

Mitigation **for increased air pollution from transportation**, may include:

- increased vehicles emission controls;
- use of rail instead of trucks where possible;
- highway improvements to accommodate increased traffic; and
- carbon sequestration.

Mitigation **for increased air pollution from prescribed range burning**, may include:

- timing and weather restrictions;
- size and pattern of area burned;
- frequency of burns; and
- location of range to be burned.

Discussion

Reservoir drawdown and breaching to benefit fish and wildlife can have negative associated effects on humans in terms of reduced air quality. These effects are a result of increased particulate matter caused by erosion and exposed sediment from drawdown and breaching; increased dust and emissions from deconstruction activities; and increased emissions as transportation shifts from navigation to road and rail. The associated effects include impacts to human and animal (livestock) health through degraded air quality; and crop and forest damage, damage to buildings and other structures, and reductions in water quality through increased acid rain and chemical depositions. Two other associated negative effects include reductions in visibility and increased contributions to global warming.

A short-term positive associated effect is improved air quality as industrial production is curtailed due to rising energy costs from the loss of hydro generation. However, in the long-term this positive effect would likely be quickly followed by a negative effect as other power producers develop new thermal generation, which could include diesel. This would result in some of the industrial facilities resuming full production, resulting in increased emissions. Also, as a result of increased power costs, some residential customers may switch to lower cost fuels relying more on wood or fossil fuels, further impairing air quality.

Changes in hydrosystem operations to benefit fish and wildlife can have similar associated effects as those discussed in **Reservoir drawdown and breaching** above, but to a lesser extent. A positive associated effect from changes in hydrosystem operations is related to the installation of high-efficiency, fish-friendly turbines. The increased hydroelectric power generated would delay the need for air-quality impairing thermal generation.

Wildlife range burning has negative associated effects. The exposure of soils and the creation of ash increases particulate matter through wind—degrading air quality for humans. Also, burning organic material creates CO₂, which contributes to global

warming. Both of these can also result in decreased visibility. However, regeneration of wildlife range vegetation can result in decreases of CO₂, through carbon sequestration.

5.2.3.2 Economic Environment

Actions taken for fish and wildlife affect economic activities. Those most affected by fish and wildlife actions are as follows:

- Power and Transmission;
- Transportation;
- Agriculture, Ranching, and Forest Products;
- Commercial Fishing;
- Other Industry;
- Recreation; and
- Industrial, Residential, and Commercial Development.

Some actions specifically impact a particular industry. Actions to reduce fish harvest, for example, have readily identifiable effects on commercial fishing. Actions such as fencing sensitive areas for wildlife would most likely impact ranching. Other actions taken for fish and wildlife can affect several industries.

Habitat actions to improve riparian lands may affect multiple industries, such as agriculture, ranching, and forestry; or development, depending on which industry happens to be located in the riparian zone. Dam breaching for anadromous fish would likely affect all the economic areas listed above.

Some actions may not affect any particular economic area. For example, actions to modify instream areas and instream passage might not create any loss of economic activity in any industry; economic costs are generally just the costs of implementing the actions. Instead the regional economy as a whole is impacted by the cost of funding and implementing fish and wildlife mitigation and recovery actions.

Following the assessment for each economic area below is a discussion of the potential generic effects of actions taken for fish and wildlife on the regional economy including regional employment.

Power and Transmission

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that would affect electric power generation and transmission include:

- dam breaching or reservoir drawdown;
- changes in hydrosystem operations;
- dam and facility modifications;

- changes in transmission rights-of-way maintenance; and
- routing and technology changes of new transmission.

Possible Adverse Effects

The possible adverse effects to power and transmission from mitigation and recovery actions include:

- dam breaching or reservoir drawdown that results in a loss of electrical generation at a specific location;
- breaching or drawdown may affect downstream hydrology reducing power generation;
- changes in reservoir operations affect timing and amount of power generation;
- dam and facility modifications can result in decreased power generation and inefficient use of transmission;
- decreased transmission reliability affected by large shifts in the location, timing or amount of generation capacity;
- changes in system operations could result in the need for new transmission facilities;
- altered or decreased transmission maintenance activities (vegetation removal, pesticide use) in sensitive habitat, causing costs to increase;
- decreased road densities that affect transmission facility access and reliability; and
- decreased power system reliability resulting in outages.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on power generation and transmission as Table 5.2-6 illustrates. The degree of effect is a function of the amount of hydropower generation lost and transmission reliability compromised.

Table 5.2-6: Some Factors That Shape Effects on Power Generation and Transmission

Factors Leading to Effect	Effect
Dam breaching or reservoir drawdown	Amount of power loss, cost unpredictability for replacement power, new transmission required for changes in power generation
Specific changes in hydro operations	Amount of power loss or gain, cost unpredictability
Dam and facility modifications	Amount of power loss or gain, cost unpredictability
Timing of power loss or gain	Cost
Extent to which fish and wildlife policies may influence hydro generation	Amount and type of new generation required to meet load, and the transmission required to support new generation

Factors Leading to Effect	Effect
Changes that alter the present availability of transmission facilities, the capacity of the lines, and the ability to reroute power efficiently in emergency conditions	Cost of new transmission facilities to maintain system reliability
Fish and wildlife limitations that alter maintenance practices across the system	Costs increase, and transmission reliability may decrease (e.g., outages)

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for the adverse effects include:

- Increase cost-effective energy conservation to reduce electricity use. Electricity consumers could be encouraged to consume less by education, subsidies, higher prices, or by development and application of new technology.
- Increase thermal generation to replace lost hydropower. Natural-gas combustion turbines are currently the most likely replacement for peaking and base load capability.
- Use renewable energy resources to replace lost hydropower.
- Increase power imports or decrease power exports to reduce power replacement.
- Reduce spill, providing opportunities to increase power generation.
- Locate new generation facilities where there is available transmission capacity.
- Maximize use of existing rights-of-way to increase transmission capacity and reliability.
- Install low maintenance transmission facilities.
- Use non-chemical options for vegetation management in transmission rights-of-way.

Discussion

Fish and wildlife actions can have both intended and associated affects on power and transmission. The replacement of older turbines with more efficient, fish-friendly turbines are intended to benefit hydropower generation as well as fish. Similarly, culvert replacement for improved road access for transmission construction, operation, and maintenance benefit both fish passage and transmission reliability. Transmission reliability is also increased when transmission facilities are made more avian-friendly, reducing the risk to birds and power outages. Negative intended effects include the loss of hydropower generation when water is stored or spilled for fish; and reduced transmission reliability as a result of altered maintenance practices (e.g., reduction in danger tree removal).

Associated effects on power and transmission can be both positive and negative. A positive effect results in increased potential to generate power from reduced spill as juvenile fish transport increases. Another positive associated effect is the promotion and

furthering of the energy conservation and renewable power generation industries as lost hydropower is replaced.²⁰⁴ However, power replacement utilizing renewables or conservation could result in other negative effects—increased costs and decreased power reliability. Another negative associate effect is the additional infrastructure that would be required, which includes transmission facility, thermal generation, and gas pipeline construction. For example, breaching the four lower Snake River dams would require major changes to the regional transmission system. Also, there would be increased costs associated with deconstruction and building new resources. Further, increasing flows in spring for migrating fish result in a negative associate effect as it creates a surplus of power that is not marketable due to depressed prices. If not used for fish, this water could be stored and used to generate power during times when the electricity market is more favorable.

Transportation

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that would affect transportation include:

- dam breaching or reservoir drawdown;
- dredging restrictions;
- changes in hydrosystem operations for fish;
- substantial changes to juvenile fish migration or transportation; and
- habitat improvements affecting the transportation infrastructure.

Possible Adverse Effects

Possible adverse effects to transportation from fish and wildlife actions include:

- eliminating barging upstream of the last dam breached;
- reduced navigation from seasonal restrictions;
- reduced navigation from decreased channel dredging;
- increased pressure on rail and road infrastructure;
- increased costs as new rail and road capacity would be required;
- increased business failures from high costs associated with shifts in transportation;
- reduced upstream economic activity associated with lost ports;
- impacts to fish transportation expenditures and related industries; and
- decreased transportation or its infrastructure for species or habitat protection.

²⁰⁴ Energy conservation and renewable power sources would have positive effects on air quality. See the discussion on air quality in this EIS, Section 5.2.3.1.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on transportation as Table 5.2-7 illustrates. The degree of effect is a function of the amount of transportation lost.

Table 5.2-7: Some Factors That Shape Effects on Transportation

Factors Leading to Effect	Effect
Location of the most downstream dam breached or drawn down below MOP	Amount of navigation lost above the breached dam
Availability of alternative transportation and infrastructure	Increased costs of moving goods to market
Dredging restriction in the lower Columbia River	Reduced navigation and increased costs of moving goods to market
Fish transportation strategy used	Changes in navigation
Types of habitat actions implemented	Reduced transportation infrastructure and increased costs to compensate

Possible Mitigation Measures

The types of mitigation measures that might be undertaken to eliminate, reduce, or compensate for adverse effects from fish and wildlife actions include:

- redirecting the focus of port development to areas with higher density rail and road infrastructure;
- shifting to more rail and road based transportation;
- improving port facilities in coastal areas, especially Astoria;
- increasing shallow draft shipping in lower Columbia River;
- maximizing and expanding existing infrastructure and avoiding sensitive habitat areas(e.g. double rails, more lanes); and
- refocusing small business practices to serve the local markets.

Discussion

Fish and wildlife actions can have both intended and associated effects on transportation. Several negative intended effects include reduced navigation as a result of restrictions placed on dredging to benefit fish; and reduced transportation and infrastructure development in sensitive habitat areas. Some positive associated effects on transportation can result from increased fish transport (barging) that could maintain the river for commercial navigation; and increased rail and road development and use if dams are breached severely reducing navigation. However, the increased costs for rail and road infrastructure development and maintenance; increased shipping delays for goods headed to market; and reduced navigation as a result of dam breaching are some of the negative associated effects from fish and wildlife actions.

Agriculture, Ranching, and Forest Products

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that could affect these industries include:

- dam breaching and reservoir drawdown;
- changes in hydrosystem operations;
- habitat improvements affecting land use;
- land retirement programs and restrictions; and
- water quality improvements.

Possible Adverse Effects

Possible adverse effects to agriculture, ranching, and forest products from fish and wildlife actions include:

- paying higher electricity costs for agriculture and ranching operations;
- relocating irrigation diversions as a result of breached dams or reservoir drawdowns;
- impairing groundwater irrigation because of lower water tables after breaching;
- eliminating barging of agricultural products and supplies;
- paying higher costs for transportation of products and supplies;
- losing some agricultural, livestock, and forestry production;
- decreasing the overall land base for agriculture, ranching, and forest products; and
- increasing restrictions on agricultural, grazing, and forestry practices (e.g.; pesticides, herbicides, non-point source runoff, cropping technique).

Context and Intensity

Many factors influence the effects fish and wildlife actions have on agriculture, ranching, and forest products as Table 5.2-8 illustrates. The degree of effect is a function of the amount of production lost or change in practice.

Table 5.2-8: Some Factors That Shape Effects on Agriculture, Ranching, and Forest Products

Factors Leading to Effect	Effect
Locations of dams breached	Reduced irrigation from those reservoirs, increased cost of irrigation modifications, crop or livestock changes
Changes in irrigation technology or deficit irrigation	Changes in the type of crop or crop yield
Increased Power costs	See Table 5.2-5
Increased transportation costs for products and supplies	See Table 5.2-6

Factors Leading to Effect	Effect
Active versus passive restoration	Amount of land removed from production; potential increased risk from human-caused or natural disturbances (e.g., noxious weeds, fire)
Extent to which land retirement programs and restrictions are used for fish and wildlife	Amount and quality of land removed from production, either directly or because of increased cost
Reduced land base and use of traditional practices	Inability to compete in the market; increased production costs
Restrictions on practices that can impact water quality (e.g., pesticides, livestock instream, size of clearcuts)	Increased production risks and costs

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for adverse effects from fish and wildlife actions include:

- installing more efficient irrigation;
- changing to more valuable cash crops, reducing production of low value crops;
- shifting farm production from marginal lands;
- increasing subsidies and monetary incentives for land retirement or water purchase/lease;
- switching to dry land farming or alternative livestock;
- using grazing as a habitat enhancement tool;
- increasing organic farm production;
- better integrating forest management practices and forest product markets;
- focusing on native plants or crops less dependant on chemical application;
- using modern agricultural and forestry practices that preserve or enhance production; and
- for transportation-related mitigation see transportation above.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on agriculture, ranching, and forest products. One positive intended effect could come from the compensation to the farmer, rancher, or forest landowner for land retirement, conservation easements, or water leases. Sometimes these benefits are increased when individuals are compensated for otherwise marginally productive lands. However, there are other intended effects that are negative. These can include the revocation of grazing allotments on public lands, impacts to groundwater and irrigation for agriculture, fencing livestock out of sensitive habitat areas possibly increasing the cost required to construct upland watering areas, and reducing timber harvest. Several positive associated effects on agriculture, ranching, and forest products result from the requirement to develop more efficient and reliable irrigation and increased timber salvage

from efforts to improve habitat, as sound silvicultural and forest management practices (e.g., prescribed burns, select cuts, reducing harvest unit size) are implemented. Negative associated effects from fish and wildlife actions could come from the increase in costs for transporting goods to market, reduced production, changes to dry land farming, increases in crop depredation, and reduced access to resources.

Commercial Fishing

Fish and Wildlife Actions

Any actions that decrease commercial fish populations would affect commercial fishing. The types of proposed fish and wildlife mitigation and recovery actions that could affect commercial fishing include:

- changes in fishing regulations (e.g., reduced season length; alternate-year fishery closures; change in allowable methods, increased escapement goals, size, or location; or more enforcement of existing regulations);
- buy-outs or other payment to limit commercial fishing (fishing effort would be reduced by purchase of the fleet or by payment to not fish at specific times and/or places);
- salmonid predator control (e.g. marine mammals and birds);
- changes in spawning and rearing habitat;
- focusing mitigation and recovery actions on resident fish and wildlife;
- changes in hydrosystem configuration and operation; and
- changes in hatchery practices.

Possible Adverse Effects

Possible adverse effects to commercial fishing from fish and wildlife actions include:

- decreasing catch;
- decreasing revenue;
- increasing costs;
- decreasing ability to cover costs; and
- declining commercial fishing industry.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on commercial fishing as Table 5.2-9 illustrates. The degree of effect is a function of the amount of reduced catch or increased costs.

Table 5.2-9: Some Factors That Shape Effects on Commercial Fishing

Factors Leading to Effect	Effect
Total amount of fish produced (Table 5.2-3), including hatchery-produced and naturally spawning	Amount of fish available for harvest
Amount of allowable incidental take of protected marine mammals	Amount of fish available for harvest
Changes in listed species status	Amount of fish available for harvest
Changes in commercial harvest practices	Amount of fish harvested; costs of fishing, quality and timing of catch
Willingness to sell in a commercial fishing fleet buyout program	Reduction of commercial fleet sizes; impacts on commercial fishing-dependant coastal communities

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- increasing hatchery production for harvest;
- creating and enforcing international fishing limitations off the Pacific Northwest coast;
- assistance in shifting from commercial to guide-based sport fishing, or other employment;
- providing incentives to modernize commercial fishing fleet; and
- providing compensation for local communities or retraining for displaced fishermen.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on commercial fishing. Most effects are based on the amount of fish available for harvest. As harvest is scaled back, the net effect is increased costs of operation and the downsizing of the commercial fishing fleet. For example, a positive intended effect could be increased numbers of fish for harvest—as a result of increased hatchery production for harvest purposes. However, there may also be negative intended effects as harvest is reduced through increased regulations, such as escapement goals and timing restrictions, to protect listed species. This same dichotomy surfaces in a discussion of positive and negative associated effects. For example, associated effects include the increase/decrease in the economic health of coastal communities (including local support services and the fish processing industry), and the increase/decrease in the size of the commercial fishing fleet. A positive associated effect could also be an increase in the market price for harvested fish, as limited catch results in increased value. However, a negative associated effect is the increase in the cost of the commercial fish operations.

Other Industry

Fish and Wildlife Actions

The types of proposed fish and wildlife mitigation and recovery actions that could affect other industry include:

- dam breaching and reservoir drawdown;
- changes in hydrosystem operations;
- habitat actions targeted at mining practices and mine rehabilitation; and
- actions to reduce point and non-point source pollutants.

Possible Adverse Effects

Some industries, especially the service and government sectors, would not likely be as affected as natural resource-based industries from actions taken to benefit fish and wildlife. Possible adverse effects to other industry²⁰⁵ from fish and wildlife actions include:

- increased electricity prices, particularly the direct service aluminum industry;
- restrictions on mine access and water quality resulting in high operating costs;
- increased pollution control costs; and
- increased raw materials (e.g., sand and gravel, wheat, wood pulp, apples) and transportation costs.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on other industry as Table 5.2-10 illustrates. The degree of effect is a function of the amount of increased costs of operations or raw materials.

Table 5.2-10: Some Factors That Shape Effects on Other Industries

Factors Leading to Effect	Effect
Intensity of the habitat actions	Less raw material available increasing costs; increasing operation costs; less water available for industrial processes
Amount of hydropower lost	Increased costs of electricity and transportation
Level of incentives to reduce production of raw materials	Less raw material available increasing costs
Amount and enforcement of pollution control regulations	Increasing operation costs to treat water
Amount of transportation lost to dam breaching	Increased costs of transportation for raw materials and industrial products

²⁰⁵ Adverse effects are listed primarily for those natural resource-based industries.

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- developing least cost replacement power;
- improving road and rail transportation;
- developing less environmentally damaging and cost-effective mining practices; and
- providing incentives for improving waste water treatment.

For a discussion on raw material production (other than mining) see the Agriculture, Ranching, and Forest Products section above.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on other industry. Many of these industries are dependent on water, energy, and raw materials. Therefore these industries would be affected by environmental requirements and changes in power, water, and raw material availability. Positive intended effects can include compensation through buyout programs for marginal business and financial incentives for developing and installing better technology and reducing pollution. Negative intended effects include the restrictions, limitations, or reductions of mining (e.g., sand and gravel, gold, silver), raw material production, and wastewater discharge. Positive associate effects of fish and wildlife actions on other industry include increased efficiency through forced cost cutting and technological improvements, increased profit when perceived as a "green" industry, and reduced competition as other competing businesses fail. However, increased costs of operations, transportation, and raw material availability are negative associated effects. In particular, increased costs of operations can arise from the loss of inexpensive hydropower. Any increased costs could force marginal industries into bankruptcy.

Recreation

Fish and Wildlife Actions

The types of proposed fish and wildlife mitigation and recovery actions that could affect recreation include:

- dam breaching and reservoir drawdown;
- changes in hydro operations;
- changes in recreational fishing and hunting regulations;
- implementing predator control programs;
- changes in hatchery practices;
- limiting access to protect habitat and listed species; and
- reestablishing native fish and wildlife species.

Possible Adverse Effects

Possible adverse effects to recreation from fish and wildlife actions include:

- eliminating most flatwater recreation on the reservoir where breaching or drawdown occur, including activities such as fishing, boating, and water skiing; related supporting facilities would be closed or relocated;
- decreasing warm water fishing opportunities;
- reducing fishing, hunting, and other recreational opportunities as changes in hydro operations result in water fluctuations;
- reducing recreational harvest levels or species allowed to be harvested through changes in fishing and hunting regulations;
- decreasing hatchery fish available for recreational harvest;
- exposing potential hazards as water levels are lowered;
- separating, visually and physically, land-based recreation from water, such as camping and picnicking;
- increasing risks to swimmers and watercraft operated from increased water velocity;
- limiting recreational development in sensitive habitat areas (e.g., ski resorts);
- reducing water availability to developed recreation (e.g., golf course, resorts);
- limiting or restricting access resulting in crowding in other recreational areas;
- limiting access to areas used for dispersed recreation; and
- reducing the economic value of recreational fishing and hunting, as well as other outdoor recreation activities and support services.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on recreation as Table 5.2-11 illustrates. The degree of effect is a function of the amount of available recreational opportunities.

Table 5.2-11: Some Factors That Shape Effects on Recreation

Factors Leading to Effect	Effect
Amount of hatchery production to support recreational fishing	Amount of fish available
Variety of harvestable fish and wildlife species	Amount of loss fishing and hunting opportunities
Amount of water level and flow fluctuations from changes in hydro operations	Amount of flatwater and riverine recreation available; amount of warm water fishing available; amount of access to fishing and other recreational sites
Where dams are breached	Amount of flatwater and riverine recreation available; amount of warm water fishing available; amount of access to fishing and other recreational sites

Factors Leading to Effect	Effect
Amount of habitat set aside for fish and wildlife	Decreased opportunities for dispersed recreation such as hiking and bird watching

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- developing or improving alternative recreational opportunities;
- developing floating boat facilities instead of fixed facilities to address water level fluctuations;
- using formerly inundated lands for recreational purposes;
- establishing user levels to avoid overcrowding at certain recreational sites;
- relocating and adapting recreational facilities for altered environments (e.g., as reservoirs are drawn down refocus to more riverine recreation);
- allowing special hunts to offset reduced harvest levels;
- establishing a naturally spawning fish recreational harvest in the long term;
- targeting recreational development in marginal habitat areas or along habitat edges; and
- constructing more environmentally-friendly recreational facilities (smaller footprint).

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on recreation, including both sport fishing and hunting and other types of recreation. One positive intended effect to fishing and hunting comes from increases in hatchery and other stocking programs for fish and wildlife. However, altering the hatchery program or otherwise reducing harvest is a negative intended effect. Another negative intended effect on recreation is the limitations on access and development of recreational areas, as sensitive habitat is protected. Positive associated effects for fishing and hunting can result from incentive-based predator or nuisance species control programs, such as the pikeminnow program. Other positive associated effects include potential increases in riverine recreation development if dams are breached and increased water velocity for boaters (e.g., kayaking, rafting) as flows are increased for fish. However, increased flows can result in the negative associated effect by presenting hazards to swimmers or other boat users. Other negative associated effects include reduced land-based recreation and its proximity to water; reduced water-based recreation as a result of dam breaching; diminished quality of the recreational experience due to crowding; and loss of local recreation-based economy.

Industrial, Residential, and Commercial Development

Fish and Wildlife Actions

The types of proposed fish and wildlife mitigation and recovery actions that could affect industrial, residential, and commercial development include:

- dam breaching and reservoir drawdown;
- decreases in commercial harvest or changes in hatchery production;
- protecting sensitive habitat areas for fish and wildlife; and
- requiring point and non-point source pollution controls.

Possible Adverse Effects

Possible adverse effects to industrial, residential, and commercial development from fish and wildlife actions include:

- limitations in location, size, and type of development;
- reduced new development in ports near breached dams;
- increased costs of electricity;
- decreased water availability for new development;
- reduced development in areas dependant on commercial fishing;
- reduced development in areas dependant on the forest products industry;
- reduced development in areas dependant on recreation; and
- reduced development from increased costs for pollution abatement.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on industrial, residential, and commercial development as Table 5.2-12 illustrates. The degree of effect is a function of the amount of restrictions placed on development.

Table 5.2-12: Some Factors That Shape Effects on Industrial, Residential, and Commercial Development

Factors Leading to Effect	Effect
Which dams are breached or reservoirs drawdown	Development and land use patterns
Amount of increase in electricity and water costs	Increase costs of development
Amount of hatchery production for recreational fishing	Reduced development in areas that support recreational fishing
Amount of commercial harvest	Reduced development in communities dependant of the fishing industry
Habitat actions that set aside land	Reduced development potential

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- support energy and water conservation program;
- provide incentives for "green" development;
- increase development in coastal communities focusing on tourism;
- encourage cogeneration; and
- increase new development in areas that become new termini for navigation and transportation.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on industrial, residential, and commercial development. A negative intended effect on development occurs when actions taken to preserve or protect sensitive habitat areas limit or restrict new development. However, this limitation on development can have a positive associated effect for the landowners, who are not affected by the new land use restrictions and can develop in adjacent areas. The value of the adjacent land can be higher due to the limited development in the area. Increased hatchery construction to meet fish production goals is another positive associated effect on development. As fish numbers increase allowing more commercial and recreational harvest, development will also increase. For example, as commercial harvest increases, the coastal communities dependant on the industry will become more developed. However, decreased fish production or harvest levels will have the opposite effect. Other negative associated effects include the increase in development costs due to higher electricity rates and water availability, and decreases in the development potential of property that had once been waterfront before dam breaching.

Employment and the Regional Economy

Regional economic effects vary from locale to locale. These effects can have disproportionate impacts on rural communities. For example, a decrease in timber receipts from Federal lands can detract from funding for local county roads and public schools. Effects from fish and wildlife mitigation and recovery actions would be felt in the area where the action takes place or by a particular economic sector. Fish and wildlife actions that impact irrigation, either through lowered reservoirs or required changes in technology, would disproportionately affect rural areas and irrigated agriculture. While habitat actions that restrict access or timber harvest would impact the forest products industry and the local economies that depend on it. This also holds true for commercial fish harvest and the impacts that changes in harvest management would have both on the industry and coastal communities. Other actions could affect the entire Region. For example, impacts from fish and wildlife actions on navigation and electricity rates would have effects across economic sectors. Overall, actions that would affect these economies would also affect employment. Although there may be some increases in employment as personnel are required to carry out fish and wildlife actions,

it would likely not offset the overall effects of the actions on local and regional employment.

These employment effects would be felt more by low-income or minority populations, including tribal populations. For example, effects on agriculture would impact seasonal farm workers more than those employed year-round. Also, decreases in fish harvest would more adversely affect tribal and low-income workers in coastal communities. Further, increases in electricity rates would have large impacts on low-income families, as the electric bill becomes a larger portion of their income. In general, reduced employment and income could further impact these workers, their families, and their health.

For more information on the generic effects from fish and wildlife actions on the economic environment see specific sections above.

Funding Costs

For a discussion of the effects of funding costs for fish and wildlife on ratepayers, taxpayers, and others, and possible mitigation measures see Section 2.3.2.3 Current Policies—Conflicting Priorities: Challenges to Funding.

5.2.3.3 Social Environment

Actions taken for fish and wildlife affect the social environment. Those areas most affected by fish and wildlife actions include:

- Tribal Interests,
- Cultural and Historic Resources, and
- Aesthetics.

Tribal Interests²⁰⁶

This section is concerned with the potential adverse effects of mitigation and recovery actions taken for fish and wildlife on tribal members and communities. This section intends to cover the unique relationships tribal members have with the environment.

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that could affect tribal interests include:

- dam breaching and reservoir drawdown;
- changes hydrosystem operations;
- changes in fish harvest allocation;

²⁰⁶ Considerable analysis has been conducted in the Lower Snake River Feasibility Study (Corps 2002b) and its Drawdown Regional Economics Workgroup (Corps 199a) and a report on tribal conditions titled "Tribal Circumstances and Perspective Analysis of Impacts of the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs, and Shoshone Bannock Tribes" (Corps 1999c). Additional analysis is available in the Framework Report (Council 2000a).

- regulatory changes in fish and wildlife management;
- changes in hatchery use and operations; and
- habitat improvement or protection actions.

Possible Adverse Effects

The types of adverse effects from fish and wildlife actions on tribal interests include:

- increased exposure of cultural resources from breaching or drawdown;
- decreased resident or anadromous fishing opportunities/harvest;
- exposure to toxic materials from sediments (e.g., mercury bioaccumulation); and
- decline of practices essential to the preservation of tribal culture, tradition, and spirituality.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on Native American Indians as Table 5.2-13 illustrates. The degree of effect is a function of the extent to which Native American Indian interests are impacted. These interests relate to tribal fish harvest, tradition, spirituality, and health. Tribal interests also include areas such as water quality, preservation of cultural and historic resources, and socioeconomic concerns such as employment and income; however, these areas are discussed separately in other sections of this chapter.

Table 5.2-13: Some Factors That Shape Effects on Native American Indians

Factors Leading to Effect	Effect
Fluctuations in the total amount of natural resources available for Native American Indian use	Changes in tribal harvest, traditional practices, and economic and social values of resources available to Native American Indians
Fluctuations in reservoir levels	Loss of cultural resources as they are exposed and damaged
Type and amount of hatchery production	Changes in fish harvest levels
Changes in total available harvest/catch limits	Amount of allowable harvest allocated to tribal members
Changes in fish and wildlife laws and policies, or their implementation	Changes in tribal harvest and harvest methods, traditional practices, and economic and social values

Possible Mitigation Measures

The types of measures that might be undertaken to mitigate for adverse effects from fish and wildlife actions include:

- providing increased security and protection for exposed culturally important sites;
- minimizing reservoir fluctuations to reduce exposure of cultural resources and toxic sediment;
- increasing hatchery production;

- increasing tribal fish harvest allocation;
- substituting resident fish for anadromous fish; and
- improving tribal access and control of areas of cultural and spiritual importance.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on tribal interests. For example, increases in hatchery production can result in the intended positive effect of increased fish for ceremonial and subsistence uses. A negative intended effect could include decreased fish and wildlife harvest as a result of changes in harvest allocation and regulations. Positive associated effects can include increased tribal health and the facilitation of traditional tribal practices, as more fish are available for harvest. However, negative associated effects can result in decreases in tribal health from potential toxic sediment releases and bioaccumulation in fish; and the loss of important cultural resources from reservoir fluctuations or dam breaching. Changes in the available amounts for fish and wildlife funding, or in the locations where that funding gets used, can also result in negative effects on those tribes that have come to rely on fish and wildlife funding.

Effects can also stem from decisions over whether to manage for anadromous or resident fish. In some areas the resident fishery may be reduced as the focus is placed on anadromous fish. However, in other areas, resident fish may be used as substitution for lost anadromous fish. These choices can have profound effects, both intended and associated, on tribes depending on the value (tradition or spiritual) each tribe places on the fish.

Cultural and Historic Resources

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that could affect cultural and historic resources include:

- dam breaching and reservoir drawdown;
- changes in hydrosystem operations;
- habitat enhancement activities;
- hatchery construction;
- dam modifications for fish (e.g. spillways, turbines, fish passage); and
- restricting access to sensitive habitat areas.

Possible Adverse Effects

The types of adverse effects from fish and wildlife actions on cultural and historic resources include:

- exposure of cultural and historic resources;
- inundation of cultural and historic resources

- loss or damage of cultural and historic resources through disturbance, removal, or vandalism; and
- access restrictions to important cultural and historic resources.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on cultural and historic resources as Table 5.2-14 illustrates. The degree of effect is a function of the number of cultural and historic resources impacted by the fish and wildlife actions.

Table 5.2-14: Some Factors That Shape Effects on Cultural and Historic Resources

Factors Leading to Effect	Effect
Extent of the shoreline exposed from dam breaching or reservoir drawdown	Number of sites subject to exposure and damage
Amount of changes in reservoir levels and flow from changed hydro operations	Number of sites subject to exposure and damage
Amount of time a resource is exposed	Increased opportunity for the resource to be damaged or destroyed
Which dam is breached or modified	Potential loss of a historic site
Amount and location of habitat protected	Amount of access restricted to cultural and historic resources

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- minimizing reservoir fluctuations to reduce erosion and exposure of sites;
- inventorying, recording, and protecting cultural and historic resources where fish and wildlife action may affect them;
- increasing enforcement to protect historic and cultural resources from inadvertent or intentional disturbance or destruction; and
- providing limited, controlled access to important cultural and historic resources.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on cultural and historic resources. A negative intended effect arises when dam are modified, removing or altering machinery or structures that are considered historic resources. A positive associated effect can result from the protecting of sensitive habitat for fish and wildlife thereby protecting any cultural or historic resources located there. Other positive associated effects can include the restoration of or improved access to cultural sites, and the ability to study previously undocumented sites. However, access to cultural or historic sites may be restricted to protect sensitive habitat areas, resulting in negative associated effects. Other negative associated effects include the damaging of resources from exposure, theft, or vandalism due to changes in hydro operations or

construction activities; and increased disturbances due to increase human presence as fish and wildlife populations increase or access to other areas is restricted.

Aesthetics

Fish and Wildlife Actions

The types of proposed fish and wildlife actions that could affect aesthetics include:

- dam breaching and reservoir drawdown;
- wildlife range burning;
- access restrictions for sensitive habitat areas;
- salmon carcass nutrient supplementation;
- habitat enhancement and land retirement; and
- water acquisitions for fish.

Possible Adverse Effects

The types of adverse effects from fish and wildlife actions on aesthetics include:

- unsightly reservoir sediment and debris;
- malodorous water;
- increased number of decaying fish;
- increased noise and dust from dam deconstruction in the short-term;
- reduced visibility from smoke;
- unsightly burned areas; and
- limited access to aesthetically-pleasing areas.

Context and Intensity

Many factors influence the effects fish and wildlife actions have on aesthetics as Table 5.2-15 illustrates. The degree of effect is a function of the extent of impact on aesthetics by fish and wildlife mitigation and recovery actions.

Table 5.2-15: Some Factors That Shape Effects on Aesthetic Resources

Factors Leading to Effect	Effect
Amount of the shoreline exposed from dam breaching or reservoir drawdown	Amount of sediment and debris exposed, degree of odor, amount of windblown sediment
Amount of changes in reservoir levels from changed hydro operations	Level of turbidity, odor, exposed shoreline
Which dam is breached or modified and access to visitors	Size of the aesthetic impact, number of people impacted
Number of salmon carcasses added to river	Increased visual and odor impacts
Size of area burned for wildlife, or sediment exposed to wind erosion	Increased air pollution, regional haze, decreased visibility

Factors Leading to Effect	Effect
Amount of habitat enhancement or land retirement	Increased amount of "naturally-appearing" landscape
Amount of water acquired for fish	Improved riverine appearance
Amount and location of habitat protected	Amount of access restricted to aesthetic areas

Possible Mitigation Measures

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects include:

- reseeding and revegetating exposed reservoir bottoms and shorelines;
- limiting the size of the burned area;
- timing (e.g. weather conditions) burning to avoid impacts;
- allowing limited, controlled access in sensitive areas;
- developing new viewpoints; and
- selective timing and placing of salmon carcasses.

Discussion

Fish and wildlife mitigation and recovery actions can have both intended and associated effects on aesthetics. A negative intended effect can be the restricting of human access to areas of aesthetic value as sensitive habitat areas are protected. Positive associated effects from fish and wildlife actions can include increased visual appearance—"natural" looking landscape—from protecting and enhancing lands that were previously disturbed; or through passive or active restoration of lands previously inundated; increased recreation; viewing of new renewable resource technology (winds turbines). Renewable power sources, such as wind, as an alternative to CTs for replacing lost hydropower would not contribute to visibility impacts (regional haze). Negative associated effects to aesthetics include exposed sediment and windblown dust, in the short term from dam breaching or range burning; and increased air emissions if CTs or other thermal resource replace lost hydropower, and from increased truck or rail traffic from decreased navigation. Exposed sediments and debris from dam breaching; burned areas; intrusion of wind turbines; and odors from smoke, exposed mudflats, and decaying vegetation and fish can also be short-term negative associated effects. Finally, as access is limited to certain sensitive habitat areas, the negative associated effect to aesthetics will result from the overcrowding of other areas and the associated increases in noise.

5.2.3.4 Summary of Generic Effects

The following figures summarize some of the generic effects discussed above. The first set of figures (Figures 5-8 – 5-15) displays the effects of human activities on fish and wildlife and their habitats. The human activities shown are those that received the most attention during the public meetings. The second set of figures (Figures 5-16 – 5-19) depicts the effect actions taken for fish and wildlife have on the economic and social environments. These fish and wildlife actions are divided into four categories—habitat, hatchery, harvest, and hydro.

Figure 5-8: Potential Effects from Forestry (including timber harvest) on Fish and Wildlife

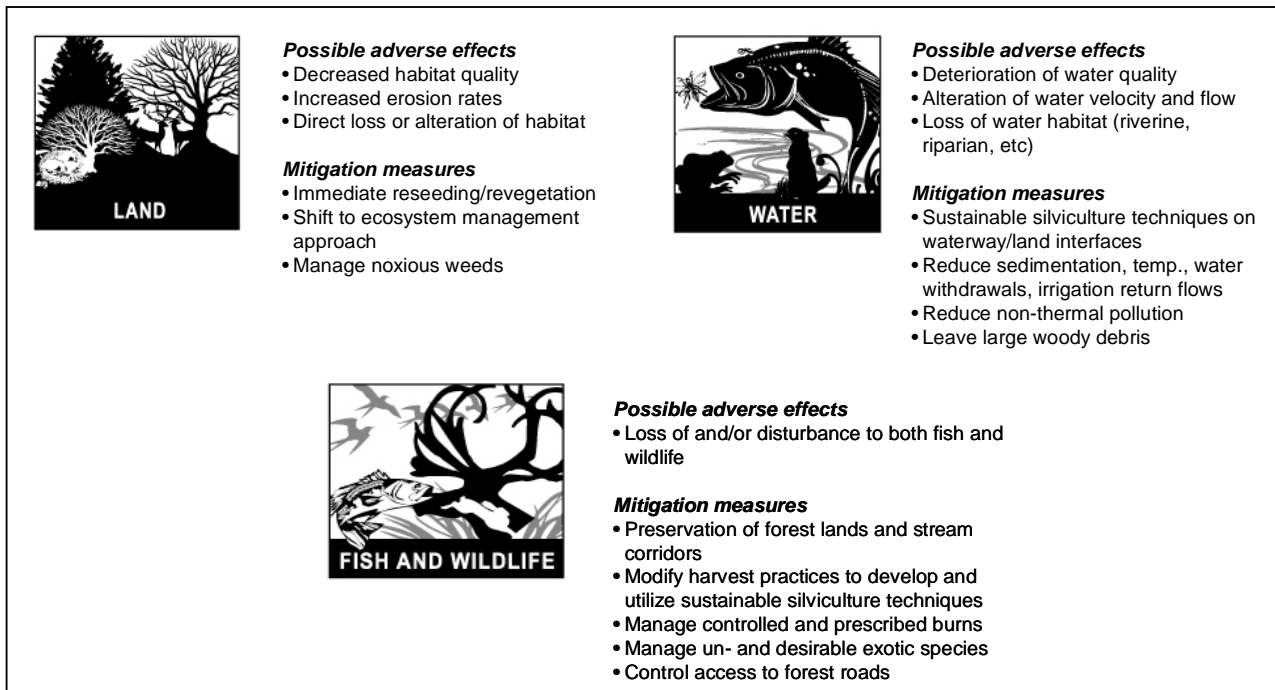


Figure 5-9: Potential Effects from Agriculture (including grazing) on Fish and Wildlife

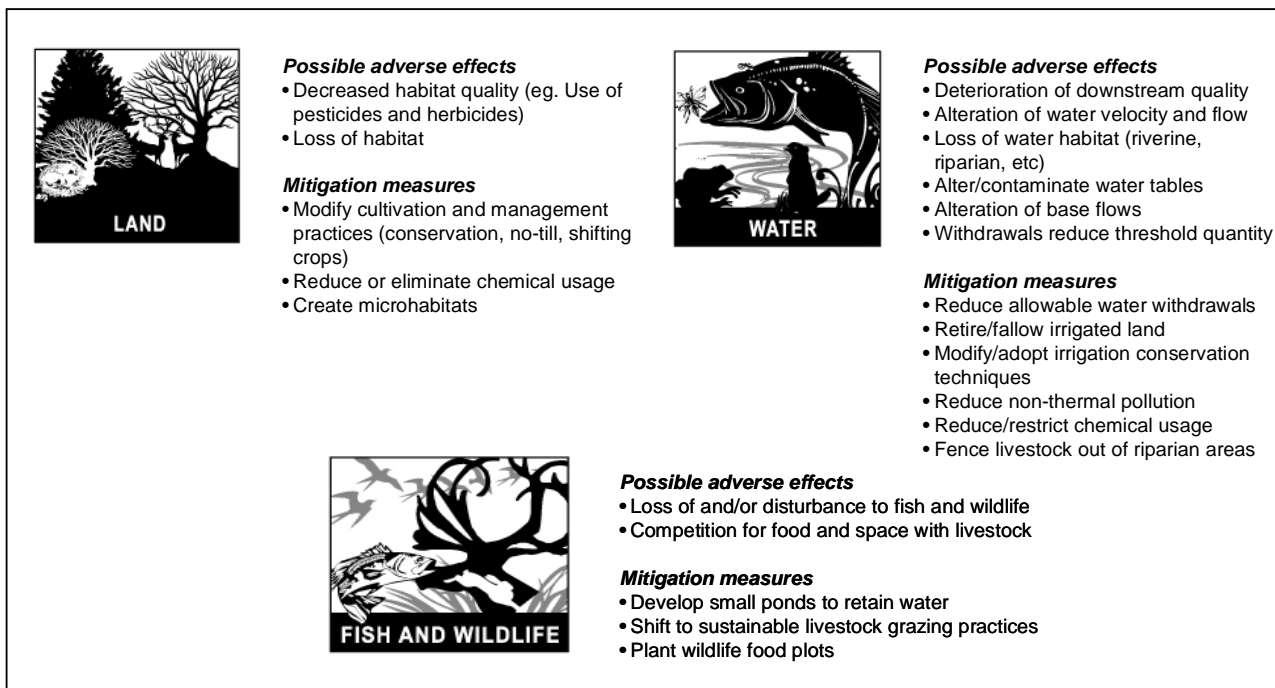


Figure 5-10: Potential Effects from Mining on Fish and Wildlife

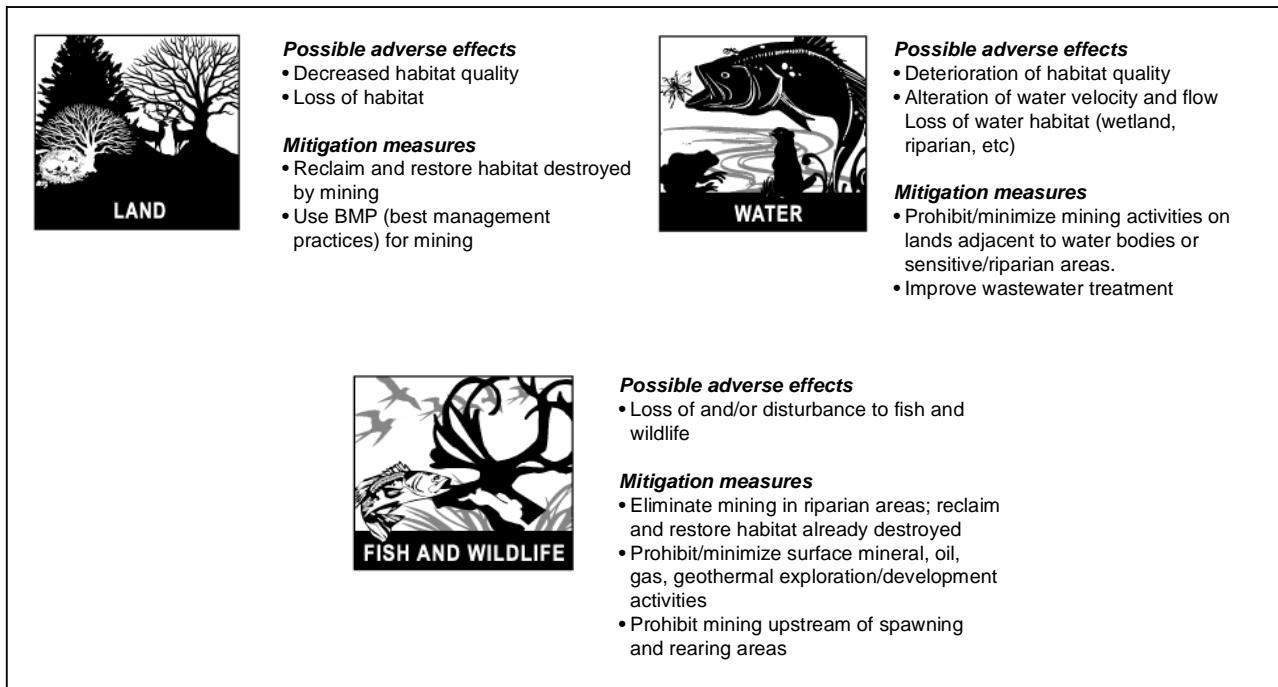


Figure 5-11: Potential Effects from Recreation on Fish and Wildlife

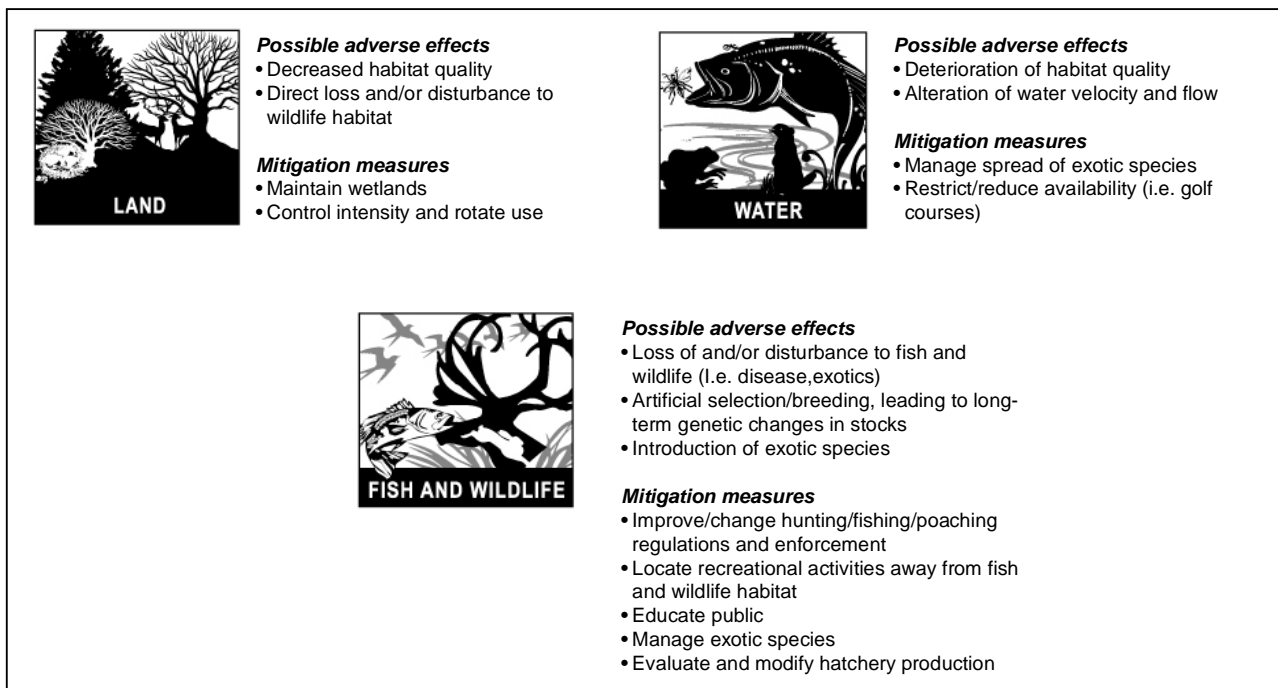


Figure 5-12: Potential Effects from Industrial, Residential, and Commercial Development on Fish and Wildlife

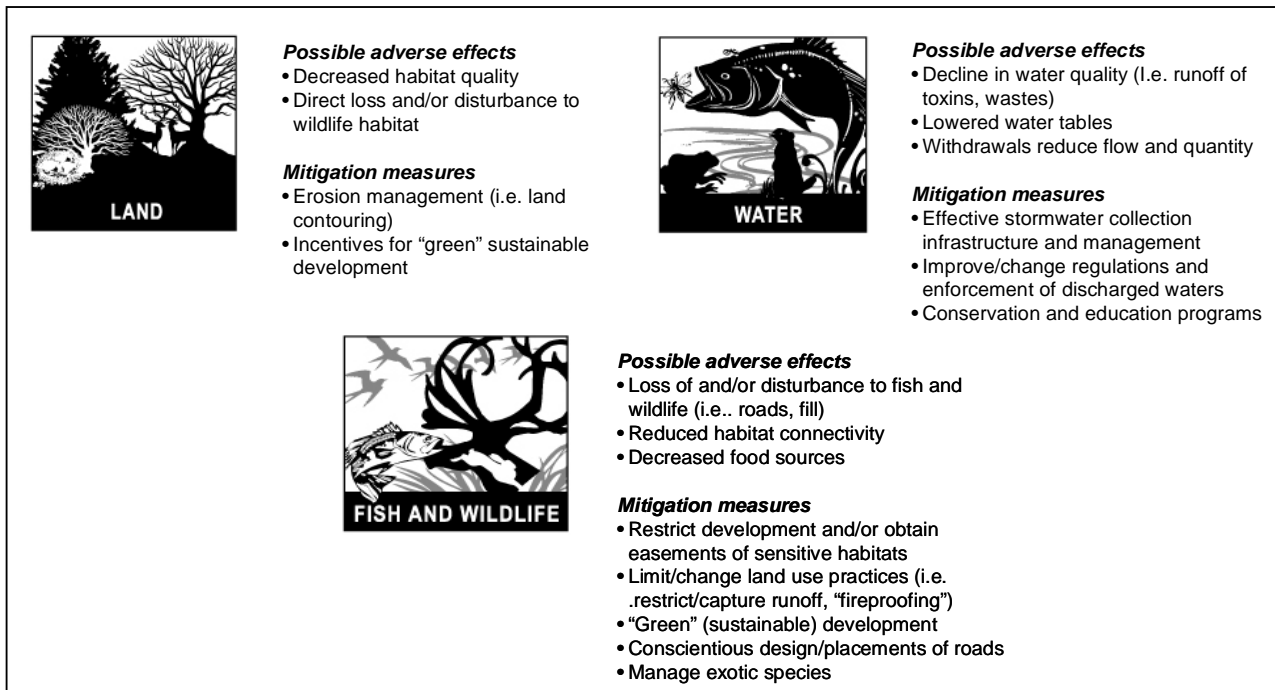


Figure 5-13: Potential Effects from Transmission Facilities on Fish and Wildlife

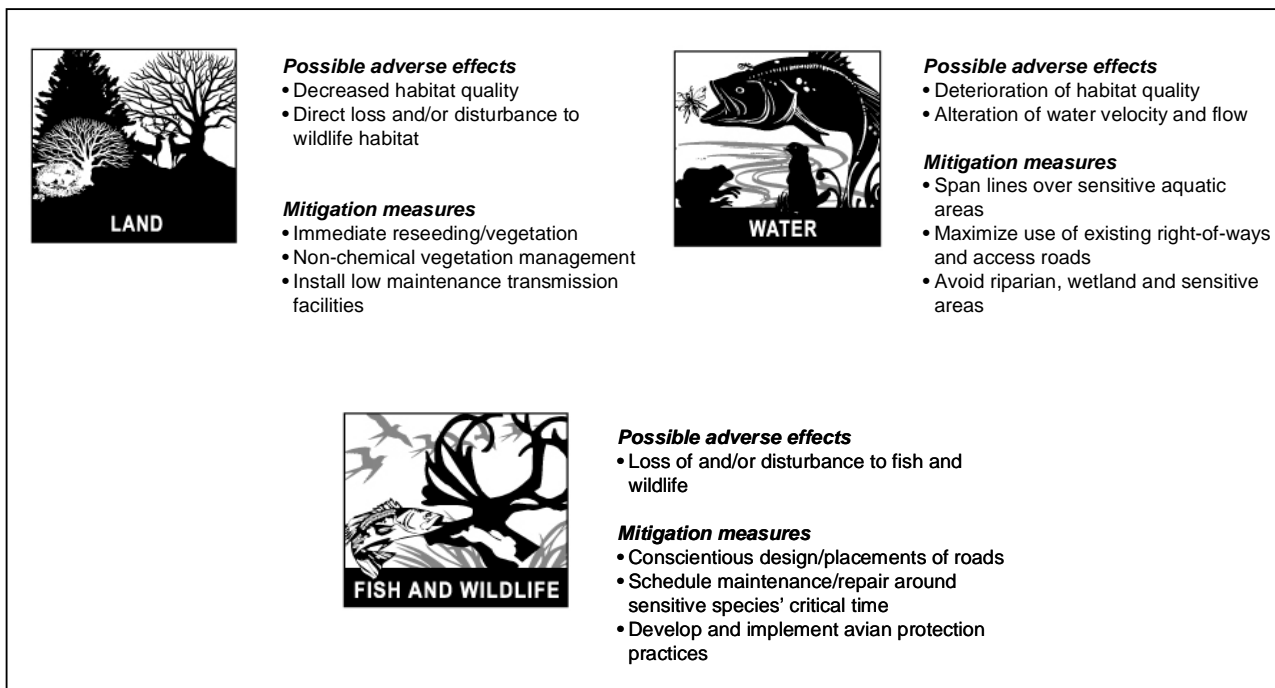


Figure 5-14: Potential Effects from Hydro Power Operations on Fish and Wildlife

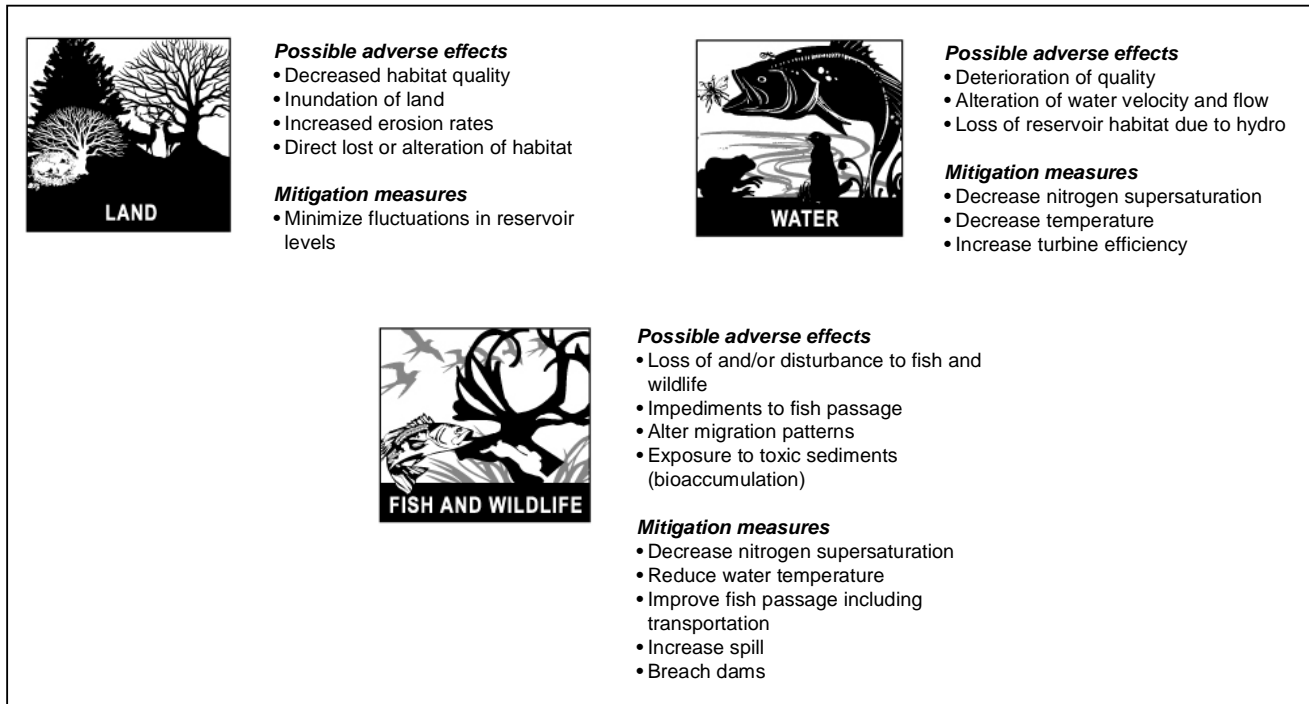


Figure 5-15: Potential Effects from Non-Hydro Energy Resources on Fish and Wildlife

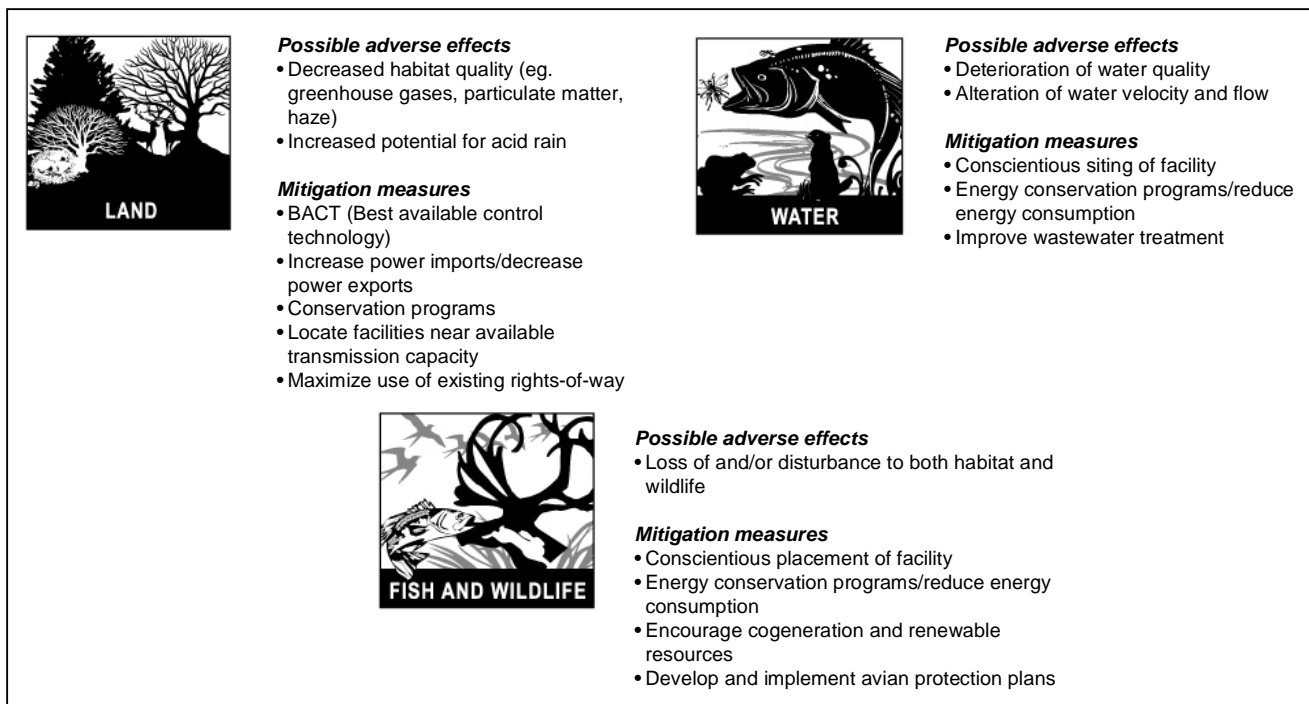


Figure 5-16: Examples of Habitat Actions and Adverse Effects on the Economic and Social Environments








Fish and Wildlife Actions	Socioeconomic Effects
<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <ul style="list-style-type: none"> • Habitat protections and improvements affecting transportation infrastructure • Habitat improvements affecting land use • Land retirement programs and use restrictions • Habitat actions targeted at mining practices and mine rehabilitation • Access limitations in protected habitat • Wildlife range burning </div> </div>	<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <p>Possible adverse effects</p> <ul style="list-style-type: none"> • Reduced navigation • Restrict transportation improvements • Decreased agricultural and forest product production • Increased operating and raw material costs • Reduced recreation opportunities • Reduced economic value of recreation • Limitations on development <p>Mitigation measures</p> <ul style="list-style-type: none"> • Maximize existing right of ways • Use low maintenance transmission facilities • Strategic port development • Improve rail and road transportation • Increase subsidies for land retirement/ water purchase/lease </div> </div>
<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <ul style="list-style-type: none"> • Dredging restrictions • Water quality improvements • Actions to reduce point and non-point source pollution • Access limitations in protected habitat • Water acquisitions for instream use </div> </div>	<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <p>Possible adverse effects</p> <ul style="list-style-type: none"> • Decline of traditional practices • Reduced access to traditional lands <p>Mitigation measures</p> <ul style="list-style-type: none"> • Fund tribal participation in federal processes • Provide increased hunting, fishing, and gathering opportunities </div> </div>
<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <ul style="list-style-type: none"> • Re-establishing native fish and wildlife species • Salmon carcass nutrient supplementation </div> </div>	<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <p>Possible adverse effects</p> <ul style="list-style-type: none"> • Loss or damage of resources through disturbances, removal, and vandalism • Restricted access to important cultural and historic sites <p>Mitigation measures</p> <ul style="list-style-type: none"> • Provide security, protection and/or limit access to sites • Tribal access to/control of cultural areas • Inventorying and recording cultural and historic sites </div> </div>
	<div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin-left: 10px;"> <p>Possible adverse effects</p> <ul style="list-style-type: none"> • Malodorous water and air • Increased number of decaying fish • Reduced visibility from smoke • Access limitations to aesthetically-pleasing areas • Unsightly burned areas <p>Mitigation measures</p> <ul style="list-style-type: none"> • Reseeding/revegetation • Control size and timing of burning • Limited, controlled access to sensitive areas </div> </div>

Figure 5-17: Examples of Harvest Actions and Adverse Effects on the Economic and Social Environments

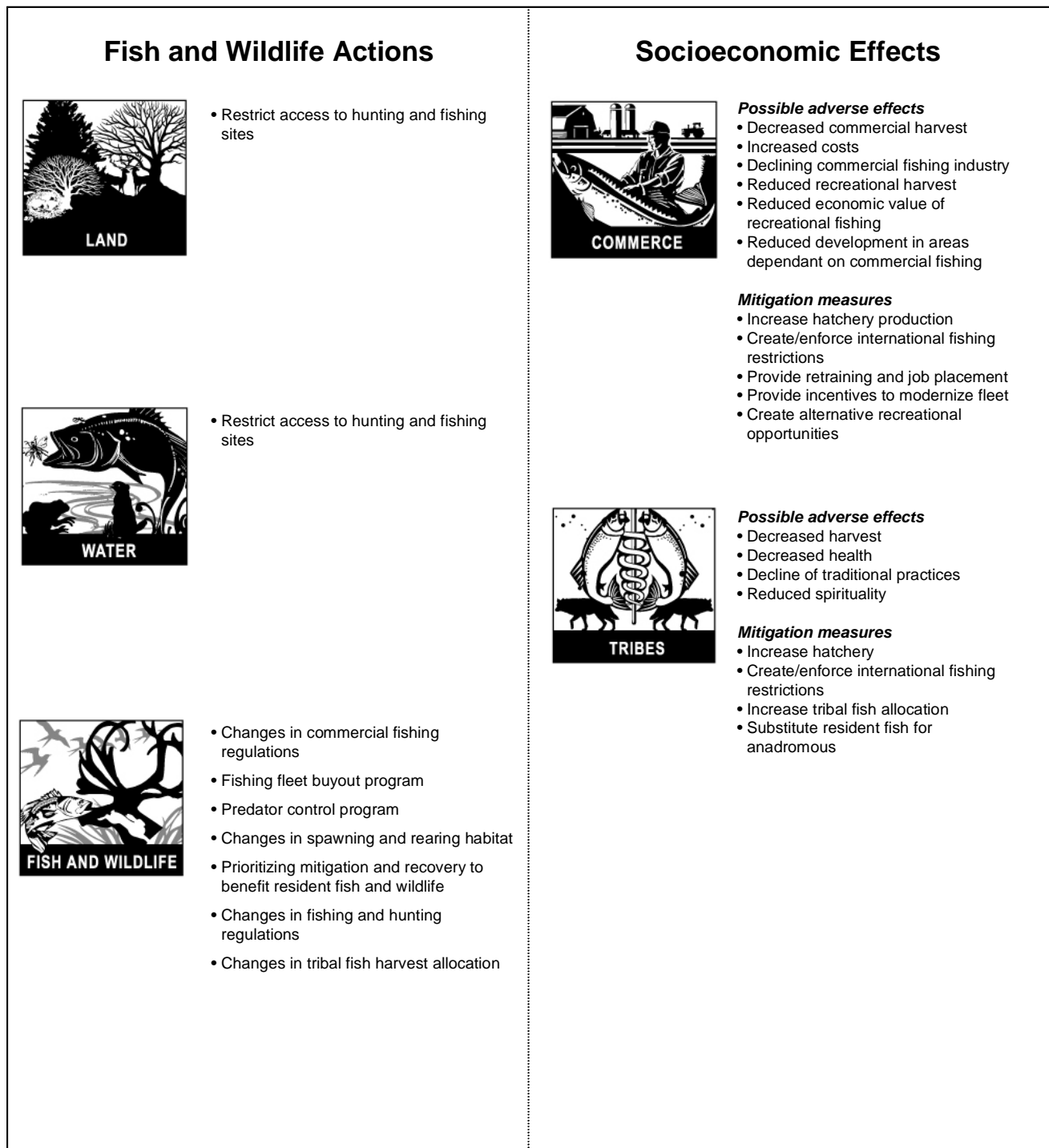


Figure 5-18: Hatchery Actions and Adverse Effects on the Economic and Social Environments

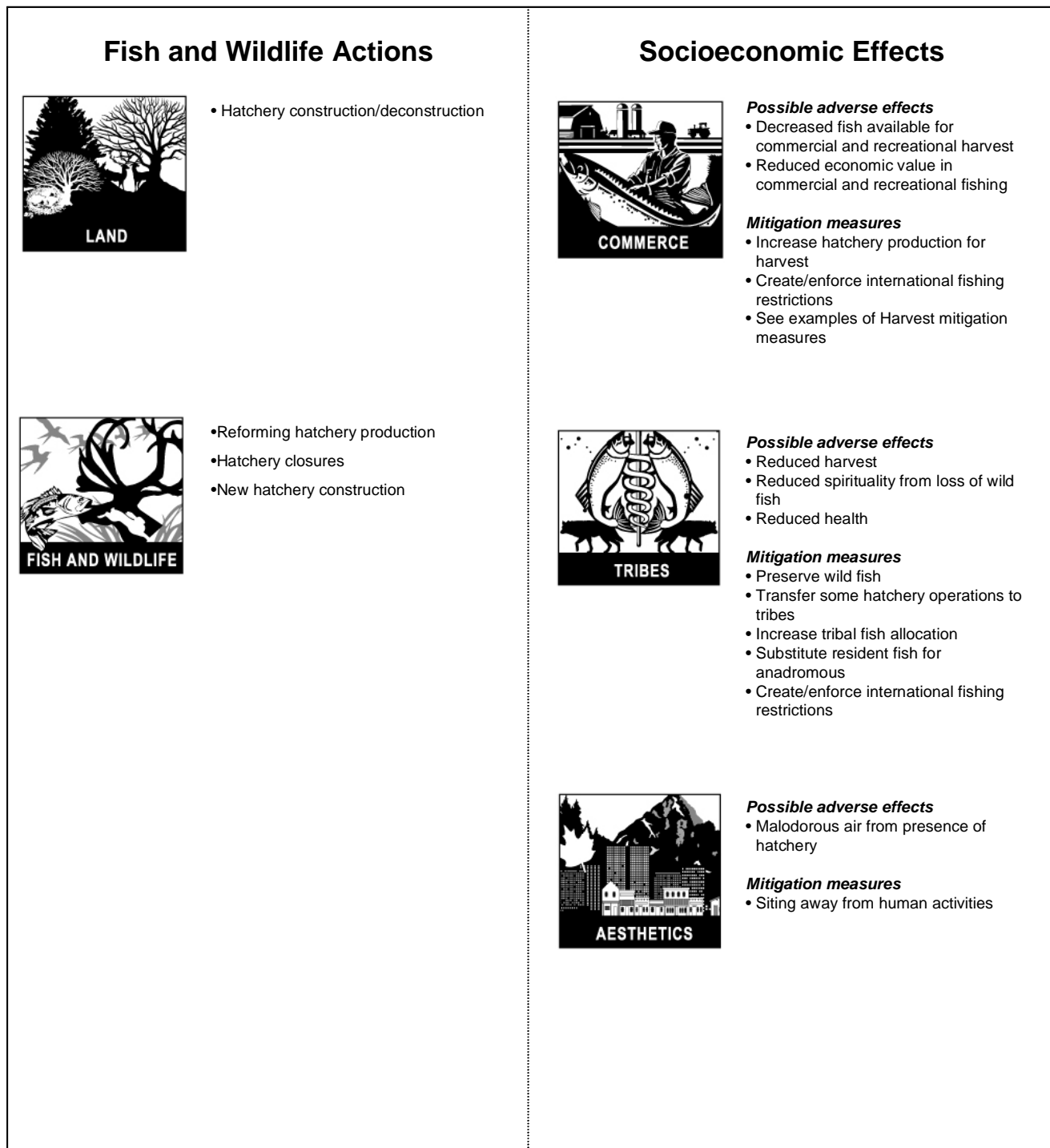
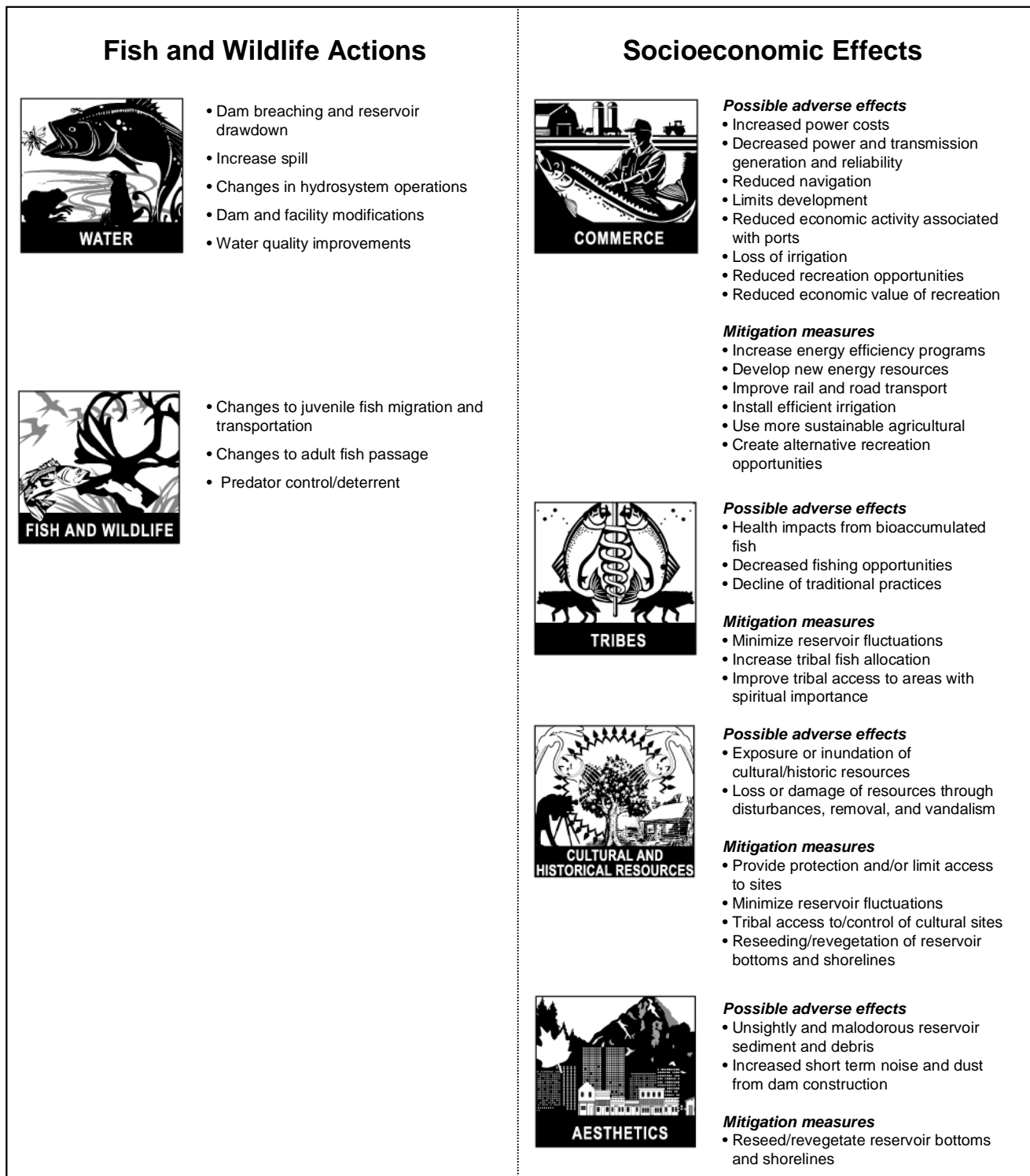


Figure 5-19: Examples of Hydro Actions and Adverse Effects on the Economic and Social Environments



5.3 ENVIRONMENTAL CONSEQUENCES OF POLICY DIRECTIONS

This EIS is very broad in coverage, focusing on effects of fish and wildlife mitigation and recovery activities on the natural, economic, and social environments within the Pacific Northwest. The types of activities considered in this analysis are derived from the categories of actions discussed in Section 5.2.1.1: *habitat, harvest, hatcheries, and hydro*. The effects of these activities are evaluated over a range of reasonably foreseeable Policy Directions. These Policy Directions, as discussed in Chapter 3, encompass a broad spectrum of regional plans and processes for fish and wildlife mitigation and recovery. The analysis considers both short-term and long-term effects.

5.3.1 Framework for Analysis

As previously discussed, Section 5.1 describes the existing conditions of the affected environment. Section 5.2 evaluates the natural, economic, and social environments in terms of the generic environmental effects that human activities have on fish and wildlife, and the generic environmental effects that fish and wildlife activities have on humans. Section 5.3 is the detailed analysis of the environmental consequences of implementing the alternative Policy Directions. Each Policy Direction is evaluated based on its effects on the natural, economic, and social environments.

The five alternative Policy Directions evaluated in this section include:

- Natural Focus,
- Weak Stock Focus,
- Sustainable Use Focus,
- Strong Stock Focus,
- Commerce Focus.

For a description of each Policy Direction see Section 3.2.

These alternative Policy Directions span a full range of reasonably foreseeable future directions for fish and wildlife policy in the Region. This range includes Policy Directions that may be perceived as more favorable for fish and wildlife as well as those that may be perceived as more favorable to people, from the standpoint of economics and social well-being. Therefore, for any Policy Direction, the same environmental consequences may be both beneficial and adverse, depending on the perspective. The reader is provided with a description of the effects associated with each Policy Direction.

5.3.1.1 A Comparison to Status Quo

Status Quo (the "No Action" alternative) represents a continuation of the policy direction that the Region appeared to be following before 2002. Under Status Quo, there is no comprehensive and consistent policy to guide fish and wildlife mitigation and recovery activities. For a description of Status Quo see Section 3.2.1. The alternative Policy

Directions share many of the same attributes as Status Quo; however, these other alternatives are based on a unified planning approach. Status Quo provides the baseline against which all the alternative Policy Directions are compared.

5.3.1.2 A Relationship Approach

By design the analysis in this EIS is more qualitative than quantitative—it is a policy-level evaluation, not a site-specific one. Therefore, the analysis is based on predictable *relationships* between changes to the environment (air, land, and water) and the consequences for fish, wildlife, and humans. The overall intent is to align the level of decisionmaking with the appropriate level of analytical detail so that the public and decisionmakers can better understand the range of potential effects at each stage of decisionmaking. Once a Policy Direction is selected, any necessary site-specific analysis will be carried out when the actual implementation actions for the chosen Policy Direction are known. At that time, any new scientific or other relevant information will be incorporated into the site-specific analysis. This clarifying information could then be documented and tiered to the overall Policy Direction decision, as appropriate. The objective is to inform the public and decisionmakers. This approach should provide the document with extended usefulness, as values and priorities change over time.

5.3.1.3 An Environmental Analysis

The objective of this analysis is to describe the expected environmental conditions under the possible range of implementing actions for fish and wildlife mitigation and recovery under each Policy Direction. The comparisons of the alternative Policy Directions with Status Quo are meant to show how the environmental consequences of each Policy Direction may differ from conditions under the Status Quo Policy Direction. The analysis is organized by the following effect areas:

- Air Quality,
- Land Habitat,
- Water Habitat,
- Fish and Wildlife,
- Commercial Interests,
- Recreation,
- Economic Development,
- Funding Costs,
- Tribal Interests,
- Cultural and Historic Resources, and
- Aesthetics.

Each of these broad effect areas is further broken into subcategories in the analysis.

For each effect area category or subcategory, the affected environment is briefly summarized in terms of existing conditions (for a more complete description of the affected environment see Section 5.1). Next, the environmental conditions under the Status Quo Policy Direction are briefly described. Then, the environmental conditions under each of the alternative Policy Directions are described. The environmental effects analysis considers both the short and long terms. The short term includes those effects likely to occur within 10 years (major short-term effects will be examined in greater detail in future project-specific tiered environmental analyses). The long term generally extends beyond the 10-year period. The environmental effects are described in terms of "better", "worse", or the "same" as Status Quo. The terms "better" or "worse" are equivalent to the NEPA terms "beneficial" and "adverse."

At the beginning of each effect area, a summary is provided to briefly describe the environmental consequences of each alternative Policy Directions. Each effect area is first summarized in a table, broken down by the environmental consequences on each subcategory, when applicable. Shading is used to quickly show the reader whether the Policy Direction results in *much worse*, *worse*, *the same*, *better* or *much better conditions* relative to the Status Quo policy. The ratings were assigned through a modified Delphi process using a panel of experts.²⁰⁷ In the natural environment, the environmental consequences are described in terms of the effects on fish and wildlife. In the economic and social environments, the human perspective is considered in describing the environmental consequences. Following each table, the environmental consequences are summarized by Policy Direction.

5.3.1.4 The Sources for Analysis

The use of multiple sources has been critical to the qualitative analysis used in this EIS. Over the last several years, an enormous database of environmental analyses has been created. In this EIS, the use of this existing database was maximized. Many environmental documents have been incorporated by reference. These important sources include the Columbia River SOR EIS, the Lower Snake River Juvenile Migration Feasibility Report/ EIS, the Forest Service/BLM's Interior Columbia Basin EIS, and BPA's Business Plan EIS. For more information on these and other environmental documents see Section 1.3.3. Other important sources include the Council's Fish and Wildlife Program, NMFS and USFWS BiOps, John Day Drawdown Phase I Study, and reports from the Multi-Species Framework Process and Federal Caucus. These sources are described in Section 1.3.2. For a more technical evaluation, please refer to these documents, including their respective appendices. The analysis was further aided by the comments received from around the Region during the preparation of this EIS.

Many of these studies and processes are complex and often subjective. The lack of concurrence regarding basic assumptions, methodology, and analysis (including various models) have led to often conflicting and biased conclusions. Therefore, it is difficult to

²⁰⁷ Charles Alton, Jean Edwards, Steve Mader, Roger Mann, Michael Mayer, Kathy Pierce, John Pizzimenti, and Ben Underwood. See List of Preparers for backgrounds.

compare results. However, the qualitative assessment of this EIS provides for an objective comparison of the many studies and processes.

5.3.2 Natural Environment

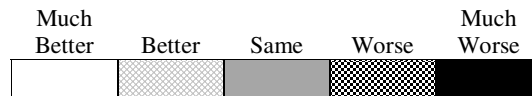
The Policy Direction ultimately selected and implemented will result in environmental effects on the natural environment. Effects on air quality, land, water, and fish and wildlife are evaluated for each Policy Direction. For water and fish and wildlife, the environmental effects are evaluated and described by subcategories. The anticipated effects associated with each Policy Direction are discussed throughout this section.

5.3.2.1 Air Quality

Table 5.3-1A displays how effects on air quality vary across the range of Policy Directions. Emissions of major concern are carbon monoxide (CO), carbon dioxide (CO₂), oxides of nitrogen (NO_x), particulate matter (PM₁₀), and sulfur dioxide (SO₂). Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects on humans that are the same as, better than, or worse than Status Quo. Fewer air pollution emissions are characterized as better in the table. Most of the effects are based on information from the Columbia River SOR EIS, the Phase I Results of BPA's Regional Air Quality Modeling Study, and the Lower Snake River Juvenile Migration Feasibility Study EIS.²⁰⁸

Table 5.3-1A: Air Quality Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
CO	Same	Much Worse	Much Worse	Same	Same	Worse
CO ₂	Same	Much Worse	Much Worse	Same	Same	Worse
NO _x	Same	Much Worse	Much Worse	Same	Same	Worse
PM ₁₀	Same	Worse	Worse	Same	Same	Worse
SO ₂	Same	Much Worse	Much Worse	Same	Same	Worse



²⁰⁸ USDOE/BPA, Corps, and Bureau 1995c, Section 4.3; USDOE/BPA 2001d; and Corps 2002b, Section 5.3 Air Quality, Table 5.3-6 and Section 5.3.2.4 Alternative 4—Dam Breaching.

Summary of Effects: Under both Natural and Weak Stock Policy Directions, air emissions from most of the pollutants would be much worse than Status Quo largely due to the effects of dam breaching. However, PM₁₀ would only be worse than Status Quo largely due to the exposed areas becoming revegetated. This would happen at a faster rate under Weak Stock as these areas are actively enhanced.

Under the Sustainable Use and Strong Stock Policy Directions air emission would be about the same as Status Quo. Although hydro operations are not further constrained under a Sustainable Use Focus, fish and wildlife restrictions still limit development. Under Strong Stock there would be fewer fish and wildlife restrictions and more power would be generated. However, development would also increase and new non-hydro power resources would be constructed to meet the demand.

The Commerce Focus increased air emissions would result from expanding economic activity and new power sources needed to support it. These effects are described in greater detail in Table 5.3-1B.

Table 5.3-1B: Air Quality Effects Across the Policy Directions Analysis

EFFECT AREA: AIR QUALITY (POLLUTION) fewer emissions = better	
Existing Conditions	Impacts on air emissions mainly result from transportation, construction activities, and energy generation. The air emissions of major concern are carbon monoxide (CO), carbon dioxide (CO ₂), nitrogen oxides (NO _x), particulate matter (PM ₁₀), and sulfur dioxide (SO ₂). ²⁰⁹ Barges, trains, and trucks remain the main modes of transportation for moving commodities within in the Region. ²¹⁰ Trains, trucks, and ocean-going cargo vessels are used widely for importing and exporting goods to and from the Region. These modes of transportation mainly influence the levels of CO, CO ₂ , NO _x , and SO ₂ . Construction activities and the exposure of sediment can result in increased PM ₁₀ . The main fuel sources for power generation that affect air quality include primarily natural gas and coal, and to a lesser extent, wood residue. ²¹¹ These fuels can cause increases in CO, CO ₂ , NO _x , SO ₂ , and PM ₁₀ .
POLICY DIRECTION	
Status Quo	Between 1990 and 2000, based on the U.S. Census Bureau data, the Region (OR, WA, ID, MT) experienced about a 21% growth in population; it has a projected growth of about 19% between 2000 and 2015. ²¹² In 2001, regional firm power resources totaled about 21,000 aMW (based on a twelve-month average and 1936-37 water conditions). Of the 21,000 aMW, the major components were hydro, coal, imports, non-utility generation, nuclear, and combustion turbines. ²¹³ Since 1995,

²⁰⁹ Corps 2002b, Section 4.3.1.1 Regulated Air Pollutants; and USDOE/BPA 1995, Section 3.6.3 Air Quality.

²¹⁰ Council 2000, Section 5.3.4 Transportation.

²¹¹ See Appendix E of this EIS.

²¹² Data taken from US Census Bureau, <http://www.census.gov/population/projections/state/stpjpop.txt> (last visited February, 2003).

²¹³ See Chapter 5 of this EIS, Section 5.2.3.1. Air Quality.

EFFECT AREA: AIR QUALITY (POLLUTION) fewer emissions = better	
	hydrosystem operation (FCRPS) requirements for salmon recovery have reduced hydropower generation in the Region by about 1000 MW. ²¹⁴ Relative to existing air conditions, the Status Quo Policy Direction is expected to include some increase in air pollutants associated with additional economic growth: the need for increased transportation of commodities and increased generating resources (mostly combustion turbines [CTs]). ²¹⁵ The increase in air emissions will be regulated by existing pollution abatement programs, such as those under the Clean Air Act, and mitigated by technological improvements.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Drawdown of reservoirs and breaching of dams ²¹⁶ cause impacts from emissions associated with thermal power plants used to replace lost hydropower, increased truck and train use to replace lost navigation, deconstruction-related emissions, and windblown dust from exposed dry sediments. This Policy Direction would require a sizable increase in power generation, most likely from new CTs, to replace hydropower lost from breaching and drawdown. For example, breaching the four lower Snake River dams and the John Day Dam to a "natural river" level would decrease generating capacity by about 2,000 aMW. ²¹⁷ In addition, barge traffic would decrease considerably, leading to increased air emissions from the new truck and train traffic needed to replace lost barging capabilities. ²¹⁸ Actual dam deconstruction would increase airborne particulate matter (PM ₁₀); and, as reservoirs empty, dust would rise from newly exposed land. As new vegetation covered the land, dust would decrease, so these deconstruction and reservoir effects would be temporary. ²¹⁹ Therefore, PM ₁₀ emissions would only be worse compared to Status Quo. Overall, however, there would be much more air emissions resulting in impacts much worse than compared to Status Quo.
Weak Stock Focus	Impacts from dam breaching would be similar to those for Natural Focus, except that the amount of increased air emissions would be somewhat less because fewer dams would be breached (although there might be an additional decrease in power from changes in hydro operation to benefit listed species). For example, over the next 10-20 years, removing the four lower Snake River dams would reduce BPA firm sales by about 800-1000 aMW. ²²⁰ Long-term air emissions would increase from increased

²¹⁴ See Chapter 2 of this EIS, Section 2.3.2.2. Other Federal Agencies and General Statutory Responsibilities.

²¹⁵ See Chapter 5 of this EIS, Section 5.2.3.1. Air Quality and Appendix E, Table B. Increased coal generation would increase CO, CO₂, NO_x, PM₁₀, and SO₂ emissions. Additional combustion turbine plants would produce the same pollutants as coal, but at a much lower rate per unit of energy produced because of greater efficiency (note: the reason SO₂ is present is that it is used in natural gas as an odor indicator).

²¹⁶ The six dams to be breached would be the four Lower Snake River Dams, and the John Day and McNary Dams on the mainstem of the Columbia River.

²¹⁷ Corps 2000, Section 10.4.6.2 Social Effects by Area of Impact: Power; Corps 2002, Section 5.10.1.2 Power System Models.

²¹⁸ Data compiled in the Lower Snake River Juvenile Migration Feasibility Study FEIS suggest that NO_x, PM₁₀ emissions would increase; CO emissions would remain about the same; and SO₂ emissions would decrease. Corps 2002b, Section 5.3 Air Quality, Table 5.3-4.

²¹⁹ Corps 2002b, Section 5.3.2.4 Alternative 4—Dam Breaching; Corps 2000, Section 7.6 Air Quality Impacts.

²²⁰ Corps 2002b, Section 5.10.1.2 Power System Models.

EFFECT AREA: AIR QUALITY (POLLUTION) fewer emissions = better	
	truck and train traffic that would replace lost navigation capability. ²²¹ Air emissions from deconstruction and reservoir drawdown would be measurable, but short-term as active revegetation practices are used. Overall, air pollution would be much worse in the long-term under this Policy Direction, compared to conditions under Status Quo.
Sustainable Use Focus	Modifying hydro operations are not expected to affect air emissions much, if at all, because of the negligible need for replacement power. ²²² No change is expected from increased road and rail transportation to replace navigation. Air emissions is not likely to change compared to Status Quo.
Strong Stock Focus	Restrictions on hydro operations specific to weak-stocks would be removed if they do not adversely affect strong stocks. Costly weak-stock recovery modifications would not be implemented and hydropower production would not be curtailed. Therefore, there would be no need for replacement power. However, economic activity, no longer limited by weak-stock recovery efforts, would be allowed to increase. Consequently, the need for new generation would increase, and likely result in an increase in air emissions. The Clean Air Act would still limit increases in new air emissions. Overall, this Policy Direction would result in about the same amount of air emissions as Status Quo.
Commerce Focus	Because there would be fewer restrictions on hydrosystem for power production, generation would increase and there would be no immediate need for replacement power resources. Regional commercial competitiveness could attract new industry, increasing PM ₁₀ and CO ₂ air emissions; such attraction would also increase the need for more power generation beyond what the hydrosystem could generate. In that case, new power sources would be constructed, which would increase air emissions, limited by the Clean Air Act. Overall, air emissions would be worse under this Policy Direction than under Status Quo.

5.3.2.2 Land Habitat

Table 5.3-2A shows how implementing the different Policy Directions would affect land habitat. Effect area subcategories include the following: quality and amount of upland habitat; and quality and amount of riparian/wetland habitat, including streamside, shoreline, and isolated wetland areas. Effects are shown, by shading, to indicate whether implementing a given Policy Direction would have effects on fish and wildlife and their habitats that are the same as, better than, or worse than Status Quo. More quality habitat is characterized as "better" in the table.

²²¹ Corps 2002b, Section 5.3.2.4 Alternative 4—Dam Breaching: Emissions Associated with Loss of Barge Transportation.

²²² Corps 2002b, Section 5.10.2.2 Alternative 2—Maximum Transport of Juvenile Salmon and Alternative 3—Major System Improvements; USDOE/BPA 2000d.

Table 5.3-2A: Land and Land Use Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Upland habitat: Quality	Same	Better	Better	Same	Same	Same
Upland habitat: Amount	Same	Same	Better	Same	Same	Worse
Riparian/wetland habitat: Quality	Same	Better	Better	Same	Same	Same
Riparian/wetland habitat: Amount	Same	Same	Better	Same	Same	Same



Summary of Effects: Under Natural Focus and Weak Stock there would be more upland and riparian/wetland habitat than compared to Status Quo. Because active methods generally would not be taken to enhance habitat under Natural Focus, there would be no overall improvement of habitat gained through this Policy Direction. However, there would still be some quality habitat similar to the amount under Status Quo. Under Weak Stock, the active management approach would result in greater amounts of high quality habitat than compared to Status Quo.

The Sustainable Use Policy Direction would result in more quality upland and riparian/wetland habitat than compared to Status Quo. An active approach to enhance and manage more habitat than managed under Status Quo results in these gains.

Strong Stock Focus would maintain the upland, riparian, and wetland habitats that support healthy fish and wildlife resulting in about the same amount of upland and riparian/wetland habitats as under Status Quo. Overall, the quality of upland, riparian, and wetland habitat would be improved compared to Status Quo, because productive areas are maintained and enhanced.

Commerce Focus would ease restrictions and encourage more development, especially in uplands. Compared to Status Quo, the Commerce Focus Policy Direction would result in similar quality habitat. Although there would be about the same amount of riparian/wetland habitat as Status Quo, there would be less upland habitat.

These effects are described in greater detail in Table 5.3-2B.

Table 5.3-2B: Land and Land Use Effects Across the Policy Directions Analysis

EFFECT AREA: LAND HABITAT more quality habitat = better	
Existing Conditions	<p>With regard to fish and wildlife, the most important land and land use issues concern the potential loss of and adverse impacts on habitat from human activities. The overall quality of upland habitat has decreased because of such activities as overgrazing, timber harvest, introduction of exotic species, and inundation by dam construction. The overall extent and continuity of riparian areas has decreased, primarily because of conversion to agriculture and range, but also because of urbanization, transportation improvements, and stream-channel modifications.²²³ Quality riparian shrublands have also been lost because of excessive livestock grazing and increases in exotic vegetation.²²⁴ Overall, wetlands have decreased because land use activities have degraded, modified, or destroyed them. However, creation of water impoundments has allowed for some limited increases in wetland habitat. As a result of the creation of the impoundments, wetland habitat has increased from roughly 10 to more than 300 acres in the lower Snake River area, while riparian habitat has decreased by almost 1,500 acres. As a result of construction of the John Day dam, wetland habitat has increased from about 1,600 to almost 2,300 acres,²²⁵ while riparian habitat has decreased by almost 1,600 acres.²²⁶ However, there is a documented loss of more than 12,000 acres of upland habitat when the impoundments were created for the lower Snake dams.²²⁷ The use or development of some habitat areas is controlled or limited by natural resources regulations.</p>
POLICY DIRECTION	
Status Quo	<p>Habitat fragmentation has increased, especially in upland and riparian areas in the Basin.²²⁸ Mitigation efforts have focused on protecting, enhancing, and managing land habitat, but there continues to be a legacy of habitat fragmentation. Development of native habitat and agricultural land will increase to meet the demand for urban growth and other land use activities. For example, in 1998, Oregon's Metropolitan Service District (Metro) expanded the Portland area's urban growth boundary by 3,527 acres to meet future needs (providing 14,000 jobs and room for roughly 23,000 housing units). In 1999, the Metro Council voted to include another 377 acres.²²⁹ Similar increases are occurring in other Oregon municipalities. Overall, valuable upland habitat has decreased. However, upland habitat quality has increased in some areas, where it had been historically degraded (e.g., overgrazed) and is currently being restored.²³⁰ Some of these increases are marred by the invasion of exotic species and other changes in landscape composition. Wetland habitat has increased in some areas and decreased in others, while overall riparian</p>

²²³ USDA/USFS and USDO/BLM 2000b, Chapter 2 Affected Environment, Terrestrial Species.

²²⁴ USDA/USFS and USDO/BLM 2000b, Chapter 2 Affected Environment, Terrestrial Species.

²²⁵ Corps 2002b, Section 4.6.1 Vegetation, Table 4.6-1; Corps 2000, Section 8.1 Mitigation Measures for Wildlife Resources, Table 50.

²²⁶ Corps 2002b, Section 4.6.1 Vegetation, Table 4.6-1; Corps 2000, Section 8.1 Mitigation Measures for Wildlife Resources, Table 50.

²²⁷ Corps 2002b, Section 4.6.1 Vegetation, Table 4.6-1.

²²⁸ Corps 2002b, Section 4.6.1 Vegetation, Table 4.6-1.

²²⁹ Metro 2003.

²³⁰ Corps 2002b, Section 4.6 Terrestrial Resources.

EFFECT AREA: LAND HABITAT more quality habitat = better	
	habitat has decreased and become fragmented. However, some replacement riparian habitat has been created. Mitigation efforts have focused on managing habitat, but there continues to be a trend toward increased habitat fragmentation.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Breaching or modifying the six dams would result in an increase in the amount of upland and riparian habitat, but it could result in a decrease in wetland habitat in certain areas. Dam breaching would expose more than 39,000 acres of inundated land. ²³¹ Terrestrial/ riparian restoration efforts would focus on preserving land and stopping land-use activities by humans such as farming, grazing, mining, other development, and access in certain protected areas. Restoration emphasizes passive techniques, resulting in the natural succession of fish and wildlife habitat. No effort would be placed on the control of exotic plant species (e.g., cheatgrass, knapweed, and yellow star-thistle) that can alter habitat quality, sometimes by forming monocultures that restrict wildlife use and reduce species diversity (e.g., knapweed limits elk browsing opportunities). ²³² Periodic natural disturbance, such as flooding and fire, would be part of the natural restoration process. Overall, there would be much more upland and riparian/wetland habitat, but the quality of these habitat types would be about the same as under Status Quo.
Weak Stock Focus	Substantial human intervention to enhance lost or degraded habitat would benefit ESA-listed fish and wildlife, especially in areas designated as critical habitat. Dam breaching or modification would create some upland and riparian habitat. Breaching of the four lower Snake River Dams would expose about 14,000 acres of previously inundated land. ²³³ Active habitat improvements would be used primarily to obtain important habitat features for listed species, and control non-native vegetation. Land use activities that affect listed species would be curtailed. A variety of habitat protection and enhancement mechanisms would be used, such as purchase of conservation easements, fee title acquisitions, riparian fencing, and cost-sharing with other Federal agencies under various agricultural incentive programs. Habitat protection and enhancement efforts would be conducted using a "watershed" or "ecosystem" approach, i.e., a more comprehensive look at a sub-basin and its biological needs. Habitat restoration and enhancement efforts would result in an increase in high-quality habitat for listed species. Overall, there would be much more upland and riparian/wetland habitat and the quality of these habitat types would be better than under Status Quo.
Sustainable Use Focus	A management approach that considers habitat needs for both listed and non-listed fish and wildlife would be used. Habitat conservation would be strengthened through improved management of agriculture, forestry, livestock grazing, mining, and road building. There would be an intensive effort to manage habitat, and a moderate effort to rebuild it. The focus would be on multi-species conservation and active management of their habitats. Active management methods might include more land shaping, removal of migration obstructions, exotic species control, and riparian/wetland enhancement. These actions would result in conserving some areas that would be developed under Status Quo. Overall, there would be more quality

²³¹ Corps 2000, Section 7.18.1 Wildlife Habitats, Table 44; Corps 2002b, Section 5.2.3 Alternative 4—Dam Breaching (the 39,000 acres only includes the four Lower Snake dams and the John Day dam; because McNary Dam is not included in the total, the result would be higher).

²³² Sheley, R.L. et al. 1998.

²³³ Corps 2002b, at Section 5.2.3 Alternative 4—Dam Breaching.

EFFECT AREA: LAND HABITAT more quality habitat = better	
	upland and riparian/wetland habitat than under Status Quo.
Strong Stock Focus	Management actions would focus on maintaining existing habitat for healthy populations of fish and wildlife. Strong Stock habitat would not be sacrificed for weak stocks, but improved where most stocks would benefit. An emphasis would be placed on the maintenance and active management of habitat to prevent further degradation. Priority would be given to existing habitat that supports strong and healthy populations of fish and wildlife to ensure continued productivity. Efforts would result in higher quality habitat than under Status Quo, however the amount of upland and riparian/wetland habitat would be about the same as under Status Quo.
Commerce Focus	Land would not be improved or maintained for habitat unless the benefit of such management was to exceed the costs. Federal, regional and state programs for habitat enhancement would be limited and focused on the land most valuable for species and less valuable for commercial interests. However, areas suitable for both habitat rebuilding and increased recreational opportunities would be managed for those multiple uses. Some existing terrestrial habitat would be developed for commercial interests. Voluntary actions and financial incentives would be used to implement private, cost-effective, and efficient habitat enhancement and maintenance. Mitigation concepts such as mitigation credit trading would be used to provide replacement habitat or preserve other habitat as a credit against new development. Financial incentives, such as start-up grants, tax breaks, and technical assistance, would be used to encourage local landowners, businesses, corporations, and trustee agencies to improve wetland, riparian, and terrestrial areas. Overall, there would likely be less upland habitat than under Status Quo, but riparian/wetland habitat would be about the same. Habitat quality for both upland and riparian/wetlands would be about the same as Status Quo.

5.3.2.3 Water Habitat

Table 5.3-3A shows how the Policy Directions would affect water quality, instream water quantity, and the amount of river and reservoir habitat for fish and wildlife. Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo. Improving aquatic conditions for fish and wildlife is characterized as "better" in the table. Some increases in water quality factors, such as more instream water quantity and amount of habitat, would be better for most fish and wildlife, but other increases, such as more nitrogen supersaturation or sedimentation, would be worse.

Table 5.3-3A: Water Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Nitrogen Supersaturation						
Non-thermal Pollution						
Sedimentation						

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Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Temperature/ Dissolved Oxygen						
Instream Water Quantity						
Amount of Stream/River Habitat						
Reservoir Habitat						



Summary of Effects: Breaching six dams under the Natural Focus Policy Direction would result in more river-like conditions in those stretches of the Columbia and Snake Rivers. This Direction would result in long term improvements in all water quality factors. In fact, several factors would be much better than Status Quo. There would also be gain in the amount of instream water and stream/river habitat. However, because six dams are breached there would be much less reservoir habitat available compared to Status Quo.

The Weak Stock Policy would have similar effects as those described for Natural Focus, however, some water quality improvements would not be as great. Also, since only four dams are breached, the amount of reservoir habitat would only be worse than compared to Status Quo.

Under Sustainable Use there would be some improvements in water quality. However, nitrogen supersaturation and temperature/DO would remain the same as Status Quo. This would be largely due to hydrosystem operations designed to benefit fish and wildlife. There would also be improvements in the amount of instream water and river/stream habitat because of active water acquisitions and habitat enhancements. Since no dams would be breached under this Direction, the amount of reservoir habitat would be the same as under Status Quo.

Strong Stock Focus would result in improvements in nitrogen supersaturation, as spill is reduced. However, there would be increases in sedimentation as more development is allowed. Other water quality parameters would be the same as Status Quo. The amounts of instream water and river/stream habitat would also be the same as under Status Quo. However, there would be more reservoir habitat as reservoir levels are maintained.

Commerce Focus would result in improvements in nitrogen supersaturation, as spill is reduced, however other water quality parameters would be worse due to increasing

development. The amount of instream water and river/stream habitat would also be worse as development is given priority. Reservoir habitat would likely increase as reservoirs are used for increased storage compared to Status Quo.

These effects are described in greater detail in Table 5.3-3B.

Table 5.3-3B: Water Effects Across the Policy Directions Analysis

EFFECT AREA: WATER HABITAT: Nitrogen Supersaturation less = better	
Existing Conditions	The main issue for fish concerning nitrogen supersaturation is increased mortality because of gas bubble trauma (GBT), a condition caused by high levels of dissolved gas. Nitrogen supersaturation, also referred to as Total Dissolved Gas (TDG), is caused by water spilling over large dams. As spill volumes increase, the dissolved gas concentrations downstream consistently increase. As the river flow passes each of the lower Snake and Columbia River dams, sequential spill causes the concentration of dissolved gas in the river to increase, incrementally and cumulatively. Many existing structures were not designed to minimize nitrogen supersaturation problems when they were constructed. For Washington, Idaho, and Oregon, a TDG standard of 110% saturation at ambient atmospheric pressure is the maximum concentration for TDG. However, the Washington Department of Ecology (WDOE) has waived the state standard for the four lower Snake River dams; WDOE has set an upper limit of 115% saturation in the forebays and 120% saturation in the tailwater. If the measured concentrations exceed these values (based on a daily average of the 12 highest hourly measurements), then the spill release is curtailed to meet the limits. The lower Snake River between the Clearwater River and Columbia River has been placed on the Washington 303(d) list as water-quality-impaired for dissolved gas. ²³⁴ Segments of the Columbia River in Oregon are also listed; Oregon is considering similar action.
POLICY DIRECTION	
Status Quo	TDG is being managed by controlled flow, voluntary spillway releases, installation of flow deflectors, and other spillway modifications. Some excessive voluntary spill operations for weak stocks and spring migrations may continue to cause TDG problems. Unless turbines and generators are fully modernized, failure of the units would cause substantial TDG effects, as happened at Ice Harbor in 1995-1996. Attempts to manage spill at dams to keep gas levels within Federal CWA guidelines would be partially attainable, except in high flow years. Additional spillway flow deflectors, modifications to existing spillway flow deflectors, and pier wall extensions would be added to further reduce dissolved gas concentrations and, thus, provide more control of TDG levels. Overall, the dissolved gas abatement structures should help lower TDG concentrations.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The breaching of six dams would eliminate the TDG problems from those specific sites. However, as plunge pools form during the development of a stable channel morphology under a different flow regime, geographically localized TDG above 110% is possible infrequently and for short durations. ²³⁵ The closer the return to a natural river, the less TDG supersaturation would remain a problem. Those dams that

²³⁴ Corps 2002b, Section 4.4.2.2 Water Quality Parameters and Standards.

²³⁵ Corps 2002b, Section 5.4.2.4 Total Dissolved Gas.

EFFECT AREA: WATER HABITAT: Nitrogen Supersaturation less = better	
	remained could experience elevated TDG locally, as a result of an increase in flow and the need to spill additional water. Removing six dams would reduce the cumulative effect of TDG. Overall, there would be a very large decrease in TDG, compared to conditions under Status Quo.
Weak Stock Focus	Removing four dams would eliminate TDG problems from those specific sites, with effects similar to those under Natural Focus. Therefore, these actions could also decrease the cumulative TDG effect of the entire hydro system, although there could be local fluctuations. If other dam operations increased flows for weak stocks, they would increase the levels of saturated gas exposure mainly through increased spill. Existing dams would be further modified to reduce TDG, benefiting weak stocks. Overall, there would be a large decrease in TDG, compared to conditions under Status Quo.
Sustainable Use Focus	Spill and flow regimes would be balanced with state CWA standards. Structural improvements would be made to the dams to benefit fish and wildlife. Improvements could include new spillway flow deflectors, modifications to existing spillway flow deflectors, and pier wall extensions. Overall, however, TDG supersaturation, a problem even with improvements, would be the same as Status Quo.
Strong Stock Focus	Healthy, strong stocks would be less dependent on coordinated spill and flow schemes, and juvenile transportation would be used more to further reduce spill. The reduction in spill would decrease the amount of supersaturated gas in the river. Overall, there would likely be a decrease in the TDG problems compared to Status Quo.
Commerce Focus	Except in instances of flood control releases or large flows, spill would be minimized under a commercial focus. The water normally spilled would likely be stored for a higher commercial value, such as power production or municipal use. If spill for fish were unable to achieve some kind of commercial benefit, it would likely be discontinued, resulting in a reduction in TDG. Overall, TDG levels would be less than under Status Quo.

EFFECT AREA: WATER HABITAT: Non-thermal pollution less = better	
Existing Conditions	The main concerns for fish and wildlife regarding non-thermal pollution include direct adverse physiological effects (e.g., bioaccumulation, direct contact) and habitat degradation. Non-thermal pollution can include excesses of organic matter, fertilizers (e.g., phosphates), pesticides (e.g., DDT, aldrin, heptachlor), herbicides (e.g., 2,4-D), sediment (sedimentation is discussed separately below), acid mine drainage, and a large number of metals (e.g., arsenic, lead, mercury) and chemicals (e.g., dioxins). Sources of non-thermal pollution include municipal and industrial wastewater, industrial facilities, irrigation return flows, mine runoff, agricultural and grazing runoff, and untreated storm water. Agriculture represents the largest nonpoint source of non-thermal pollution and uses the largest amount of surface water within the Basin. ²³⁶ There are 7 to 9 million acres of irrigated land in the Columbia River Basin used for both agriculture and grazing. The discharge of point source pollution is regulated by either EPA, or authorized state agencies, through NPDES permits under the CWA. Water quality is also regulated by state-specific water quality standards. Increases in non-thermal pollution can result in changes to

²³⁶ NMFS 2000b, Section 5.3.2 Habitat Effects.

EFFECT AREA: WATER HABITAT: Non-thermal pollution less = better	
	the pH levels. The discharge of non-thermal pollution can impair water quality and designated beneficial uses of specific bodies of water.
POLICY DIRECTION	
Status Quo	Between 1990 and 2000, based on U.S. Census Bureau data, the Region experienced about a 21% growth in population; it has a projected growth of about 19% between 2000 and 2015. ²³⁷ Increasing population and economic growth produces additional pollution, but existing and planned regulations and programs, technological improvements driving new industries and the decline of old, less-regulated industries all combine to reduce pollution. The net effect is that pollution would increase from existing levels. Non-thermal pollution would continue to be regulated under the CWA and new water quality standards that limit the Total Maximum Daily Loads (TMDLs) of pollutants.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Non-thermal pollution would likely decrease as habitat is protected and access is limited to these areas, thereby decreasing the sources of pollution. The drawdown and removal of six dams could result in limited increases in non-thermal pollution as previously settled contaminants are re-released into the water column; however, there would be a long-term net benefit. (See Sedimentation, below.) Discharges of non-thermal pollution would be reduced through new controls on wastewater and other point and non-point sources to meet more stringent state water quality criteria pursuant to the CWA. Stronger enforcement of discharge permits would help ensure that water quality standards are met. Overall, the level of non-thermal pollution would be less than that under Status Quo.
Weak Stock Focus	Improvements in water quality may be achieved by actively pursuing reductions in non-thermal pollution to meet water quality criteria for listed anadromous and resident fish. New controls on wastewater and other point and non-point sources to meet more stringent state water quality criteria pursuant to the CWA would reduce discharges of non-thermal pollution. Increased enforcement of water quality standards for pollutants would be focused in the critical habitat of listed species. Efforts would be made in agricultural management and residential/commercial development to reduce non-point sources in targeted weak-stock tributaries. Non-thermal pollution would be further reduced by efforts to enhance more habitat for listed fish and wildlife. The drawdown and removal of four dams could result in a short-term increase in non-thermal contaminants in association with sediment movement; however, these pollution levels would likely decrease in the long term. ²³⁸ Overall, there would be less non-thermal pollution compared to Status Quo.
Sustainable Use Focus	State and Federal water quality standards would be achieved and enforced throughout the Region pursuant to the CWA. Management for multiple purposes would include reductions in non-thermal pollution to improve water quality. Riparian land acquisition and active restoration would reduce upgradient non-point source contributions. Non-thermal pollution would be further reduced by efforts to improve other habitat to maintain harvestable populations of fish and wildlife. Positive incentives, monitoring, and enforcement would be used to reduce point and

²³⁷ Data taken from US Census Bureau, <http://www.census.gov/population/projections/state/stpjpopt.txt> (last visited February, 2003).

²³⁸ Corps 2002b, Section 5.5.1.4 Alternative 4—Dam Breaching.

EFFECT AREA: WATER HABITAT: Non-thermal pollution less = better	
	non-point source pollution. Overall, there would be less non-thermal pollution compared to Status Quo.
Strong Stock Focus	Management of water quality throughout the Region would be targeted in habitat that would benefit healthy populations of fish and wildlife. Implementation of pollution controls would be prioritized to areas occupied by strong stocks. Increases in non-thermal pollution would continue to be regulated under the CWA and new water quality standards that limit the TMDL of particular pollutants. However, other areas would still be required to meet water quality standards. Overall, there would be about the same amount of non-thermal pollution as under the Status Quo.
Commerce Focus	Water quality would be managed to ensure health and safety of humans and continued provision of designated beneficial uses. There could be some use of positive incentives and trading of pollution credits allowed to accommodate industrial growth. Pollution controls would be efficient and cost-effective. Pollution levels might increase as a result of greater development. Overall, non-thermal pollution would be worse than compared to Status Quo.

EFFECT AREA: WATER HABITAT: Sedimentation less = better	
Existing Conditions	With respect to fish and wildlife, the main concern regarding sedimentation involves the potential degradation of aquatic habitat and the related adverse effects of soil erosion on terrestrial habitat. Sedimentation is the result of soil erosion, and is measured in terms of turbidity and suspended sediment. Turbidity is the amount of light scattered or absorbed by the water. Suspended sediment is the portion of the sediment load that moves suspended in the water column. ²³⁹ Accelerated sedimentation from erosion results from land disturbances, including agriculture, grazing, logging, and urban development, as well as channel dredging for river navigation. Landslides of various types occurring along reservoir shorelines also contribute to reservoir sedimentation. ²⁴⁰ Dams impound water and reduce velocity, allowing most suspended material to settle to the bottom of the reservoir and the rest to remain suspended in the water column. This action affects turbidity levels and the concentrations of contaminants— most are attached to sediment particles— in the reservoir. Sediment transport downstream of dams is affected because natural sediment movement is interrupted by the dams. Dredging to maintain navigation channels can increase the velocity of the current and the movement of suspended sediments; dredging can also disturb sediments that could contain toxic substances that are harmful to plants and animals. ²⁴¹ Agricultural runoff contributes to sedimentation in some tributaries because return flows are often high in sediments. Historic forest practices contribute to stream sedimentation at existing roads and stream crossings, and to mass wasting. In addition there are direct effects on species. Although some level of sediment may be important to certain life stages of specific fish, too much sedimentation can reduce the survival of eggs and alevins, reduce primary and secondary productivity, interfere with feeding, and cause behavioral avoidance and breakdown of fish social organizations. ²⁴²

²³⁹ Corps 2002b, Section 4.4.2.2 Water Quality Parameters and Standards

²⁴⁰ Corps 2002b, Section 4.2.4 Erosion and Sedimentation.

²⁴¹ Corps 2002b, Section 4.4.2.1 Activities in the Lower Snake River Affecting Water Quality.

²⁴² See Section 5.2.2.2 Water, in this EIS.

EFFECT AREA: WATER HABITAT: Sedimentation less = better	
POLICY DIRECTION	
Status Quo	Large sediment loads are deposited into the river system throughout the Basin. For example, the lower Snake River downstream of Lewiston, Idaho, annually transports approximately 3-4 million cubic yards of new sediments that have been eroded from its drainage basin. Approximately 100-150 million cubic yards of sediment have been deposited upstream of the four lower Snake River dams since Ice Harbor became operational in the early 1960s. ²⁴³ Although an increase in development may result in more sedimentation, other changes in land-use practices (conversion to more permanent crops, agricultural and grazing management, and practices to control erosion during construction) could compensate. The Region could experience gradual improvement as water quality standards, Best Management Practices (BMPs,) and new TMDLs are applied across the land base.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	<p>Dam breaching would allow the annual sediment accumulating behind the individual the six dams to be flushed downstream. Sediments would increase downstream from breached facilities as accumulated reservoir sediments flush downstream for more than 5-10 years. Removing the six dams under would result in most of the suspended sediment being deposited at or upstream from The Dalles Dam. The finer sediment (e.g., clays and silt) could travel past The Dalles and Bonneville Dams, to be deposited in either the Columbia River Estuary or the Pacific Ocean. The sediment would also cover large amounts of benthic habitat, disrupting primary productivity and food supplies in the short term. There would be adverse effects on anadromous stocks destined for the upper Columbia and Snake Rivers in the short term</p> <p>Erosion would increase from newly exposed land that had previously been submerged by reservoirs. Lowering the water levels by breaching the dams would expose mudflats and steep banks that are susceptible to sloughing and erosion during storm flow events. It is estimated that dam breaching could result in 68 potential failure areas on the 140-mile lower Snake River reach alone. It is anticipated that there could be at least two large failures on the Little Goose and Lower Granite reservoirs, and one large failure on the Ice Harbor and Lower Monumental reservoirs.²⁴⁴ These effects would be temporary, until these areas could be stabilized. The retirement and protection of agricultural and other eroding lands, and a reduction in human uses, would reduce sediment loads over the long term relative to Status Quo. Overall, in the long-term there would be much less sedimentation than compared to Status Quo.</p>
Weak Stock Focus	The effects would be similar to those under Natural Focus, but because fewer dams are breached, the duration and location of the short-term effects would be less. Short-term sediment loads would increase, but long-term loads would decrease to more natural rates in specific weak-stock tributaries through active management. The breaching of four dams would allow sediment that accumulates behind the individual dams to be carried downstream. For example, most of the incoming sediment would probably be deposited behind the McNary Dam. The finer sediment (e.g., clays and silt) would likely travel past McNary and be deposited in either the

²⁴³ Corps 2002b, Section 4.2.4 Erosion and Sedimentation.

²⁴⁴ Corps 2002b, Appendix D, Natural River Drawdown Engineering.

EFFECT AREA: WATER HABITAT: Sedimentation less = better	
	Columbia River estuary or the Pacific Ocean. Overall, there would be less sedimentation than compared to Status Quo.
Sustainable Use Focus	Erosion and sedimentation would be reduced throughout the Basin, as part of a more active land use management strategy. Enhancing and managing habitat (e.g., spawning gravel, soil conservation, streambank stabilization, and riparian management) might have temporary, adverse effects, but would result in the stabilizing of ground surfaces, decreasing sedimentation. Overall, sedimentation would be less compared to Status Quo.
Strong Stock Focus	Management for strong stocks would result in decreased flow and spill, and would focus on maintaining existing strong stock habitat, keeping it from further degradation. Commercial activity and development in other areas could increase, resulting in more erosion and deposits of sediment into the rivers. Because this development would be limited to areas not supporting strong stocks, the amount of sedimentation in those areas would remain about the same as compared to Status Quo. However, overall there would be more sedimentation than compared to Status Quo.
Commerce Focus	Sedimentation would increase as development increases. Although all new development would be required to comply with water quality standards, sediment controls must be efficient (benefits exceed costs) in order to be implemented. Incentives-based implementation actions would be used to focus water quality improvements in prime watersheds. Overall, sedimentation would be worse than under Status Quo.

EFFECT AREA: WATER HABITAT: Temperature/Dissolved Oxygen lower temperature = better	
Existing Conditions	Stressful water temperatures and low dissolved oxygen (DO) levels are major concerns for fish and wildlife. In the Columbia River, the major effect of dams on water temperature is to delay the occurrence of downstream maximum temperatures in late summer and to delay cooling in early autumn because of detained flows. ²⁴⁵ The capacity of water to hold oxygen in solution is inversely proportional to temperature. That is, higher stream temperatures result in lower concentrations of DO. Adequate DO concentrations are important for supporting fish, invertebrates, and other aquatic life. Increases in DO concentration can come from wind-created wave action, photosynthesis, and the reaeration of water at the surface from spill. The potential for oxygen depletion is higher in slow, deep, biologically productive reservoirs. Water temperature is one of the critical parameters affecting adult and juvenile salmonid migration behavior during April through September. High water temperatures can stress salmon physiologically and become lethal, or trigger premature egg hatching. Salmonid mortality occurs at sustained temperatures of greater than 73°F. Low water temperatures can also cause cessation of spawning, increased egg mortalities, and susceptibility to disease. ²⁴⁶ Mainstem changes in temperature and DO levels are associated with dry years, low flows, long retention times, and warm weather. Thermal pollution from industrial discharges could also contribute to negative impacts. Tributary problems could be more closely linked to the timing and quantity of irrigation diversions, low storage releases, altered channel

²⁴⁵ Corps 2000, at Section 4.8 Water Quality.

²⁴⁶ See: Corps 1991; Federal Caucus 1999b and 2000b, Habitat Appendix, p. 134 and Hydro Appendix, p. 39; see Section 5.2.2.2 Water of this EIS.

EFFECT AREA: WATER HABITAT: Temperature/Dissolved Oxygen lower temperature = better	
	morphometry, increased solar radiation through loss of riparian and stream bank shading, and irrigation return flows. Hundreds of water bodies are identified as being impaired for these parameters.
POLICY DIRECTION	
Status Quo	Cooler water from the Dworshak reservoir is released during the summer months for temperature control, generally lowering temperatures 1.8-5.4°F in the Clearwater River and the Lower Granite reservoir, with diminishing benefits downstream on the Snake River. The State of Washington's water quality standards specify that water temperatures in the lower Snake River shall not exceed 68°F as a result of human activity. Oregon also disallows water temperature increases in the Columbia River, outside assigned mixing zones, when the stream water temperature is at or above 68°F. Idaho's specific temperature criterion for salmonid spawning calls for a maximum instantaneous water temperature in the mainstem Snake River of 72°F, with daily averages no greater than 66°F. In Washington, DO concentrations for Class A water must be equal to or greater than 8 milligrams per liter (mg/L) throughout the year. Oregon specifies at least 90% saturation for its portions of the Columbia River. Idaho requires the following minimum limits: at least 6 mg/L (30-day mean); 4.7 mg/L (7-day mean); 3.5 mg/L (instantaneous minimum); and 6 mg/L or 90% of saturation (whichever is greater) for salmonid spawning purposes. ²⁴⁷ Revised regional water quality standards and TMDLs for impaired watersheds should bring about gradual improvement. Water temperature/DO conditions could be affected by global warming.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	A return to a natural river and natural tributaries, dam breaching, land retirement, and strong thermal pollution controls could gradually help improve water temperature, including normal fluctuations for the rivers affected. However, water temperatures during low-flow years could reach higher summer peaks under the near-natural river conditions than under the existing impounded river conditions. ²⁴⁸ Under wet and average conditions, peak summer temperatures are projected to be similar to those observed under existing conditions. ²⁴⁹ Upstream reservoirs (upper Columbia, upper Snake, Clearwater) would have to be managed for flow in dry years to avoid downstream problems. These temperature fluctuations would have an inverse effect on DO. However, an increase in nutrients related to erosion could cause short-term, harmful reductions in DO in slack waters. ²⁵⁰ There would be less opportunity for solar heating because of reduced water surface area. However, because some of the reservoirs are operated as run-of-river, usually with relatively short water retention times, the change in temperature would be minimal. ²⁵¹ There would be fewer opportunities to control temperature through controlled releases. Although conditions could be worse or not improved in very dry years, overall both temperature and DO would be somewhat better than under Status Quo.

²⁴⁷ Corps 2002b, Appendix C, Section 3.2.2 Water Quality Standards, Table 3-1.

²⁴⁸ Corps 2002b, Section 5.4.2.2 Water Temperature.

²⁴⁹ Corps 2002b, Section 5.4.2.2 Water Temperature.

²⁵⁰ Corps 2000, Section 7.5.7 Dissolved Oxygen.

²⁵¹ Corps 2000, Section 7.5.3 Temperature.

EFFECT AREA: WATER HABITAT: Temperature/Dissolved Oxygen lower temperature = better	
Weak Stock Focus	This Policy Direction would be similar to Natural Focus but would entail less dam breaching, more aggressive management measures focused in weak-stock areas, and more management of irrigation (as opposed to land retirement). Further modifications and limitations to the hydrosystem could result in more cold-water releases to benefit listed species, especially in very dry or hot years. Gains could be greatest where weak stocks are found in water-quality-impaired waters. Overall, temperature and DO would be better than under Status Quo.
Sustainable Use Focus	Efforts would focus on reducing water temperatures in many tributaries. These actions could include systemwide irrigation water management, retention and reuse of irrigation return flows, and active streambed and riparian management to increase shading along strategic reaches. However, reducing water temperature in tributaries would have little effect on the mainstem. Temperature control structures, improved mixing zones, and cold-water releases on mainstem and upstream tributary facilities might also help. Overall, temperature and DO would likely be about the same as under Status Quo.
Strong Stock Focus	Standards for temperature and dissolved oxygen would be met. Additional efforts such as techniques to cool water or manage dissolved oxygen would be implemented only if needed to benefit healthy stocks. Water temperatures and DO levels would be about the same as those under Status Quo.
Commerce Focus	Thermal pollution would be managed primarily to ensure human health and safety. Any temperature or DO control must be cost-effective; and most controls would be driven by regulation. Temperature in a particular watershed might improve, especially if it is determined that a cold-water fishery is a valuable use of the watershed. Overall, temperatures and DO would be worse than under Status Quo.

EFFECT AREA: WATER HABITAT: Instream Water Quantity more = better	
Existing Conditions	With respect to fish and wildlife, the main concern regarding instream water quantity is the loss of habitat caused by water withdrawals during summer months, when water levels are at their lowest. Water withdrawals from the system, including those for consumption, storage, irrigation, and groundwater storage, reduce the amounts of river and stream water and flows. Tributaries, arid areas, and areas upstream of the four lower Snake River dams experience the most substantial adverse effects from water withdrawals. Also, urban watersheds with large areas of impervious surfaces exhibit altered streamflows.
POLICY DIRECTION	
Status Quo	Water quantity problems are a major cause of habitat degradation and reduced fish production. Withdrawing water for irrigation and for urban and other uses, can increase temperatures, smolt travel time, and sedimentation. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September). Water returns to surface streams and groundwater in ways that are difficult to measure. For example, average mean daily flows are at minimum from mid-summer (mid-July) to the early fall (mid-October), while average mean daily flows are at maximum from mid-May to mid-June (where streams are affected by snow runoff). ²⁵² Programs to manage storage releases (e.g., flow augmentation

²⁵² Corps 2002b, Section 4.4.1 Hydrology.

EFFECT AREA: WATER HABITAT: Instream Water Quantity more = better	
	and spill) and acquire water rights/leases from irrigation (e.g., the 427,000 acre-feet (AF) to augment Snake River flows) would continue. Development of new surface-water irrigation is limited by state law and prior appropriations. Water conservation programs to increase efficient use of water (such as irrigation management, more efficient irrigation systems, and monitoring systems) would reduce per-acre water application.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Dam breaching would greatly reduce the flow and surface area of the affected rivers and cause different seasonal fluctuations in flow. Instream water quantity would also fluctuate similarly to natural conditions in breached sections. This latter result could have both positive and negative effects for fish, based on such factors as water year and migration timing. Increased flows from drawdown could decrease the river travel time for migrating fish. ²⁵³ The quantity and flow would still be limited by irrigation and domestic withdrawals. The preservation and protection of land could increase water quantity, as long as the lands that were preserved had water rights that were designated for instream use. Also, the cost of reconfiguring affected irrigation systems and the loss of pumping stations could deter some farmers, further reducing irrigation withdrawal. In low flow periods, water quantity would likely be slightly worse than Status Quo. However, overall, there would be more instream water than compared to Status Quo.
Weak Stock Focus	Dam breaching would greatly reduce the quantity and surface area of the affected river. For example, as a result of breaching four dams, the surface area of the Snake River would be reduced from about 33,000 acres to 19,000 acres. Flow depths and water quantity would vary seasonally. ²⁵⁴ This variation could have both positive and negative effects for fish, based on such factors as water year and migration timing. Increased flows due to drawdown could decrease the travel time for migrating fish. ²⁵⁵ Irrigation and industrial withdrawals would be reduced where there would be direct effects on weak stocks; land retirement or interbasin transfers of water would be emphasized. Storage would be managed to increase instream flow for weak stocks. Most increases in water quantity would be in the Snake River system and in arid tributary regions in Central/Eastern Oregon and Washington. Overall, instream water quantity would be better than under Status Quo.
Sustainable Use Focus	The amount of water withdrawn would be reduced, primarily by using more efficient technology and water conservation programs. Water rights acquired from irrigated lands in riparian zones would be used to leave water in streams to benefit fish and wildlife. Irrigation and other withdrawals would be managed to reduce or avoid adverse effects. Some storage would be used to increase flows during fish migrations. Overall, there would be more instream water than Status Quo.
Strong Stock Focus	Water withdrawals would be managed to avoid future ESA listing of strong stocks. Actions would be taken to maintain or enhance existing instream water quantities in areas important for strong stocks. Increased commercial activity and population growth would require more water; however, withdrawals would be limited in areas affecting strong stocks. Efforts to augment instream water would increase in dry years. Overall, instream water quantities would be about the same as those under Status Quo.

²⁵³ Corps 2000, Section 7.17.1.4 Rate of Migration.

²⁵⁴ Corps 2002b, Section 5.4.1.3 Alternative 4—Dam Breaching.

²⁵⁵ Corps 2000, Section 7.17.1.4 Rate of Migration.

EFFECT AREA: WATER HABITAT: Instream Water Quantity more = better	
Commerce Focus	Irrigation, industrial, and municipal water withdrawals would increase to meet demand. New rights would be issued for water withdrawals, but incentives for cost-effective and efficient conservation efforts might be used to avoid direct mortality of listed stocks. Most water conservation efforts would be limited to those that are economically viable. Fish and wildlife actions would attempt to reduce impacts through projects such as aquifer storage and recovery, which can sequence withdrawals to particular periods resulting in fewer effects. Overall, instream water quantity would decrease compared to conditions under Status Quo.

EFFECT AREA: WATER HABITAT: Amount of Stream/River Habitat more = better	
Existing Conditions	The amount of stream/river habitat, a function of instream water quantity, is a major concern for fish and wildlife management efforts. The quality and quantity of freshwater habitat in much of the Columbia River Basin have declined dramatically in the last 150 years. Activities such as logging, farming, grazing, road construction, mining, and urbanization have changed the historical habitat conditions of the Basin. ²⁵⁶ By creating passage obstructions, these activities can make suitable habitat inaccessible. The amount of stream and river habitat is also related to the highly regulated nature of the river system. Mainstem habitats of the Columbia, Snake, and Willamette rivers have been affected by impoundments that have inundated large amounts of spawning and rearing habitat, reducing that habitat, for the most part, to a single channel. Floodplains have also been reduced in size, off-channel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are affected by flow fluctuations associated with reservoir management, at least along the larger rivers and streams. ²⁵⁷ Anadromous fish typically spend from a few months to three years rearing in freshwater tributaries, with thirty-two sub-basins provide spawning and rearing habitat. Other fish and wildlife are associated with stream and river habitat for part or all of their life stages. The dams on the river system have directly and indirectly reduced spawning and rearing habitat quantity and quality. ²⁵⁸
POLICY DIRECTION	
Status Quo	The amount of stream and river habitat increases, based on the purchase/lease of water rights from irrigators. These gains benefit mainly those fish and wildlife that use the tributary habitat. Actions taken are similar to those described under Status Quo for the Instream Water Quantity effects. Other actions are taken to improve existing habitat. Some tributaries still lose habitat during dry months or low water years.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Much more stream and river habitat would be created by the breaching and/or drawdown of six reservoirs. Nevertheless, the quality of habitat would vary seasonally. Some quality habitat would be lost in the short term from increased sedimentation and, in the long term, from elimination of reservoir shorelines. The

²⁵⁶ See Section 5.2.2.1 Land of this EIS.

²⁵⁷ See Section 5.2.2.1 Land of this EIS.

²⁵⁸ Corps 2002b, Section 4.5.1 Anadromous Fish.

EFFECT AREA: WATER HABITAT: Amount of Stream/River Habitat more = better	
	<p>inability to regulate flows during the dry seasons could decrease the amount of habitat available for fish in those affected areas. However, quality habitat would develop naturally, based on the restriction of land use activities on stream/river adjacent lands. Drawdown would also cause some loss of shallow water habitat. For example, extensive shallow water habitat in the John Day Reservoir would be lost, which could substantially reduce the natural production of upriver bright fall chinook salmon, the only healthy stock of anadromous fish remaining in the upper Columbia River Basin.²⁵⁹ Overall, there would be much better stream/river habitat compared to Status Quo, although potentially lower habitat quality in the short term.</p>
Weak Stock Focus	<p>More stream and river habitat would be created by breaching the lower Snake River Dams; however, the quality of habitat would vary seasonally. Breaching dams would result in more natural river conditions. For example, breaching the four lower Snake River dams and eliminating the reservoirs would result in a 140-mile near-natural river.²⁶⁰ Such factors as excess sedimentation would cause a short-term loss in quality habitat. The inability to regulate flows during the dry season would decrease the amount of habitat available for fish in the affected areas. Drawdown might provide slightly more rearing habitat for species such as fall chinook salmon, resulting in greater production potential.²⁶¹ Other actions, including those described under Instream Water Quantity effects, would be taken to acquire more water for instream habitat use. Other actions to enhance stream/river habitat to benefit weak stocks would be implemented. Degraded river/stream habitat would be enhanced to benefit listed species. Overall, there would be more stream/river habitat than under Status Quo.</p>
Sustainable Use Focus	<p>Increases in instream water quantity through the purchase or lease of water rights would create some increase in habitat, especially in the tributaries. Flow augmentation during the drier months could increase the amount and quality of habitat available during that time. Active management efforts would increase available habitat for fish and wildlife. Overall, there would be more stream/river habitat than under Status Quo.</p>
Strong Stock Focus	<p>Any increases in stream/river habitat would be focused in areas important to strong stocks, while efforts for weaker stocks would be de-emphasized. Habitat would be maintained at existing levels in order to ensure that the healthy stocks remain strong. Habitat could be maintained through the purchase of water rights in order to offset new withdrawals. Overall, there would be about the same amount of stream/river habitat as under Status Quo.</p>
Commerce Focus	<p>The amount of stream/river habitat would likely either increase or decrease in site-specific locations, based on the commercial benefits of maintaining a certain amount of habitat for recreational revenues. Habitat in areas suitable for development would likely be lost as a result of increased water withdrawals. There would likely less stream/river habitat than under Status Quo.</p>

²⁵⁹ Corps 2000, Section 7.17.1 Potential Effects on Juvenile Salmonids.

²⁶⁰ Corps 2002b, Section 3.4 Alternative 4—Dam Breaching.

²⁶¹ Corps 2002b, Section 7.17.1.3 Habitat Changes.

EFFECT AREA: WATER HABITAT: Amount of Reservoir Habitat more = better	
Existing Conditions	<p>The main issues for fish and wildlife management concerning reservoir habitat is reservoir operations, which can increase or decrease the available aquatic habitat. Reservoir operations can affect water temperature, velocity, and sedimentation. Reservoir habitat can be lost as a result of irrigation and domestic use withdrawals, droughts, and flow modifications to the hydrosystem. The FCRPS consists of 31 dams with hydropower facilities on the Columbia River and its tributaries.²⁶² There are 14 major Federal dams on the mainstem Columbia and lower Snake Rivers, 12 operated by the Corps and 2 operated by the Bureau. Overall there are 255 Federal and non-federal projects in the Basin. Although some of these are considered run-of-river dams, others maintain large reservoirs for flood control, irrigation, and other uses. Generally, the amount of reservoir habitat is related to the amount of water storage. Some of the large reservoirs have a large amount of reservoir habitat. For example, the reservoir behind the Grand Coulee Dam stores approximately 5.19 MAF of water, while the reservoir behind the Libby Dam stores 4.98 MAF.²⁶³ While run-of-river dams maintain limited reservoirs much smaller than those of the larger storage reservoirs. For example, the reservoirs behind Lower Granite and Ice Harbor dams have a normal operating capacity of 49,000 AF and 25,000 AF, respectively.²⁶⁴ Reservoir habitat can be characterized as either open water or back water. The loss of reservoir habitat should be examined as it relates to the surface area that would be reduced, the overall reduction in volume, and changes in associated habitat features. Reservoirs provide both surface habitat and water column habitat for certain species of fish, other aquatic organisms, and wildlife. For example, some species of waterfowl and raptors (e.g., bald eagles and osprey) benefit from the large open waters and shallow areas of reservoirs, while diving waterfowl and native resident fish benefit from the water column habitat. However, reservoirs can also adversely affect certain species of anadromous fish, by causing extended travel times, residualization (failure to migrate), and decreased survival rates.²⁶⁵</p>
POLICY DIRECTION	
Status Quo	<p>The amount of reservoir habitat would continue to fluctuate seasonally to allow for improved anadromous fish migrations, and in response to irrigation and domestic use withdrawals. In 1995, 1998, and 2000, the NMFS issued BiOps for the operation of the FCRPS. These BiOps outlined actions to be implemented specifically relating to reservoir management. For example, NMFS requested that three of the lower Snake River reservoirs be operated within 1 foot of the reservoirs' MOP from April 3 until adult fall chinook enter the Snake River, and that all four reservoirs be operated within their normal ranges after November 15.²⁶⁶ Water withdrawals also potentially result in lost reservoir habitat. For example, the water supply directly or indirectly affected by the John Day reservoir, excluding large-scale irrigation, was recently estimated at about 2,200 wells, mainly used for domestic use.²⁶⁷ Also, irrigation withdrawals from the reservoir have been estimated</p>

²⁶² Corps 2002b, Section 4.1.1 Physical Environment.

²⁶³ USDOE/BPA 2001b, p.14.

²⁶⁴ Corps 2002b, Section 2.1 Project Characteristics.

²⁶⁵ Corps 2000, Section 4.18.7 Reservoir Passage.

²⁶⁶ Corps 2002b, Section 2.1.3 Reservoir Operation Levels.

²⁶⁷ Corps 2000, Section 4.14 Water Supply.

EFFECT AREA: WATER HABITAT: Amount of Reservoir Habitat more = better	
	at more than 1.2 million gallons per minute (gpm) from a total of 30 pump stations. ²⁶⁸ Some water rights have been obtained through leases to be used for instream benefits.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Breaching six dams would decrease the amount of reservoir habitat. The direct loss of reservoir habitat could improve habitat conditions for some listed anadromous and resident species of fish; however, in the short term, the dam removal process would adversely affect all aquatic species through reduced water quality. Wildlife species would also be affected in both the short and long term. (See Fish and Wildlife Section, below.) The removal of dams would affect large sections of the Columbia and lower Snake rivers. The John Day reservoir, the second longest reservoir on the Columbia River, extends 76 miles, while the McNary Dam reservoir extends approximately 62 miles. ²⁶⁹ Removal of the lower Snake dams would create 140 miles of near-natural river. ²⁷⁰ Large losses of both reservoir surface and water column habitats would be expected. For instance, removal of the six dams would result in a loss of more than 100,000 acres of reservoir surface area, and more than 800,000 AF of water. ²⁷¹ Overall, the amount of reservoir habitat would be much worse than under Status Quo.
Weak Stock Focus	Flow management targeted for ESA-listed anadromous fish and the removal of four dams would decrease the amount of reservoir habitat. The direct loss of reservoir habitat could improve habitat conditions for some listed anadromous and resident species of fish; however, in the short term, the dam removal process would adversely affect all aquatic species. Wildlife would also be affected in both the short and long term. Measures would be taken to enhance newly created habitat to benefit ESA-listed species. (See Fish and Wildlife Section, below.) For example, removal of the four dams on the lower Snake River would result in the loss of almost 14,000 surface acres of reservoir habitat and approximately 143,000 AF of water, ²⁷² potentially creating 140 miles of near-natural river in the lower Snake River. ²⁷³ Flow management could include changes in timing and duration of releases from other dams, resulting in fluctuations in reservoir habitat. There would be less reservoir habitat than under Status Quo.
Sustainable Use Focus	The amount of reservoir habitat would continue to fluctuate from changes in flow management intended to benefit fish. Water rights acquired from agricultural lands and water left instream for fish and wildlife could temporarily increase the amount of reservoir habitat. However, some storage would be used to increase flows during fish migrations. Overall, the amount of reservoir habitat would be the same as Status Quo.
Strong Stock Focus	Hydro restrictions would be reduced, so long as they do not affect strong stocks. Reservoir habitat could fluctuate, based on the operation of the dams for their

²⁶⁸ Corps 2000, Section 4.13 Irrigation.

²⁶⁹ Corps 2000, Section 3.2 Description of the Study Area; Corps 1999b.

²⁷⁰ Corps 2002b, Section 5.6.1.3 Alternative 4—Dam Breaching.

²⁷¹ Corps 2000, Section 3.2 Description of the Study Area; Corps 1999b; Corps 2002b, Section 5.6.1.3 Alternative 4—Dam Breaching.

²⁷² Corps 2002b, Section 5.6.1.3 Alternative 4—Dam Breaching; and Section 2.1 Project Characteristics, Table 2-1.

²⁷³ Corps 2002, Section 5.6.1.3 Alternative 4—Dam Breaching.

EFFECT AREA: WATER HABITAT: Amount of Reservoir Habitat more = better	
	authorized purposes. More water would be stored. Spill for weak stocks would be eliminated and it is likely that less spill would be required to maintain the strong stocks of fish. Overall, there would be more reservoir habitat than compared to Status Quo.
Commerce Focus	Reservoir levels and habitat would change in response to the best economic use of the water. More water would be stored. If spill for fish did not achieve commercial benefits, it would likely be discontinued, resulting in more storage for power production, irrigation, or other valuable uses. There would be more reservoir habitat than under Status Quo.

5.3.2.4 Fish and Wildlife

Table 5.3-4A shows how the various Policy Directions would affect native anadromous fish, native resident fish, and native wildlife. The potential effects of non-native species on native species are also shown. In all cases, effects are shown by shading to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo. In general, increases in native fish and wildlife species are characterized as "better" in the table.

Table 5.3-4A: Fish and Wildlife Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Naturally-spawning Native Anadromous Fish ²⁷⁴						
Hatchery-produced Native Anadromous Fish						
Native Resident Fish						
Native Wildlife ²⁷⁵						
Non-native Species						



²⁷⁴ Suspended sediment resulting from dam breaching could have adverse effects on all aquatic organisms present in-river, particularly during the first 5-year period; however, over the long term the situation would improve. Corps 2002b, at Section 5.5.1.4 Alternative 4—Dam Breaching.

²⁷⁵ If Dam Breaching were chosen, some unavoidable adverse impacts to plant communities would occur in the short term, including direct loss due to scouring and sloughing and indirect loss due to competition from exotic species. Corps 2002b, at Section 5.6.1.3 Alternative 4—Dam Breaching.

Summary of Effects: Dam breaching, under the Natural Focus Policy Direction would restore natural river conditions in some reaches and expose previously inundated lands. Naturally-spawning native anadromous fish, as well as native resident fish would benefit under this Policy Direction. Native wildlife would benefit from the newly exposed habitat and restrictions on access. Hatchery-produced anadromous fish would be much worse under this Policy Direction because the hatchery program would be eliminated. Under Natural Focus, impacts to native fish and wildlife from non-native species are worse as populations of non-native species increase due to the lack of human intervention.

Under the Weak Stock Policy Direction, management strategies intended to recover listed species would benefit most native fish and wildlife. Conditions would be better for both naturally-spawning anadromous fish and hatchery-produced anadromous fish, as habitat is increased, predation decreased, and hatchery production shifts to a conservation focus. Native resident fish do much better because benefits are gained from increased habitat, improvements to the hydrosystem, elimination of non-native species competition, and hatchery modifications. Native wildlife, also do much better under this Direction because of direct programs to enhance habitat, increasing wildlife numbers and reducing non-native competitors. The impact on native species from non-native species is less under this Direction.

The Sustainable Use Focus Policy Direction would benefit all native fish and wildlife by rebuilding and maintaining habitat, modifications to the hydrosystem, and managing undesirable species. Hatchery-produced anadromous and resident fish increase as hatcheries are used for supplementation purposes. Some undesirable non-native species are reduced, while other desirable non-native species are managed to increase in numbers resulting in conditions similar to Status Quo.

Overall, the Strong Stock Focus would result in conditions worse than Status Quo for naturally-spawning anadromous fish as focus shifts to maintaining strong stocks. Hatchery-produced anadromous fish would do better as hatcheries are used to supplement strong stocks. Native resident fish would likely decline compared to Status Quo despite the use of hatcheries. Native wildlife populations would be managed to keep populations strong. Weak populations would continue to decrease. Therefore there would be some loss of species diversity, however overall wildlife abundance would be better than under Status Quo. Non-native species impacts would likely increase resulting in worse conditions for native fish than under Status Quo. Non-native species would likely increase as the health of strong stocks/populations is encouraged, whether the species is introduced or not, however, impacts to native wildlife would be similar to Status Quo.

Under the Commerce Focus Policy Direction, naturally-spawning anadromous fish would be much worse than under Status Quo, as less emphasis is placed on recovering weak stocks. Hatchery-produced anadromous fish would do much better as artificial production through hatcheries and fish farms is emphasized. Some native resident fish would do worse as more value is placed on anadromous fish. Under Commerce Focus, wildlife would also do worse compared to Status Quo, though commercially valuable

species would do better. Non-native species would be reduced to benefit more valuable native species, therefore, native fish and wildlife would be better than under Status Quo.

The reasoning for these effects is described in greater detail in Table 5.3-4B.

Table 5.3-4B: Fish and Wildlife Effects Across the Policy Directions Analysis

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced) more fish = better	
Existing Conditions	<p>The main concerns regarding native anadromous fish include ocean conditions, loss of habitat, over-harvest, and hydro operations. Also, there is some concern that problems arise from the interaction between naturally-spawning and hatchery-produced native anadromous fish. Since European-American settlement of the Pacific Northwest, anadromous fish populations have declined. Annual runs of salmon and steelhead returning to the Columbia River were estimated at between 8 and 16 million fish before settlement, but had declined to approximately 2.5 million fish by the early 1980s.²⁷⁶ Population sizes of the different stocks of salmon vary substantially, as a result of natural and human-caused mortality factors. During the 1970s, when all the lower Columbia River and lower and middle Snake River dams (Federal and non-federal) were completed, the estimated in-river survival rate for spring/summer chinook salmon was 5-40%.²⁷⁷ However, system survival rates indicate that in-river survival has increased up to 62% for spring/summer chinook—as high as it was when only four dams were in place in the Columbia and Snake Rivers in the 1960s.²⁷⁸ The proportion of hatchery fish found in the river system has steadily increased. Hatcheries in the Pacific Northwest produced fish primarily for sport, commercial, and tribal harvest. With the increase in hatchery production, the proportion of wild fish decreased from about 75% in the 1970s to about 25% by the mid- to late-1980s.²⁷⁹ The passage of the ESA as well as of the Regional Act resulted in the creation of Federal duties to protect, mitigate, and enhance fish and wildlife affected by Federal hydroelectric projects and to ensure that those species listed under the ESA were not jeopardized by Federal actions.²⁸⁰ The species of salmon in the Pacific Northwest include pink, coho, chinook, chum, and sockeye, as well as steelhead trout. However, these species are divided further into ESUs under the ESA, based on certain criteria. Many of these ESUs are listed as threatened or endangered, with few healthy wild (naturally-spawning) ESUs remaining. As of 2001, there were 17 listed ESUs of salmon and steelhead in the Pacific Northwest (3 listed as endangered and 14 as threatened; 12 ESUs listed in the Columbia/Snake River system).²⁸¹ Other species of anadromous fish found in the Pacific Northwest include the Pacific lamprey, some sturgeon, and the non-native American Shad.</p>

²⁷⁶ Corps 2002b, Section 4.5.1 Anadromous Fish.

²⁷⁷ Corps 2002b, Section 6.4.2.1 Aquatic Resources—Anadromous Fish.

²⁷⁸ Corps 2002b, Section 6.4.2.1 Aquatic Resources—Anadromous Fish.

²⁷⁹ Corps 2002b, Section 4.5.1.2 Anadromous Fish: Run Status.

²⁸⁰ See Chapter 2 of this EIS for descriptions of the Acts.

²⁸¹ Endangered Species Status of West Coast Salmon and Steelhead, available at <http://www.nwr.noaa.gov/> (last visited February, 2003).

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced) more fish = better	
POLICY DIRECTION	
Status Quo	<p>In 2001, the Columbia River Federal Basinwide Salmon Fund expenditures for salmon recovery by the regional Federal agencies (Corps, BLM, Bureau, USFWS, BIA, USGS, NMFS, USFS, and EPA), were about \$350 million. Bonneville's ratepayers funded more than \$180 million of that total.²⁸² Major policies shaping salmon management are defined and guided by mitigation requirements, the Regional Act, the ESA, tribal fishing rights, and international treaties. However, there is no unified policy direction among all the interested parties, and science offers no clear and agreed-upon answer to the problem. Even with the expenditures noted above, certain ESUs continue to decline for a variety of reasons—and expenditures are increasing. Anadromous fish populations vary erratically, their numbers and health driven by ocean and freshwater harvest, ocean and freshwater survival conditions, and weather cycles. Efforts are made to protect and enhance habitat for anadromous fish. Water-quality-limited salmon runs may be enhanced through streambank protection via the use of buffers. Hatcheries are used primarily to mitigate the effects of the hydro system and support harvest. For example, hatcheries operated to mitigate for the John Day Reservoir produce approximately 11.9 million fall Chinook smolts annually, four times greater than the original anticipated loss and agreed upon mitigation.²⁸³ Some hatcheries, however, are used to meet conservation goals.²⁸⁴ For example, BPA implements a number of conservation hatchery programs, including the program for Snake River sockeye salmon, which keep the genomes alive in stocks that are virtually extinct in the wild.²⁸⁵ Hydro operations are guided by NMFS' BiOps. Structural modifications are made to the dams to improve passage for the benefit of anadromous fish. Flow augmentation, spill, and transportation of juveniles fish are also used to benefit anadromous fish. Given the numerous parties involved with anadromous fish policy, it is unclear whether salmon populations will increase to sustainable levels.</p>
	Effect in Comparison to the Status Quo Condition:
Natural Focus	<p>The drawdown of reservoirs or removal of six dams would result in short and long-term effects on anadromous fish. Short-term adverse effects would include elevated suspended sediment, reduced rearing habitat, and reduced migratory habitat quality. Some of these short-term effects could result in increased mortalities, although it is unclear what the effect would be for lamprey. Beneficial effects might include reduced predation of juveniles and increased migration times.²⁸⁶ Some long-term effects include reduced passage mortality, a decrease in dissolved oxygen levels, a decrease in predation rates on juveniles, and an increase in the amount of riverine habitat.²⁸⁷ Whether certain populations of anadromous fish would be able to persist past the short-term effects is uncertain. Access to protected quality habitat would be</p>

²⁸² USDOE/BPA 2002e.

²⁸³ Corps 2000, Section 4.18.4 Hatchery Production.

²⁸⁴ Supplementation - Artificial propagation intended to reestablish a natural population or increase its abundance. (Federal Caucus 1999b, Glossary, p. 100).

²⁸⁵ A detailed history and current status of hatcheries, emphasizing their roles for mitigation and production, can be found in the Federal Caucus 2000b, pp. 52-66 and in the associated Hatchery Appendix.

²⁸⁶ Corps 2002b, Section 5.5.1.4 Alternative 4—Dam Breaching.

²⁸⁷ Corps 2002b, Section 5.5.1.4 Alternative 4—Dam Breaching.

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced) more fish = better	
	<p>prohibited or very reduced, allowing for natural habitat improvements. The phase-out of hatcheries and focus on wild anadromous fish would reduce the overall number of fish in the river. Harvest would be reduced overall to restore naturally-spawning native anadromous fish. These efforts would likely recover certain populations in the long run, with several caveats: natural conditions may not be attainable in decades or ever; harvest may not be completely controllable (other nations may continue to allow harvest); weather and ocean conditions may not be favorable, and some genetic stocks are permanently lost. Even with maximum implementation actions, it is likely that fish populations would not approach pre-European settlement levels. Over the long term, however, abundance of some naturally-spawning fish would be much better than under Status Quo; hatchery-produced native anadromous fish would be much worse.</p>
Weak Stock Focus	<p>The reservoir drawdown or removal of four dams would result in short- and long-term effects on anadromous fish. Short-term adverse effects would include elevated suspended sediment, reduced rearing habitat, and reduced migratory habitat quality. Some of these short-term effects could result in increased mortalities, although it is unclear what the effect would be for lamprey. While immediate beneficial effects might include reduced predation of juveniles and increased migration times,²⁸⁸ some long-term effects could include reduced passage mortality, an increase in dissolved oxygen levels, and an increase in the amount of riverine habitat.²⁸⁹ Whether certain populations of anadromous fish would be able to persist past the short-term effects is uncertain. Other actions in conjunction with dam removal would be implemented to benefit listed species. These could include active habitat improvements, harvest controls (e.g., a shift to selective harvest), and hatchery management. For example, more habitat critical to listed anadromous fish would be enhanced. Also, overall harvest of weak stocks would be further restricted. Hatcheries would be managed primarily for conservation purposes and not supplementation. However, even under this Policy Direction, populations of anadromous fish would not increase to pre-European settlement levels. Overall, there would be more naturally-spawning and hatchery-produced native anadromous fish than under Status Quo.</p>
Sustainable Use Focus	<p>Efforts would be made to rebuild and manage anadromous fish habitat to enhance production and maintenance of harvestable levels of anadromous fish, including habitat for lamprey. Management of undesirable fish species to benefit anadromous fish could include such methods as changes in angling regulations, physical removal (e.g., nets, traps, or electrofishing), the use of piscicides (e.g., rotenone and antimycin), dewatering and stream flow augmentation, and habitat manipulation techniques. Modifications would be made to the hydro system to further increase survival of anadromous fish. For example, new technology (e.g., removable spillway weirs and extended submerged bar screens) might be installed to assist in fish passage and to decrease passage-caused mortality.²⁹⁰ Transporting fish would also be used to assist in fish passage. Hatchery production would increase to supplement the naturally-spawning salmon populations to benefit harvest. Hatchery programs would be designed to avoid the loss of genetic diversity while maintaining sufficient numbers of fish for harvest. It is unclear whether all these improvements would benefit lamprey, though they would benefit from screening. Compared to</p>

²⁸⁸ Corps 2002b, Section 5.5.1.4 Alternative 4—Dam Breaching.

²⁸⁹ Corps 2002b, Section 5.5.1.4 Alternative 4—Dam Breaching.

²⁹⁰ Corps 2002b, at Section 5.5.1.3 Alternative 3—Major System Improvements.

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced) more fish = better	
	Status Quo, naturally-spawning and hatchery-produced fish would increase with habitat, hatchery, and harvest improvements.
Strong Stock Focus	There would be an emphasis on managing strong stocks of anadromous fish. Weaker stocks would be allowed to continue to decline, while stronger stocks would be supported through habitat maintenance and hatchery production. Stocks in the Columbia River mainstem would be emphasized. Restrictions on hydrosystem operations would be decreased, unless operations were adversely affecting strong stocks. In most years, the unimpounded Hanford Reach of the Columbia River would be managed much as it is under Status Quo. Hatcheries would be operated to support strong stocks of anadromous fish; sustainable fish harvest would increase overall. Because there would be a loss in genetic diversity as weak stocks decline, there would be less naturally-spawning native anadromous fish than Status Quo. However, there would be more hatchery-produced native fish than under Status Quo.
Commerce Focus	The focus would be on producing a commercially viable salmon harvest using least-cost production, primarily hatcheries and fish farming. Less emphasis would be placed on the importance of native stocks, and some weak stocks might become extinct. The management of stocks in the Columbia River mainstem would be emphasized. Total run size would increase, however, naturally-spawning runs would decrease. Overall, populations of naturally-spawning native anadromous fish would be much worse under this alternative than under Status Quo. Hatchery-produced native anadromous fish would be much better compared to Status Quo, given increases in artificial production.

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish more fish = better	
Existing Conditions	The main concerns relating to native resident fish include habitat loss and degradation, competition with and predation from introduced species, and the effects of management focused on harvest and the recovery of listed anadromous fish. Some native resident fish species, including bull trout, redband trout, mountain whitefish, burbot, and white sturgeon, are in decline. For example, by 1994, Kootenai River white sturgeon had been listed pursuant to the ESA as endangered. ²⁹¹ Similarly, by 1999 all five of the distinct population segments of bull trout had been listed as threatened under the ESA. ²⁹² Bull trout are estimated to have historically occupied about 60% of the Columbia River Basin; however, in 1998 they were estimated to occur in only 4% of its estimated historical range. ²⁹³ Cold-water resident species such as trout and mountain whitefish have declined since construction of the dams. ²⁹⁴ The dams have blocked spawning migrations of resident

²⁹¹ Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Kootenai River Population of the White Sturgeon 59 Fed. Reg. 45989, 46002 (Sept. 6, 1994).

²⁹² Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout, 63 Fed. Reg. 31647, 31674 (June 10, 1998); Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Jarbidge River Population Segment of Bull Trout, 64 Fed. Reg. 17110, 17125 (April 4, 1999); Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Coterminous United States, 64 Fed. Reg. 58909, 58933 (Nov. 1, 1999).

²⁹³ USDO/USFWS 1998b.

²⁹⁴ Corps 2002b, Section 4.5.2.1 Species Composition.

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish more fish = better	
	fish, modified the habitat, and affected species composition. ²⁹⁵ A change in prey organisms might also be a reason for the decline of some cold-water resident species. ²⁹⁶ However, other native resident species (e.g., the northern pikeminnow, largescale sucker, and bridgelip sucker) are found in reservoirs in high numbers. For example, age one and older bridgelip sucker, redbreast shiner, largescale sucker, and northern pikeminnow accounted for about 70% of all fish sampled in 1979 and 1980 in Lower Granite reservoir. ²⁹⁷ Species such as the northern pikeminnow have been and are being actively harvested for the benefit of anadromous species. ²⁹⁸
POLICY DIRECTION	
Status Quo	Resident fish face continuous pressure from intense efforts to recover anadromous fish, from habitat loss or degradation, and from introduced species. The USFWS has issued BiOps concerning the effect of human activities (e.g., land management and hydro operations) on listed resident fish. Efforts have been made to improve habitat conditions and increase specific resident species. For example, Oregon's 1999-2001 adopted budget for its natural production program (focused on habitat rehabilitation and fish management) totaled approximately \$45 million, although this money is meant to benefit anadromous fish as well. ²⁹⁹ Populations of other resident native species are larger than historical populations, and where these large population levels have been identified as undesirable; intense management programs have been initiated to reduce their numbers. For example, a bounty has been placed on the northern pikeminnow in order to reduce its numbers and predation on juvenile salmonids. ³⁰⁰ Although some native resident fish (e.g., white sturgeon) benefit from ESA-driven habitat restoration and hatchery measures, management priority is largely for anadromous fish.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Native resident fish could benefit from habitat protection, discontinuation of hatcheries, and decreasing of harvest. The drawdown of reservoirs or removal of six dams would improve conditions for some species, while others might be adversely affected. For example, redbreast shiner production would likely increase, and benefits might be achieved in white sturgeon production. ³⁰¹ However, white sturgeon rearing conditions might not improve. ³⁰² Opportunistic species would increase, while those species less adaptable would be eliminated (survival of the fittest). For example, northern pikeminnow populations might increase slightly though they would be restricted to the slower-moving water areas. Predation on juvenile salmonids might decrease as water velocity and turbidity increase. ³⁰³ Short-term negative effects of dam breaching could include stranding, increased predation in off-channel mitigation ponds and other embayments, changes to spawning habitat,

²⁹⁵ Corps 2002b, Section 4.5.2.1 Species Composition.

²⁹⁶ Corps 2002b, Section 4.5.2.1 Species Composition.

²⁹⁷ Corps 2002b, Appendix B: Section 3.3.2 Historical and Current Distribution and Abundance.

²⁹⁸ Corps 2002b, Section 4.5.2.3 Aquatic Food Chain.

²⁹⁹ State of Oregon 2001.

³⁰⁰ Oregon Administrative Rule 635-011-0175, Special Northern Pikeminnow Bounty Fishery.

³⁰¹ Corps 2000, Section 7.17.7 Potential Impacts on Resident Fish and Habitat.

³⁰² Corps 2000, Section 7.17.7 Potential Impacts on Resident Fish and Habitat.

³⁰³ Corps 2000, Section 7.17.7 Potential Impacts on Resident Fish and Habitat.

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish more fish = better	
	and initial increased turbidity that could reduce feeding, growth, and reproduction and could have lethal effects for limited periods. ³⁰⁴ Long-term effects would include considerable changes in the amount and type of resident fish habitat, corresponding changes in the structure of the fish community, and some increased effects from flow augmentation. ³⁰⁵ Overall, there still does not appear to be scientific consensus on the effect of dam removal on the resident fish community. ³⁰⁶ Quality habitat would be protected, although the slow pace of passive restoration and species recolonization would limit improvements. There might be some improvements in habitat achieved by reducing human activity within specified areas and decreasing allowable harvest. All hatcheries would be discontinued, including those that produce non-native fish (e.g., brown trout), a step that could decrease predation and competition for resources, providing a benefit for native resident fish. There would be more native resident fish under this Policy Direction than compared to Status Quo.
Weak Stock Focus	Listed native resident fish would benefit from specific actions taken to assist in their survival and recovery. The drawdown or breaching of four dams would create both short- and long-term effects on native resident fish similar to those discussed under Natural Focus above. Certain weak species, such as white sturgeon, could benefit from dam removal and the return to a natural river condition. ³⁰⁷ Other weak native resident species, such as bull trout, could increase their usage of these previously impounded areas, depending on summer temperatures. ³⁰⁸ However, there still does not appear to be scientific consensus on the effect of dam removal on the resident fish community. ³⁰⁹ Additional measures would be taken to improve weak stocks and assist in their recovery; these steps could include the restoration of weak-stock habitat, further modifications of and limits on the hydrosystem, and management of hatcheries with a focus on conservation. This change in hatchery function could eliminate competition of hatchery-produced introduced species (e.g., brown trout) with listed resident fish. Any harvest of listed native resident fish or commercial activity that affects listed native resident fish would be decreased. Overall, there would be substantially more native resident fish under this Policy Direction than under Status Quo.
Sustainable Use Focus	Measures would be taken to improve conditions for both listed and non-listed fish as well as for native and non-native fish. Enhancing production and maintaining harvestable levels of resident fish would be emphasized. Desirable resident fish could be supplemented by hatchery operations. When possible, native resident fish would be prioritized over non-native fish; however, the need for a sustainable fishery and regional interests would dictate the target resident species. Management for resident species could take priority over management for anadromous species in certain areas, such as blocked anadromous fish habitat. Sustainable harvest levels would be achieved through managing predation, human activities, and habitat improvements. Management of undesirable fish species to benefit resident fish could include such methods as changes in angling regulations, physical removal (e.g., nets, traps, or electrofishing), the use of piscicides (e.g., rotenone and

³⁰⁴ Corps 2002b, Section 5.5.2 Resident Fish, Table 5.5-11.

³⁰⁵ Corps 2002b, Section 5.5.2 Resident Fish, Table 5.5-11.

³⁰⁶ Corps 2002b, Section 5.5.2.4 Effects of Alternatives.

³⁰⁷ Corps 2002b, Section 5.5.2.4 Effects of Alternatives.

³⁰⁸ Corps 2002b, Section 5.5.2.4 Effects of Alternatives.

³⁰⁹ Corps 2002b, Section 5.5.2.4 Effects of Alternatives.

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish more fish = better	
	antimycin), dewatering and stream flow augmentation, and habitat manipulation techniques. Modifications to benefit targeted resident fish would also be made to hydrosystem operations. Native resident species would increase relative to Status Quo, unless they were limited by requirements for anadromous fish stocks or other desirable fish species.
Strong Stock Focus	As management efforts shift to maintain strong stocks, weak native resident fish species would continue to decline. Hatcheries would be used to maintain strong populations for harvest. Increases in non-native fish species could result in the loss of more native resident fish through competition and predation. Some native resident fish could decline, as positive effects of weak-stock management were lost. Harvest would also increase, so long as the healthy, strong populations were not adversely affected. Overall, native resident fish species would likely decline as compared to Status Quo.
Commerce Focus	Comparative economic values of fish, wildlife, and commercial uses would control species management. More user fees for fishing would be used to improve habitat for valuable native resident fish species. Measures selected for implementation would be based on cost/benefit analysis. Hatchery production of marketable native resident fish would likely increase. Less effort would be focused on weak species such as bull trout. Overall, there would be fewer native resident fish than compared to Status Quo.

EFFECT AREA: FISH AND WILDLIFE: Native Wildlife more wildlife = better	
Existing Conditions	The main concerns regarding native wildlife relate to the loss of habitat as a result of human activities and inter-specific competition with introduced species. Native wildlife species vary in degrees of health and abundance. Some species are listed as threatened or endangered, others are substantially diminished, while still other populations are healthy and increasing. Some wildlife species require undisturbed habitats, and others have flourished in modified habitats. Many species continue to be adversely affected by economic growth, urbanization, and habitat fragmentation. Declines in plants and terrestrial vertebrates are attributable to a number of human causes, including conversion of habitat to agriculture, urban development, grazing, timber harvest, introduction of exotic plant and animal species, recreation, high road densities, and mining. Fragmentation has isolated some animal and plant habitats and populations and reduced the ability of populations to disperse across the landscape, resulting in potential, long-term loss of genetic interchange. ³¹⁰ The ESA has protected some native wildlife by listing them as either threatened or endangered and by designating critical habitat; these actions are expected to ensure the survival and recovery of these species, resulting ultimately in their delisting. Bird species listed as threatened or endangered include the bald eagle, spotted owl, and marbled murrelet. Listed mammals include the Canada lynx, woodland caribou, grizzly bear, Columbian white-tailed deer, and gray wolf. ³¹¹

³¹⁰ USDA/USFS and USDO/BLM 2000b, Chapter 2 Terrestrial Species.

³¹¹ See Appendix C of this EIS.

EFFECT AREA: FISH AND WILDLIFE: Native Wildlife more wildlife = better	
POLICY DIRECTION	
Status Quo	Between 1983 and 2001, BPA spent approximately \$145 million on wildlife mitigation, acquiring and enhancing habitat to offset habitat lost as a result of the Federal hydrosystem. ³¹² Listed species are protected and managed through Federal ecosystem management policies and private initiatives. Mitigation measures such as the construction of avian-friendly facilities and construction of nest boxes can reduce negative effects and can improve conditions for some species. Native wildlife also benefit from actions taken to protect and manage fish. Many non-listed species are regulated and managed by individual states for recreational purposes (e.g., hunting, bird watching). For example, between 1997 and 1999, the Oregon Department of Fish and Wildlife spent approximately \$27 million on game and non-game species and habitat improvement and maintenance. ³¹³ Habitat actions included the creation and/or substitution of habitat based on Habitat Evaluation Procedures or other credit valuation methods, and memoranda of agreement between government entities.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The creation of more land habitat through dam breaching, land retirement, and passive restoration would result in wildlife tradeoffs in the short and long-term. For example, direct impacts from the breach of the six dams would cause an immediate loss of habitat and/or increased predation on many waterfowl species (e.g., Canada goose, American coot), aquatic furbearers (e.g., beaver, river otter, mink, and muskrat), non-game birds (e.g., pied-billed grebe and red-winged black bird), neotropical migrants, colonial nesting birds (e.g., Caspian and Forster's terns), some raptors (e.g., great horned owl, and osprey), mule deer, and reptiles and amphibians (e.g., Western painted turtle and northern leopard frog). ³¹⁴ Some species would benefit from the short-term increase in available prey species. Some shorebirds (e.g., American avocet) would benefit from exposed mudflats, while some mammalian predators could capitalize on new land connections to island waterfowl nest sites. ³¹⁵ Restrictions on development and other human activities in protected areas would benefit wildlife in the long term. For example, new riparian and terrestrial habitat would be created from former reservoir bottoms, although the length of time for natural re-vegetation of the area is uncertain. In the short term, this Policy Direction would be much worse for native wildlife than Status Quo; however, in the long term it would be somewhat better than Status Quo.
Weak Stock Focus	The removal of four dams would result in both the short- and long-term effects similar to those discussed under Natural Focus. However, newly exposed lands would be actively managed and enhanced, decreasing the long-term effects on many wildlife species. Habitat protection and improvements would be focused on threatened and endangered species, resulting in increased numbers. There would be some incidental benefits to non-listed species (e.g., newly created habitat, avian-friendly facilities) in attempts to protect listed species. Other listed species would benefit directly from programs to control predators and, possibly, non-native competitors. Overall, there would be more native wildlife in the long-term compared to Status Quo.

³¹² USDOE/BPA 2001f.

³¹³ State of Oregon 2001.

³¹⁴ Corps 2000, Section 7.18.2 Wildlife; Corps 2002b, Section 5.6.2 Wildlife.

³¹⁵ Corps 2000, Section 7.18.2 Wildlife; Corps 2002b, Section 5.6.2 Wildlife.

EFFECT AREA: FISH AND WILDLIFE: Native Wildlife more wildlife = better	
Sustainable Use Focus	Needs of listed species would be balanced with the needs of all species. More habitat mitigation and better management techniques would be used to enhance production, achieving harvestable populations of wildlife. Efforts could include rebuilding degraded habitat, improving existing habitat to increase production (e.g., planting food plots), reducing mortality (e.g., construction of avian-friendly facilities), and controlling predators and undesirable species. Management of undesirable wildlife species could include such techniques as relocation of problem individuals or populations, change in hunting regulations, physical removal/deterrence (e.g., shooting, trapping, water spray, and avian predator lines), biological/chemical controls (e.g., sterilization), and habitat manipulation. Habitat actions included the creation and/or substitution of habitat. This Policy Direction would likely result in more native wildlife than Status Quo.
Strong Stock Focus	Existing strong wildlife populations would be actively maintained and managed to keep populations robust to avoid unhealthy conditions. Harvest levels of wildlife could increase so long as strong, healthy populations are maintained. ESA-listed predators, including grizzly bears, Canada lynx, and wolves would likely decline as efforts to recover them are abandoned and resources are shifted to maintain strong species, in particular harvestable game species. This loss of predation would help to further increase strong populations of wildlife. Therefore some improvement in strong wildlife populations would be expected. Although there would be some loss of species diversity, overall wildlife populations would be better than under Status Quo.
Commerce Focus	Wildlife would be managed as a commodity. More user fees for hunting would be used to improve habitat for valuable species. Wildlife measures would be selected for implementation on the basis of cost/benefit analysis. Public benefit would be maximized from expenditures of finite wildlife enhancement funds. Emphasis would be placed on benefits and costs of artificial propagation and stocking of wildlife species. Increases in urbanization and industrialization would cause negative effects, although those species that habituate to human presence would increase. Overall, most native wildlife would be worse under this Policy Direction than under Status Quo; however, if a species were identified as commercially valuable, that species would be better off under this Alternative than under Status Quo.

EFFECT AREA: FISH AND WILDLIFE: Non-Native Species fewer non-native species = better	
Existing Conditions	Major concerns for native fish and wildlife from non-native species are predation, competition for resources, and habitat modification. Declines in fish and wildlife can be attributed to the introduction, whether intended or accidental, of exotic species. ³¹⁶ The introduction of exotic species is second only to habitat loss as the reason for species decline. Regional non-native species include fish (e.g., American shad, walleye, smallmouth bass), mammals (e.g., opossum, eastern cottontail, nutria), amphibians (e.g., bullfrog), birds (e.g., ring-necked pheasant, Hungarian partridge, Chukar), mollusks (e.g., zebra mussels, oyster drill, New Zealand mudsnail), and crustaceans (e.g., European green crab, Chinese mitten crab). Some non-native species such as the zebra mussel have the ability to change entire ecosystems. Non-native species (e.g., Chukar and ring-necked pheasant) also have become established game species, generating hunting revenues and resulting in

³¹⁶ USDA/USFS and USDO/BLM 2000b, Chapter 2 Terrestrial Species.

EFFECT AREA: FISH AND WILDLIFE: Non-Native Species fewer non-native species = better	
	specific habitat management goals to increase their numbers. Some non-native species introduced for sport fishing now prey on and compete with juvenile anadromous fish. There has been some attempt to regulate and prohibit the introduction of undesirable non-native species both locally and Federally. For example, in 1990 Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act, ³¹⁷ while in 1996 ODFW adopted specific rules to regulate and prohibit non-native wildlife. ³¹⁸
POLICY DIRECTION	
Status Quo	In the last century, there has been a large increase in the number of exotic species found in the Northwest. In fact, one-third of all species found in the Northwest are non-native. ³¹⁹ For example, Oregon estimates that at least 96 non-native species exist in the wild, and, 62 of these species have become established and are believed to have self-sustaining populations. ³²⁰ The impact of these species on native fish and wildlife has been substantial. For example, between 1983 and 1986 the mean annual loss of juvenile salmon to predation was between 1.9 and 3.3 million fish. Walleye and smallmouth bass accounted for 21% of the mean annual loss. ³²¹ The number of non-native, often harmful, populations continues to increase. For example, in the Umpqua River Basin there are an estimated 17 species of non-native sport fish compared to the 7 native species, ³²² while there are estimated to be 18 non-native fish species in the lower Snake River reservoirs, as compared to the 17 native species. ³²³ Efforts to control undesirable non-native species and to prevent the introduction of any new, potentially harmful non-native species continue. However, management is still carried out to increase desirable non-native species in limited circumstances (e.g., Chukar, brown trout).
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Dam breaching would result in the loss or conversion of certain aquatic and terrestrial habitats for fish, mammals, birds, amphibians and aquatic invertebrates, among others. The loss of reservoir habitat would adversely affect both undesirable and desirable non-natives. The slow pace of passive restoration would do little to control the increase of established non-natives, but could slow introductions into undeveloped areas. Opportunistic species would increase, while less adaptable species would be eliminated. Overall, many established non-native species would increase under this Policy Direction; therefore, the effects would be worse for native fish and wildlife than under Status Quo.
Weak Stock Focus	With the removal of four dams, non-native species would experience habitat loss and related population declines. However, the removal or reduction of some non-native species through dam breaching might benefit some ESA-listed fish and wildlife.

³¹⁷ The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 U.S.C. §§ 4701–4751 (2000).

³¹⁸ Importation, Possession, Confinement, Transportation and Sale of Nonnative Wildlife (Wildlife Integrity Program), OAR 635-056-0000 (1996).

³¹⁹ Palmisano, J.F. 2000a.

³²⁰ ODFW (Oregon Department of Fish and Wildlife) 2001.

³²¹ Kaczynski and Palmisano 1993; Harza Northwest, Inc. 1996.

³²² Palmisano, J.F. 1997.

³²³ Corps 2002b, Section 4.5.2.1 Resident Fish—Species Composition.

EFFECT AREA: FISH AND WILDLIFE: Non-Native Species fewer non-native species = better	
	Non-native species that prey, compete, or otherwise limit weak native species would be reduced. Populations of non-native species decline, especially in weak stock watersheds. Compared to Status Quo, native this alternative would be better for native fish and wildlife would because it reduces populations of non-native species.
Sustainable Use Focus	Undesirable non-native species would be actively managed to benefit the greatest number of targeted native fish and wildlife species. Management for undesirable non-native fish species could include such methods as changes in angling regulations, physical removal (e.g., nets, traps, or electrofishing), the use of piscicides (e.g., rotenone and antimycin), dewatering and stream flow augmentation, and habitat manipulation techniques. Non-native fish would be enhanced only under certain circumstances (for example, in areas that completely lack native fish and where native fish could not be reintroduced). Hatchery production would be used to provide sustainable fish harvesting, and could include non-native species. Management for undesirable non-native wildlife species could include such techniques as relocation of problem individuals or populations, change in hunting regulations, physical removal or deterrence (e.g., shooting, trapping, water spray, and avian predator lines), biological or chemical controls (e.g., sterilization), and habitat manipulation. Species-specific management would continue to maintain or increase some desirable non-native wildlife species. Management of undesirable non-native species would be conducted to minimize, when practical, the impact on non-targeted species. Overall, undesirable non-native species would decline and desirable non-native species would increase. Therefore, this alternative would have similar effects on native species of fish and wildlife as those under Status Quo.
Strong Stock Focus	There would be no distinction between native and non-native species, in terms of management actions. Non-native fish would increase because the river system would be managed for all strong fish populations, regardless of whether or not they are introduced. Healthy populations of desirable non-native wildlife also would benefit under this alternative. Populations of non-native species could increase to the extent they out-compete native species. Overall, non-native species would likely increase, so that conditions for native fish would be worse than under Status Quo, although conditions for native wildlife would likely be the same as Status Quo.
Commerce Focus	The comparative economic value of fish and wildlife would control species management, regardless of whether the species were native or introduced. Some non-native species would be allowed or encouraged to thrive, based on their economic potential. Other non-native species could be reduced or eradicated (e.g., using bounty programs) if they posed a potential economic threat to a commercially valuable native species. However, overall non-native species would be reduced to benefit more valuable native species (such as salmon), therefore native fish and wildlife would be better than under Status Quo.

5.3.3 Social and Economic Environments

The Policy Direction ultimately selected and implemented will result in environmental effects on the economic and social environments from fish and wildlife mitigation and recovery actions. Effects on the economic environment are grouped into the following effect area categories: commerce, recreation, economic development, and funding costs. Effects on the social environment are grouped into the following effect area categories: tribal interests, cultural and historic resources, and aesthetics. The effect area categories are further divided into subcategories and evaluated for each Policy Direction. The

anticipated effects associated with each Policy Direction are discussed throughout this section.

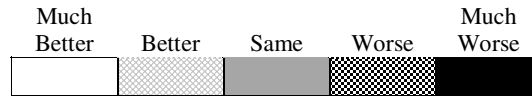
5.3.3.1 Economics

Table 5.3-5A shows how the Policy Directions would affect commerce, recreation, and economic development. Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo. All economic effects are from the perspective of the industry. Each broad category is further divided into subcategories for evaluation. Fewer impacts on the industry are characterized as "better" in the table. Under recreation, more opportunities is characterized as "better" in the table. Employment effects for all industries are summarized in the economic development category. More employment is characterized as "better."

Table 5.3-5A: Economics Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Commercial Interests						
Power						
Transmission						
Transportation						
Agriculture, Ranching, and Forest Products						
Commercial Fish Harvest						
Other Industry (e.g. mining, Direct Service Industries [DSIs])						
Recreation						
Sport Fishing and Wildlife Harvest						
Other Recreation						
Economic Development						
Industrial, Residential, and Commercial Development						

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Employment						



Summary of Effects: The Natural Focus Policy Direction would be much worse for the commercial interests and economic development in the long term, primarily because of bam breaching. However, the effects on recreation would only be worse due to restricted access and the loss of river and reservoir recreation in certain areas.

In general, under Weak Stock commercial interests, recreation, and economic development are worse, primarily due to the effects of dam breaching and designating critical habitat for listed species.

The Sustainable Use Policy Direction would have effects on commercial interests similar to Status Quo, however, commercial fish harvest would be slightly better. Overall economic development is also about the same as Status Quo, although there may be slightly more employment opportunities. Overall, sport fishing and wildlife harvest under this alternative would be better than Status Quo, but other recreation would be about the same.

The Strong Stock Policy Direction would result in improved conditions for all of the commercial, recreation, and economic development subcategories when compared to Status Quo.

Commerce Focus would benefit all commercial, recreation, and economic development subcategories compared to Status Quo. Effects on other industry and employment would be much better than Status Quo.

The reasoning for these effects is described in greater detail in Table 5.3-5B.

Table 5.3-5B: Economic Effects Across the Policy Directions Analysis

EFFECT AREA: COMMERCIAL INTERESTS: Power less need for new resources = better	
Existing Conditions	The impacts to the power generation capability of the hydrosystem from changes to benefit fish are a major concern. The regional power firm resources are made up of hydro (55%), coal (19%), imports (8%), nuclear (5%), independent/small power producers (6%), combustion turbines (3%), and other miscellaneous resources (4%). ³²⁴ The Columbia River and its tributaries are extensively developed, with

³²⁴ See Chapter 5 of this EIS, Section 5.2.3.1 Air Quality and Appendix E.

EFFECT AREA: COMMERCIAL INTERESTS: Power less need for new resources = better	
	more than 250 Federal and non-Federal dams constructed since the 1930s. These include 31 major multiple-use facilities built by Federal agencies on the Columbia River and its tributaries—the FCRPS. ³²⁵ BPA is the Federal power-marketing agency for the FCRPS. About 45% of the electric power used in the Northwest comes from BPA marketed resources. ³²⁶ Since 1995, hydrosystem operational requirements on the FCRPS for salmon recovery have reduced power generation in the Region by about 1000 MW. Most of the lost power has been replaced by higher-cost combustion turbines and power market purchases. ³²⁷ However, increasing population growth and demand are stressing existing generation, leaving fewer contingencies to meet fluctuations.
POLICY DIRECTION	
Status Quo	Between 1990 and 2000, the Region (OR, WA, ID, MT) experienced about a 21% growth in population; the Region has a projected growth of about 19% between 2000 and 2015. ³²⁸ With this population growth, the need for power increases. Between 2002 and 2011, the regional firm loads are projected to grow by nearly 2,400 aMW. ³²⁹ The recent recession, if it continues, may moderate this increase. The increased electrical demand is likely to be met mostly with combustion turbines and possibly some renewable energy resources. ³³⁰
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The hydropower lost from breaching six dams would be replaced with non-hydro power generation, most likely combustion turbines (CT) and possibly with cost-competitive renewable resources. For example, breaching the John Day Dam and the four lower Snake River dams and operating at a "natural river" level would decrease generating capacity by about 2,000 aMW. ³³¹ Under this Policy Direction, generation would be further decreased by the breaching the McNary Dam. The considerable loss of hydropower would result in a much greater and immediate need for replacement power than under Status Quo. Although some of the power loss would likely be accommodated by energy conservation and renewable resources, most of the need for power production would be met by CTs. There would be a much greater need for new resources than under Status Quo.
Weak Stock Focus	The effects from breaching dams would be similar to those under Natural Focus, but would occur to a lesser degree because only the four lower Snake River Dams are breached. Any additional constraints put on power generation at existing facilities for listed stocks (e.g., changes in flow, spill, drawdowns, and facility modifications to improve in-river juvenile salmon survival) would further reduce available generation. As under Natural Focus, the lost hydropower would likely be replaced by combustion turbines, conservation, and, possibly, renewable resources. As an

³²⁵ Corps 2002b, Section 4.10.1 Generation.

³²⁶ USDOE/BPA 2002a.

³²⁷ See Chapter 2, Section 2.3.2.3 Conflicting Policies: Managing the Money Resource

³²⁸ Data taken from US Census Bureau, <http://www.census.gov> (last visited February, 2003).

³²⁹ USDOE/BPA 2000c, p. 63.

³³⁰ See Appendix E of this EIS.

³³¹ The 2000 aMW is drawn from the Corps' John Day Drawdown Phase I Study (Corps 2000) Section 10.4.6.2 (1,146 aMW), and the Lower Snake River FEIS/Final Report (Corps 2002b), Table 5.10-2 (820-960 aMW).

EFFECT AREA: COMMERCIAL INTERESTS: Power less need for new resources = better	
	example, the hydro power lost over the next 10-20 years from removal of the four lower Snake River Dams would reduce BPA firm sales by about 800-1000 aMW. ³³² That would mean lost ability to meet customers' loads and historical obligations. The amount of additional lost hydropower from extra constraints would depend on the severity of the restrictions. Overall, the need for immediate replacement power from new resources would be much greater than under Status Quo.
Sustainable Use Focus	Modifications to the hydrosystem at existing facilities to benefit fish would be balanced with the need for reliable generation within the Region. Many improvements for fish would be structural or technological improvements that would have little effect on generation. Depending on the specific improvement (e.g., use of flow, spill, and peak efficiency turbine operations), this Policy Direction could possibly result in some small decreases in hydrosystem generation with little, if any, changes expected to the transmission system or ancillary services. Efforts benefiting fish while allowing for increased generation would be achieved through actions such as increased fish transportation. Overall, such changes would result in a small change in the amount of hydropower generation available over the next 10-20 years. ³³³ Compared to Status Quo, there would likely be no additional need for replacement power.
Strong Stock Focus	Hydropower operations would be managed to protect existing strong stock habitat, water quality, and instream flows. Restrictions on hydropower operations would likely decrease where they are constrained by weak-stock management, allowing for more generation. Overall, there would be less need for new resources compared to Status Quo.
Commerce Focus	The laws of supply and demand would have more influence on the amounts and mixes of power generation. Restrictions on hydrosystem operations would decrease to support economic growth. ³³⁴ Flow augmentation and spill would be reduced in order to store water for increased power generation when power is more valuable. Overall, the need for new generation would decrease.

EFFECT AREA: COMMERCIAL INTERESTS: Transmission fewer impacts = better	
Existing Conditions	BPA owns and operates more than 15, circuit-miles of high-voltage line (or about three-fourths of the bulk transmission in the Northwest), including transmission facilities that provide power to and from other regions, such as California and Canada. This transmission system serves as the connection for the 31 Federal hydro projects and numerous other generating facilities, and as the importer/exporter of power among several regions. ³³⁵ Ancillary services for the overall power system (transmission and generation) are also important. For example, hydropower generation can be quickly adjusted up or down as an automatic generation control (AGC) provides the required frequencies in the transmission system. The

³³² Corps 2002b, Section 5.10.1.2 Power System Models.

³³³ Corps 2002b, Section 5.10.2.2 Alternative 2—Maximum Transport of Juvenile Salmon; and Table 5.10-2. Also, USDOE/BPA 2000d.

³³⁴ Council 2000a, Framework Alternative 7.

³³⁵ USDOE/BPA 2002a.

EFFECT AREA: COMMERCIAL INTERESTS: Transmission fewer impacts = better	
	hydropower units may also be operated as a motor, in a condensing mode, to balance the needs of the transmission system. ³³⁶ Habitat actions, including avian protection activities, can limit maintenance (e.g., vegetation removal, pesticide use), causing transmission costs to increase. Decreased road densities that affect access to transmission facilities can increase the time required for maintenance activities, also causing transmission costs to increase and reliability to decrease. ³³⁷ Increasing population growth is stressing the existing transmission system and major infrastructure investments are underway.
POLICY DIRECTION	
Status Quo	Continual modifications to dams and changes in operations will reduce generation or alter the timing of generation affecting transmission requirements—placing stress on system reliability. The Pacific Northwest transmission grid was originally constructed to complement the generation system. Because the transmission and generation systems interact electrically, the loss of hydropower generation will affect the transmission system's ability to move bulk power and serve regional loads. ³³⁸ Transmission facilities will be affected by large shifts in the location of generation capacity. Reduced voltage support from these generators and transmission capacity reductions caused by the loss of generation will likely require additional transmission facilities. Some habitat actions and avian protection activities will change the transmission construction and maintenance activities near certain habitat and avian concentration areas. For example, if manual methods were used for vegetation management on the rights-of-way to protect habitat, more frequent maintenance cutting will be required, increasing the human presence and animal disturbance, as well as increasing maintenance costs. ³³⁹ Overall, there will be some increase in the need for new transmission facilities ³⁴⁰ in response to population growth, transmission congestion, and an increased need for power of about 2,400 aMW (see Power, above).
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Dam removal would affect the reliability of the transmission system. Transmission facilities are impacted by large shifts in the location of generation capacity. For example, the loss of about 2,000 aMW ³⁴¹ from breaching the four lower Snake River dams and the John Day Dam would reduce voltage support from these generators and cause transmission capacity reductions, likely requiring additional transmission facilities. ³⁴² The increase in annual transmission reliability costs from the drawdown of both the Snake River dams and John Day reservoir would be between about \$24 million and \$37 million. ³⁴³ These costs would increase further if McNary Dam were breached. New generation would likely be needed to

³³⁶ Corps 2002b, Section 4.10.3.4 Daily Generation and Ancillary Services.

³³⁷ See Chapter 5, Section 5.2.3.2 Economic Environment.

³³⁸ Corps 2002b, Section 5.10.1.3 Transmission Reliability.

³³⁹ USDOE/BPA 2000a, Chapter VI Environmental Consequences, Threatened and Endangered (T&E) Species section, and Chapter II Methods, Cost section.

³⁴⁰ USDOE/BPA 2001a, Executive Summary.

³⁴¹ Corps 2000, Section 10.4.6.2 Social Effects by Area of Impact: Power.

³⁴² Corps 2000, Sections 4.11 Hydropower Operation and 7.10.1 System Transmission Effects.

³⁴³ Corps 2000, Section 10.2.2.3 System Transmission Effects.

EFFECT AREA: COMMERCIAL INTERESTS: Transmission fewer impacts = better	
	compensate for the lost hydro generation, requiring additional transmission facilities. If the new generation facility were strategically located, however, it could defer some load service transmission that might otherwise be needed. ³⁴⁴ In addition to being costly, many ancillary services (e.g., AGC and emergency reserve power) necessary for a safe and reliable power system could be lost. The total ancillary economic effect is estimated at more than \$20 million. ³⁴⁵ Overall, there would be many more impacts to transmission resulting in conditions that are much worse compared to Status Quo.
Weak Stock Focus	The effects would be the same as those under Natural Focus, except that the extent of impacts affecting transmission facilities would be less. For example, breaching the four lower Snake River dams would reduce hydropower generation by approximately 800-1000 aMW. ³⁴⁶ The transmission reliability costs are estimated at about \$25 million, and the ancillary service costs around \$8 million. ³⁴⁷ There might be additional changes to the power system to protect and enhance listed fish and wildlife species habitat; those changes could further reduce generation capabilities and affect development and maintenance of transmission facilities or ancillary services. The impacts to transmission would be worse than compared to Status Quo.
Sustainable Use Focus	Transmission could be affected by modifications to existing hydro generation facilities to balance benefits between fish and wildlife and reliable generation and transmission. It is likely that balancing these two aspects would keep the hydro changes within the region's ability to continue to benefit from the existing transmission facilities over the next 10-20 years. ³⁴⁸ No additional transmission construction or changes to maintenance practices would be needed than what is projected under Status Quo. Overall, transmission impacts would be about the same as those under Status Quo.
Strong Stock Focus	Fewer restrictions on hydropower operations for weak stocks would result in fewer impacts to the transmission system. Some planned system modifications could be deferred. Transmission system maintenance would avoid, minimize, or mitigate its effects on strong stock/population habitat. Compared to Status Quo, there would be fewer impacts to transmission.
Commerce Focus	The same economic factors that affect hydropower generation would apply to the transmission system. Emphasis would be placed on increasing system reliability. For-profit development of transmission systems would be introduced. Maintenance would increase resulting in higher transmission reliability. Some planned transmission system upgrades and expansions could be deferred because the existing system would be more reliable than it would be under Status Quo. However, new development may result in the need for transmission construction. Overall, there would be fewer impacts to transmission than compared to Status Quo.

³⁴⁴ Corps 2002, Section 5.10.1.3 Transmission Reliability; Chapter 5 of this EIS, Section 5.2.3.2 Economic Environment.

³⁴⁵ Corps 2000, Sections 10.2.2.4 Ancillary Services Effects and 10.2.2.5 Summary of Hydropower Net Economic Effects.

³⁴⁶ Corps 2002b, Section 5.10.1.3 Transmission Reliability and Table 5.10-2.

³⁴⁷ Corps 2002b, Section 5.10.2.3 Alternative 4—Dam Breaching.

³⁴⁸ Corps 2002b, Section 5.10.2.2 Alternative 2—Maximum Transport of Juvenile Salmon and Alternative 3—Major System Improvements.

EFFECT AREA: COMMERCIAL INTERESTS: Transportation fewer impacts = better	
Existing Conditions	Major modes of commercial transportation for the region include rail, trucking, and navigation. The Columbia and Snake Rivers provide a major water transportation route; the Region also has extensive road and rail transportation corridors. The main impacts to transportation/navigation from fish and wildlife activities primarily affect commercial transportation that uses the major river systems. The 465-mile Columbia-Snake Inland Waterway represents a key link to the Columbia-Snake River Basin interior region, facilitating navigation from the Pacific Ocean to inland ports as far away as Lewiston, Idaho. This transportation system consists of navigation channels and locks, port facilities, and shipping operations. The system is used to ship commodities in and out of the Pacific Northwest. The navigation system consists of two segments: the downriver portion, which provides a deep-draft shipping channel, and the upriver portion, which is a shallow-draft channel with a series of navigation locks. The Corps maintains a navigation channel 250 feet wide and 14 feet deep from the mouth of the Snake to the the confluence of the Clearwater and Snake Rivers. This channel connects the interior section of the Basin with the lower Columbia River deep water ports. The products shipped through the system include grain, wood chips, logs, wood products, petroleum products, farm products, chemicals, sand and gravel, automobiles, and containerized products. ³⁴⁹ Fifty-four port and other shipping operations provide transportation facilities for products. In an average year, roughly 8-10 million tons of commodities are shipped through the navigation lock at the John Day Dam. ³⁵⁰ The total traffic passing through the Ice Harbor lock was 3.6 million tons in 1996. ³⁵¹
POLICY DIRECTION	
Status Quo	The mode of transportation most impacted by fish and wildlife activities is navigation, especially the shallow-draft portion of the Columbia-Snake Inland Waterway and lower Snake River system. Total barged tonnage through John Day Dam and the lower Snake River dams is expected to grow from 11.3 million tons in 2002 to 13.3 million tons in 2022. ³⁵² The Corps continues to maintain the shallow-draft portion of the channel. Rail and road traffic will continue to increase as the economy in the Region grows.
Effect in Comparison to the Status Quo Condition:	
Natural Focus	Dam breaching would curtail navigation for commercial vessels and divert commerce to trucks and trains. For example, breaching the John Day Dam and the lower Snake River dams would require substantial changes to barging and fleets and substantially decrease commerce for the ports, related businesses, and barge lines. ³⁵³ The average annual cost of shipping Columbia and Snake River goods would increase from about \$80 million to \$100 million per year. ³⁵⁴ "Port and farm communities, navigation laborers and operators, and other indirectly affected interests may not be covered by these loss estimates." ³⁵⁵ The projected cost of

³⁴⁹ Corps 2002b, Sections 4.9 Transportation, 4.9.1.2 Ports and 4.9.1.4 Commodity Movements.

³⁵⁰ Corps 2000, Section 10.2.4 Navigation NED Evaluation.

³⁵¹ Corps 2002b, Section 5.9.1.1 Methodology.

³⁵² Corps 2000, Section 10.2.4.3 Commodity Projections.

³⁵³ Corps 2000, Sections 7.9 Navigation Impacts and 9.4 Navigation Modifications.

³⁵⁴ Corps 2000, Section 10.2.4.4 Costs of Drawdown Alternatives.

³⁵⁵ Cost estimates are from Corps 2002b.

EFFECT AREA: COMMERCIAL INTERESTS: Transportation fewer impacts = better	
	<p>upgrading the railroad and highway transportation system is in excess of \$200 million.³⁵⁶ In addition, railroad and highway embankments are located in vulnerable areas where wave impingement, undercutting, erosion, rapid dewatering, and ultimately failure are likely to occur. Consequently, adjacent transportation routes might experience varying degrees of track misalignment and effects on roads that might experience movement, cracking, slumping, piping, and other failures.³⁵⁷ Future flood events could cause damage to portions of the railroad and highway system. There would be increased truck and rail transportation, mainly caused by loss of barging. The effects of this Policy Direction would be much worse for transportation than those under Status Quo.</p>
Weak Stock Focus	<p>The effects would be the same as those under Natural Focus; however, the extent of impact would be less because no mainstem dams would be breached.³⁵⁸ For example, it is projected that breaching the four lower Snake River dams and changing from barging to trains and trucks would increase annual average transportation costs from about \$28 million to about \$48 million. Congestion and wear on road and rail infrastructure would also increase.³⁵⁹ It is estimated that breaching the four lower Snake River dams would divert barged grain to railroads (about 30%) and highways (about 70%) for transport. Both of these shifts would require investments in the infrastructure for railroads and highways. The projected costs of upgrading the transportation system is in excess of \$100 million.³⁶⁰ Overall, the effects on transportation would be worse than those under Status Quo.</p>
Sustainable Use Focus	<p>Navigation could be affected by changes made to hydro facilities and operations for fish enhancements; however, any impacts are likely to be small. Navigation could also be improved through practices such as channel deepening, as long as it is balanced with fish and wildlife needs. Any reduction in navigation would result in a small increase in the use of rail and road transportation.³⁶¹ There might be some small increases in other transportation costs if there are modifications to the hydro system for fish and wildlife. The modes of transportation for goods are not likely to change any more than under Status Quo. Impacts to transportation from fish and wildlife activities will be the same as those under Status Quo.</p>
Strong Stock Focus	<p>A shift to strong stock management would result in a decrease in impacts to navigation. In particular, the river transportation system would see little impact because changes to hydropower operations would be minimal. In fact, navigation could improve through practices including channel deepening, as long as strong stocks are not impacted. The terrestrial transportation system would remain largely unchanged; however, adjustments in road densities and locations would be made to benefit healthy stocks of fish and wildlife. For example, new development in</p>

³⁵⁶ Corps 2000, Section 10.2.8 NED Cost Summary, Table 87.

³⁵⁷ Corps 2000, Section 7.8.1 Transportation; and Corps 2002b, Section 5.2 Geology and Soils.

³⁵⁸ Corps 1999a. The Drawdown Regional Economic Workgroup (DREW) Transportation Workgroup conducted a transportation analysis as part of the Corps' Lower Snake River Juvenile Salmon Migration Feasibility Study EIS in order to identify and quantify the direct economic effects resulting from disruption of the existing transportation system. This analysis was designed to measure the effect of breaching the four Lower Snake River dams on the costs of transporting products that are currently shipped on the Columbia-Snake River Inland Waterway.

³⁵⁹ Corps 2002b, Section 5.9.4 Summary of Transportation-Related Economic Effects.

³⁶⁰ Corps 2002b, Section 5.9 Transportation and Table 5.9-1.

³⁶¹ Corps 2002b, Section 5.9 Transportation.

EFFECT AREA: COMMERCIAL INTERESTS: Transportation fewer impacts = better	
	riparian areas would be limited and system expansion in strong stock watersheds would be constrained. Transportation would likely be better than compared to Status Quo.
Commerce Focus	Market forces, rather than hydrosystem operation or the presence of dams and other water management facilities, would decide the future of river-based transportation. The proportion of modes of transportation used (navigation, rail, road) would continue to be based on cost. River transportation would benefit somewhat from less-restricted hydro operations, more efficient navigation lock operations, and improved dredging (including channel deepening). Terrestrial transportation would reflect changes in the river system's use. Increased economic development could lead to more investments in rail and road transportation, especially for transporting goods in areas removed from the Waterway. Overall, there would be fewer impacts to transportation than compared to Status Quo.

EFFECT AREA: COMMERCIAL INTERESTS: Agriculture, Ranching, and Forest Products fewer impacts = better	
Existing Conditions	Agriculture, ranching, and the forest products industry can be impacted by fish and wildlife activities, resulting in reductions or changes in farm yield, range production, and timber harvest. These impacts are related to restrictions in land and water use, and increased regulation on Federal lands to protect listed species and ecosystem health. Agriculture includes irrigated and non-irrigated crop land, hayland, and seeded pasture. There are approximately 7 to 9 million acres of irrigated agriculture in the Columbia River Basin. Some agriculture is dependant on irrigation water from Federal facilities. The Columbia River Basin also supports approximately 16 million acres of non-irrigated lands, 45 million acres of rangeland (of which approximately 25 million acres are on Federal property), and 65 million acres of forested lands (42 million acres on Federal property). Irrigated agriculture includes pasture, hay, small grains, corn, potatoes, apples, and relatively small acreage of many other crops, fruits and vegetables. ³⁶² Rangeland accounts for about 33% of the land cover in the interior Columbia Basin. ³⁶³ Most grazing use in the Northwest is for cattle, although some is for sheep and horses. Forests are the predominant land cover in the Pacific Northwest, accounting for almost one-half. ³⁶⁴ In 1994, timber-based industries (paper mills, sawmills, logging, and wood products) were the second largest source of direct, indirect, and induced employment in the upriver subregion, accounting for 21% of total employment. ³⁶⁵ Between 1990 and 2000, the Region experienced growth in human population of about 21%. ³⁶⁶ However, demand for agricultural and forest products is not directly correlated to regional population growth. Commodity prices are set in national or international markets, so producers cannot pass most agricultural, range, or forest production costs on to consumers.

³⁶² Corps 2002b, Table 4.11-2 Acreage and Crops Grown on Farms Irrigated From Ice Harbor Reservoir.

³⁶³ Quigley and Arbelbide 1997, p. 458.

³⁶⁴ Quigley and Arbelbide 1997, p. 458.

³⁶⁵ Corps 2002b, Section 4.14.1.1 Employment.

³⁶⁶ Data taken from US Census Bureau, <http://www.census.gov> (last visited February, 2003).

EFFECT AREA: COMMERCIAL INTERESTS: Agriculture, Ranching, and Forest Products	
fewer impacts = better	
POLICY DIRECTION	
Status Quo	<p>The U.S. Census Bureau projects that the Region's population will grow about 19% between 2000 and 2015.³⁶⁷ Overall, there will be a gradual increase in impacts to farming, ranching, and timber harvest as activities taken to benefit fish and wildlife increase. USDA's land conservation programs provide positive incentives for changing to uses and practices that favor fish and wildlife on private farmland and rangeland. There are some restrictions to benefit protected species that impact the agricultural managers' ability to enter into agreements for renewable energy development. Rangeland grazing is declining, especially on Federal land, in response to government decisions about carrying capacity and resource protection, and in response to the business or personal decisions.³⁶⁸ The projected decline is attributed to stocking rate reductions in recognition of continuing resource damage and declining economic feasibility of livestock grazing, as well as to recovery plans for federally-listed threatened and endangered species. Timber harvest from the interior Columbia Basin accounts for about 10% of the total U.S. harvest.³⁶⁹ The amount of annual timber harvest is declining, especially on Federal land.³⁷⁰ Although demand for forest products is expected to increase, per-capita consumption will decline slightly.³⁷¹ Timber harvesting costs are increasing, as methods and prescriptions for addressing increasingly complex fish and wildlife habitat goals are incorporated.³⁷² As habitat-based restrictions on solid wood supply increase, the type and quality of natural resource products are shifting, with increasing reliance on engineered, reconstituted, and recycled products.³⁷³</p>
	Effect in Comparison to the Status Quo Condition:
Natural Focus	<p>The breaching of six dams and drawdown of reservoirs would severely restrict water withdrawals, especially irrigation, in those areas. At John Day Reservoir alone, there are 30 irrigation pump stations and approximately 180,000 acres of irrigated lands.³⁷⁴ Consequently, under dam breaching conditions, most operators would no longer be able to pump water from the reservoir, agricultural production would drop, and the value of much of the affected farmland could be reduced to the value of non-irrigated rangeland, less than half the current land value (not including on-farm or other irrigation system modification costs).³⁷⁵ Breaching of the dams would allow large volumes of sediment to be carried downstream. These induced sediment deposits could present problems with existing water withdrawal intakes for agriculture downstream. Agricultural land use practices would be substantially</p>

³⁶⁷ Data taken from US Census Bureau, <http://www.census.gov> (last visited February, 2003).

³⁶⁸ USDOJ 1994.

³⁶⁹ USDOJ 1994, p. 86.

³⁷⁰ Quigley and Arbelbide 1997, p. 86.

³⁷¹ Quigley and Arbelbide 1997, p. 1790.

³⁷² Quigley and Arbelbide 1997, p. 1798.

³⁷³ Quigley and Arbelbide 1997, p. 1798.

³⁷⁴ Corps 2000, Section 4.13 Irrigation, p. 24.

³⁷⁵ Corps 2000, Sections 7.12 Irrigation Impacts and 10.2.5 Water Supply and Irrigation NED Evaluation; Corps 2002b, Sections 5.12.1.2 Alternative 4—Dam Breaching, Transportation and 5.14.2.1 Lower Snake River Study Area.

EFFECT AREA: COMMERCIAL INTERESTS: Agriculture, Ranching, and Forest Products fewer impacts = better	
	<p>modified. The costs of services to agricultural and forest products operations, and inputs such as transportation and electricity, would increase. For example, transportation costs to move goods to market would increase because navigation would be reduced. Agricultural production would drop, and the value of the farmland would likely be reduced. Much of the farm, range, and timberland use would be prohibited in and adjacent to the breached dams and in the areas where human use is restricted to protect habitat. Further, grazing and timber harvest on public lands with high habitat value would be virtually eliminated, as habitat is protected. Commercial forest practices would shift increasingly from public land to private land. Forest management would shift away from management for merchantable products. More old growth timber would be protected. Reductions in forest management activities combined with past wildfire suppression efforts could increase the amount and severity of wildfires, though in the long term a more natural fire-dependant ecosystem would develop. Overall, this alternative would be much worse for agriculture, ranching, and forest products than under Status Quo.</p>
Weak Stock Focus	<p>Breaching dams and drawing down reservoirs would have similar effects as those discussed in Natural Focus, though the amount of impacts would be less. For example, water supplied by the Ice Harbor reservoir for 37,000 acres of irrigated farmland valued at more than \$134 million would be affected. Water pumping would be stopped or have increased costs in the hundreds of millions of dollars, agricultural production would drop, and the value of the farmland would likely be reduced.³⁷⁶ Loss of land value could lead to a decreased county property tax base in many regional counties.³⁷⁷ Agriculture, ranching, and forest operations would be limited as more habitat would be enhanced for listed wildlife and fish. For example, ecosystem enhancement activities could cause significant changes in agriculture, range, and forestland management. Restricted timber harvest due to fish and wildlife activities could result in less marketable timber (low-value, small-diameter logs) requiring increased subsidies. However, large areas of potential range and forest land would be exposed—approximately 14,000 acres for the four lower Snake reservoirs alone.³⁷⁸ Overall, this alternative would be worse for agriculture, ranching, and forest products compared to Status Quo.</p>
Sustainable Use Focus	<p>Agriculture, grazing, and forestry could be impacted as fish and wildlife mitigation and enhancement activities increase, forcing these industries to focus on increasing production efficiency, or adjusting operations. Intensive cultivation, selective grazing, and innovative forest management practices could mitigate most impacts. Multiple-use management would allow for both commodity production and benefits for fish and wildlife. For example, increasing restrictions on livestock grazing to address habitat goals could be used to produce a shift to more efficient land uses (such as cattle grazing in young timber stands) to reduce fine fuels, increase the biomass and value of stumpage, and provide income from grazing.³⁷⁹ Some land retirement could be used where it would benefit fish and wildlife. Overall, the</p>

³⁷⁶ Corps 2002b, Sections 5.12.1.2 Alternative 4—Dam Breaching, Transportation and 5.14.2.1 Lower Snake River Study Area.

³⁷⁷ Corps 2002b, Sections 5.12.1.2 Alternative 4—Dam Breaching, Transportation and 5.14.2.1 Lower Snake River Study Area.

³⁷⁸ Corps 2002b, Summary p. 35.

³⁷⁹ USDA/USFS and USDO/BLM 1997, p. 1798.

EFFECT AREA: COMMERCIAL INTERESTS: Agriculture, Ranching, and Forest Products fewer impacts = better	
	effects of this Policy Direction on agriculture, ranching, and forest products would be similar to those under Status Quo.
Strong Stock Focus	The use of irrigated agriculture would increase as restrictions on water use relaxed and efforts to increase instream flows for weak stocks declined. Actions to acquire additional water rights for improving weak-stock habitats—rights that compete with irrigation demands—would be eliminated. New agricultural development, ranching and grazing operations and practices could be constrained near healthy stock habitat. Previously focused on management for listed species, there would be an expansion of other uses such as grazing and timber harvests in these areas. The mix and yield of forest products could shift commensurate with the shift in management emphasis. Overall, the effects of this Policy Direction would be better than Status Quo.
Commerce Focus	Existing, cost-effective agricultural irrigation would be maintained, and other uses of Columbia Basin water would increase with increased development. Dryland and irrigated farming could increase based on the value of the crop. The impacts of management changes on farmers and landowners would depend on the mix of positive economic incentives. Increased development could result in agricultural lands being taken out of production and sold for higher value uses. Less land would be set aside for fish and wildlife resulting in more available land for other uses such as grazing and forest products. Overall, agricultural, ranching, and forest products would be better than Status Quo under this alternative.

EFFECT AREA: COMMERCIAL INTERESTS: Commercial Fish Harvest more harvest = better	
Existing Conditions	Impacts to commercial fish harvest from fish and wildlife activities are closely related to the harvest levels set for specific stocks of anadromous fish. Columbia Basin salmon are harvested both in-river and off the coast of the northwestern U.S., Canada, and Alaska. Overall, the salmon fishery can be defined as a mixed-stock fishery, with increases in harvest levels only when abundance is high. Hatcheries have been operated to support anadromous fish populations for harvest. Ocean fisheries are very difficult to manage: the life history of salmon (e.g., migratory patterns and natural population levels); multiple jurisdictions, laws, and treaties involved; and the natural mixing of salmon populations from different freshwater origins all need to be considered. ³⁸⁰ The freshwater commercial fishery of the Columbia River system includes in-river sport charter boats, the non-Indian gillnet fishery (operating in the zone from the estuary to Bonneville Dam), and the treaty Indian gillnet fishery (operating in the mainstem Columbia River between Bonneville Dam and McNary Dam). ³⁸¹ While in the river, the fishery is subject to Federal, state and tribal jurisdictions, laws (e.g., ESA), treaties, and management strategies. Harvest seasons and catch have been reduced compared to historical conditions. For example, the commercial and sport harvest of chinook salmon off the Washington and northern Oregon coasts has declined from nearly 600,000 fish in 1974 to an average of about 15,000 fish since 1994. ³⁸² There also have been similar declines evidenced in the commercial river harvest. ³⁸³ The general decline of

³⁸⁰ Federal Caucus 1999b, Harvest Appendix, p. 6.

³⁸¹ Federal Caucus 1999b, Harvest Appendix p. 5.

³⁸² Federal Caucus 1999b, Harvest Appendix, p. 8.

³⁸³ Federal Caucus 1999b, Harvest Appendix, p. 8.

EFFECT AREA: COMMERCIAL INTERESTS: Commercial Fish Harvest more harvest = better	
	salmon stocks resulted in no commercial in-river spring chinook fishery since 1977. There has also not been an official commercial fishery for summer chinook since 1967, although summer chinook were incidentally harvested during the sockeye salmon harvest until about 1973. ³⁸⁴ Changes in harvest regulations have been in the form of restrictions, shortened seasons, area closures, special gear regulations, license moratoria, and buyouts of fishing fleets. There has been a trend to reduce harvest rates in mixed-stock areas in favor of harvests in more terminal areas where the stocks can be segregated and more selectively caught. ³⁸⁵ In 1999, the United States and Canada signed the Pacific Salmon Treaty, focusing on a cooperative, conservation-based approach that results in more equitable sharing of salmon catches between Canada and the United States. ³⁸⁶
POLICY DIRECTION	
Status Quo	The Pacific coast fisheries south of the Canadian border, directed primarily at chinook and coho salmon, recently reported harvests of chinook salmon that increased with increased abundance. For example, in 2000 the Oregon ocean chinook harvest was 135,900 fish, while in 2001 the preliminary numbers estimated the harvest at 275,000 fish. ³⁸⁷ Also, in 2000 the Columbia River in-river, treaty Indian, and sport commercial harvest of up-river adult spring chinook was a little more than 90 fish, but in 2001 the harvest was 22,689 fish. This sudden improvement may be related to improved ocean conditions and the future trend is difficult to predict. ESA obligations have resulted in increased emphasis on protecting threatened or endangered native fish. Reduction in harvest has reduced the economic benefits to local communities, industries, and gear manufacturers, among others. Harvest may be further reduced to comply with planned ESA and Pacific Salmon Treaty actions. The commercial salmon fishery has recently been subject to intense economic competition from the salmon aquaculture industry. Most farm-raised salmon come from Canada, Europe and South America. Economic trends and pressure from more costly harvest regulations are expected to result in continuing declines in the amount of commercial salmon fishing and the economic value of salmon harvest.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Most ocean and Columbia Basin harvest would be decreased substantially or eliminated, at least for the short term. Also, the elimination of hatchery production would further decrease harvest opportunities. Remaining opportunities would focus on the targeted harvest of selected stocks, primarily in tributaries. The short-term adverse effects from the removal of six dams would further decrease the number of fish available for harvest. As naturally-spawning anadromous fish increase in the long term, more harvest would be allowed. Overall, commercial fishing would be much worse than under Status Quo.
Weak Stock Focus	Further protections of weak stocks and a shift in hatchery management to emphasize the conservation of weak stocks would result in a decrease in harvest. The removal of the four dams would adversely affect anadromous fish in the short term, limiting the number of fish available for harvest. The change in hatchery management would

³⁸⁴ Federal Caucus 1999b, Harvest Appendix, p. 8.

³⁸⁵ Federal Caucus 1999b, Harvest Appendix, p. 7.

³⁸⁶ Pacific Salmon Commission, The Pacific Salmon Treaty, June 3, 1999.

³⁸⁷ Pacific Fishery Management Council 2002.

EFFECT AREA: COMMERCIAL INTERESTS: Commercial Fish Harvest more harvest = better	
	result in less harvestable hatchery fish production and contribute to additional restrictions on commercial harvest. There could be an increase in the harvest of weak stocks as they recover. A shift to selective fish harvest would allow some commercial harvest of non-weak stocks to continue. Overall, there would be less commercial harvest compared to Status Quo.
Sustainable Use Focus	The shift to compensation/supplementation hatchery management to produce harvestable hatchery fish would allow for increased commercial harvest. This harvest would include both hatchery-produced and naturally-spawning fish. Habitat would be improved and managed to enhance production of fish and increase harvest. Overall, there would be more commercial harvest compared to Status Quo.
Strong Stock Focus	Commercial harvest would be constrained only if that harvest would result in a decline of self-sustaining populations of healthy stocks. There would be no harvest restrictions placed on weak stocks. Habitat management efforts and increased hatchery production would allow for increased harvest. Overall, the commercial fishery harvest would increase relative to Status Quo.
Commerce Focus	Losses of fish production from upstream areas would be offset by increases in the amounts and efficiencies of hatchery-produced marketable fish, and by increases in fish farm production in the lower river and estuary. A selective fish harvest could increase when economically efficient. With fish farming and more hatchery production, the commercial fish harvest would increase compared to conditions under Status Quo.

EFFECT AREA: COMMERCIAL INTERESTS: Other Industry fewer impacts = better	
Existing Conditions	The regional economy has experienced some transition over the last decade or so, evolving from being primarily natural resource-based to a diverse economy with growing trade and service sectors. The largest industry sectors (and their relative contributions to the regional employment) include services (25.0%); trade (21.1%); government (16.4%); manufacturing (11.7%); fire, insurance and real estate (6.0%); and construction (4.7%). ³⁸⁸ Of these sectors, services has shown the highest economic growth, and has the highest per-capita income. Economic activity is greatest in metropolitan areas, but distribution varies by sector. Some economists believe that areas with high amenity values (i.e., public lands) tend to attract new businesses and skilled labor. ³⁸⁹ Mining provides about 0.5% of regional employment. Mining, aluminum products, and other natural resource-based and water- and energy-dependent industries are facing increasing regulation, operational costs, and foreign competition. These factors have resulted in a general decline of these industries. In contrast, services and government sectors are increasing.
POLICY DIRECTION	
Status Quo	The regional economy will continue to grow and diversify as the human population increases. The population in the Region is projected to grow about 19% between 2000 and 2015. ³⁹⁰ Information-based technologies and services are expected to

³⁸⁸ USDA/USFS and USDO/BLM 1997, p. 1732.

³⁸⁹ USDA/USFS and USDO/BLM 1997, p. 1735.

³⁹⁰ Data taken from US Census Bureau, <http://www.census.gov/population/projections/state/stpipop.txt> (last visited February, 2003).

EFFECT AREA: COMMERCIAL INTERESTS: Other Industry fewer impacts = better	
	grow fastest, followed by trade, government, and manufacturing. ³⁹¹ Natural resource-dependent industries will continue to face increasing costs and foreign competition. Growth in the natural resource industries will likely decline. For example, a shrinking road network on Federal lands adversely affects mining. The aluminum industry is severely affected by the price of electricity, world supply, and foreign competition. These trends are expected to continue.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Many existing industries, especially aluminum, would be severely affected by increased power costs as a result of the need to purchase replacement power to compensate for breaching dams. Other industries would be affected by the loss of navigation (see Transportation) and water withdrawals due to dam breaching. Industries would be restricted from locating in rural and wildland areas. Restricted access to protected areas would result in the further decline of natural resource-based industries, such as industrial mineral mining (e.g., sand and gravel). Overall, the effects on industries would be much worse compared to Status Quo.
Weak Stock Focus	Many existing industries would be impacted by increased power and transportation costs and reduced water withdrawals as a result of dam breaching, similar to Natural Focus. Development would also be restricted in weak-stock habitat. Further, there would be active remediation of natural resource-based industrial impacts in weak-stock habitats. Environmentally friendly industries and development would be encouraged. Overall impacts, though not as severe as those under Natural Focus, would still be worse compared to Status Quo.
Sustainable Use Focus	There could be some restrictions on certain industries if harvestable levels of fish and wildlife are impacted. These impacts would likely be offset by increases in other industries, such as the services, trade, and government sectors. Active remediation of natural resource-based industrial impacts would be required. Overall, impacts to other industry would be about the same as compared to Status Quo.
Strong Stock Focus	A decrease in development restrictions would allow increases in industrial activity. These increases would only be limited in areas where strong stocks could be adversely affected. Industries could benefit from more affordable power and transportation. Overall, there would be fewer impacts on other industries compared to Status Quo.
Commerce Focus	Regulatory flexibility and positive incentives would allow industry expand while still fulfilling environmental responsibilities. River management would not be restricted by costly weak-stock management and would be increasingly tailored to needs of all of its multiple uses, including navigation, power production, and consumptive water uses. Overall, other industry would be much better than compared to Status Quo.

EFFECT AREA: RECREATION: Sport Fishing and Wildlife Harvest more opportunities = better	
Existing Conditions	Impacts to sport fishing and hunting (including trapping) are areas of concern related to fish and wildlife populations and policies. Throughout the region, recreational fishing and hunting industries are centered on rivers, reservoirs, and forested and other undeveloped lands. The Region has plentiful hunting/trapping opportunities, such as big game (e.g., deer and elk), upland game (e.g., pheasants and rabbits),

³⁹¹ USDA/USFS and USDO/BLM 1997, p. 1743.

EFFECT AREA: RECREATION: Sport Fishing and Wildlife Harvest more opportunities = better	
	<p>furbearers (e.g., beaver and mink), and waterfowl (e.g., ducks and geese). Recreational fishing for resident fish (e.g., trout and bass) and anadromous fish (e.g., salmon and steelhead) is also plentiful. For many years, the fisheries have been supported by hatchery production to help maintain harvest levels. For the past decade hundreds of thousands of hunters and anglers have spent millions of dollars annually in support of these recreational activities.³⁹²</p>
POLICY DIRECTION	
Status Quo	<p>Sport fishing and hunting would continue at levels similar to existing conditions. In 1999, the Columbia River Basin hatcheries produced more than 140 million anadromous fish to help supplement the fisheries.³⁹³ Some ESA listings may have reduced economic benefits to local communities, tourism industries, gear manufacturers, guides, etc. Even in light of these listings, recreational fishing and hunting still produce a sizable economic benefit. For example, in 2000, Oregon and Washington combined sold more than 1.5 million fishing licenses and more than half a million hunting licenses. This amounted to about \$17 million in license revenues for fishing and more than \$11 million for hunting in Oregon alone.³⁹⁴</p>
	Effect in Comparison to the Status Quo Condition:
Natural Focus	<p>Closing all hatcheries, decreasing harvest, and reducing some resident and anadromous fisheries would result in a loss of recreational fishing opportunities. Sport fishing during the years immediately after breaching would be reduced because the populations and habitat for most resident and anadromous fish would be reduced. In the long-term, however, the anadromous fish populations could recover enough to allow some recreational fishing opportunities.³⁹⁵ The number of resident fish found in reservoirs would be reduced, while the number of anadromous fish could increase. It is estimated that there would be about a one-third reduction in carrying capacity of warmwater fish under near-natural river conditions from breaching the four lower Snake River dams. Drawing down the John Day and McNary Dams would also result in the loss of resident fish habitat. Some resident fisheries may be eliminated, while others, such as smallmouth bass and sturgeon, would likely increase in numbers sufficient to permit recreational fishing. Over time, fishing opportunities might increase with increasing fish populations. The increased recreational fishing opportunities were projected to increase the economic value about \$14 to \$50 million annually.³⁹⁶ In the short term, dam breaching would also cause some waterfowl areas to be lost, reducing hunting opportunities. However, new habitat would become available over time as a result of dam breaching and land retirement. Any increases in habitat would likely be slow due to</p>

³⁹² See websites for examples of the number of hunter and sport fishers. Oregon: <http://www.dfw.state.or.us/index.html>; Washington: <http://www.wa.gov/wdfw/huntcorn.htm>; Idaho: <http://www2.state.id.us/fishgame/> (last visited February, 2003).

³⁹³ NMFS 1999c.

³⁹⁴ Carter, Christopher 2002; and Heath, Carolyn 2002.

³⁹⁵ Corps 2000, Section 10.4.6.2 Social Effects by Area of Impact, Recreation.

³⁹⁶ The increased fishery dollars are taken from adding the \$8-45 dollars in the Lower Snake document and \$6 million from the John Day document. The other general information is taken from the referenced sections. Corps 2002b, Sections 5.13.3.2 New Recreational Activities and 5.13.5 Economic Effects; and Corps 2000, Sections 10.2.3.4 Future With-Project Recreation Use Drawdown to Natural River Level and 7.17 Aquatic Resource Impacts.

EFFECT AREA: RECREATION: Sport Fishing and Wildlife Harvest more opportunities = better	
	passive restoration. Restricted access would reduce some of the gains. With restriction of human access, closure of hatcheries, and restricted harvest, sport fishing would likely be much worse compared to Status Quo, though wildlife harvest opportunities would only be worse.
Weak Stock Focus	Dam breaching would have similar effects as in Natural Focus and could increase sport fishing and hunting opportunities in the long run. For example, recreational fishing would increase, and result in \$8 to \$45 million of revenue annually if the four lower Snake River dams are breached. ³⁹⁷ However, restrictions on harvest for listed species would limit opportunities. A shift to conservation hatcheries to assist weak stocks would further reduce the number of harvestable fish. In the short term, dam breaching would also cause some waterfowl areas to be lost, reducing hunting opportunities. Although active habitat protection and enhancement would increase overall fish and wildlife production, harvest opportunities would be reduced to protect listed populations, primarily fish. Most hunting opportunities limited by dam breaching are expected to return to pre-breach levels within 10 years. ³⁹⁸ However, overall sport fishing and wildlife harvest opportunities would be worse compared to conditions under Status Quo.
Sustainable Use Focus	The management of fish and wildlife habitat to improve production would increase fishing and hunting opportunities. Increasing hatchery production would further increase the potential sport fish harvest. The creation of a sustainable resident fishery would likely allow for increased angler opportunities, particularly in blocked areas. The economic benefits, especially to support services, would increase substantially as fish and wildlife are managed for increased harvest. Overall, the sport fishing and wildlife harvest opportunities and associated economic benefits would be better than under Status Quo.
Strong Stock Focus	Recreational harvesting of fish and wildlife would be restricted only when it would result in a decline of self-sustaining populations. Harvest restrictions that benefit weak stocks would be eliminated. Recreational harvesting of fish would be supported by hatchery production. Wildlife harvest could be supported by enhanced game management and stocking programs. Overall, the sport fishing and wildlife harvest opportunities and associated economic benefits would be better than under Status Quo.
Commerce Focus	Increased revenues from new and existing industrial and commercial development would help fund fish and wildlife activities. Increases in hatchery and fish farm production and wildlife stocking programs would allow for increased harvest opportunities. Non-native species would be promoted where there is a harvest demand. Anglers and hunters would pay increased user fees to cover production and other related costs. Some fish and wildlife habitat would be managed to preserve hunting and fishing opportunities. Overall, sport fishing and hunting opportunities would be better than under Status Quo.

EFFECT AREA: RECREATION: Other Recreation more opportunities = better	
Existing Conditions	Other recreation (other than fishing and hunting) that are affected by fish and wildlife activities include water-based recreational activities, such as rafting, kayaking, canoeing, water-skiing, boating, windsurfing, swimming. Many boat

³⁹⁷ Corps 2002b, Sections 5.13.3.2 New Recreational Activities and 5.13.5 Economic Effects.

³⁹⁸ Corps 2002b, Sections 5.13.3.2 New Recreational Activities, Table 5.13-7.

EFFECT AREA: RECREATION: Other Recreation more opportunities = better	
	<p>launch ramps, beaches, marinas, and other facilities have been developed to support these activities. For example, there are 33 developed recreation sites on the lower Snake River reservoirs alone. These sites include 29 boat ramps with 59 launch lanes, 9 campgrounds with approximately 435 individual campsites, and 49 day-use facilities (e.g., shelters, swimming beaches, and scenic views). There are also 22 access or primitive recreation areas where camping is allowed. More than 25 million people visited the John Day reservoir during a 10-year period from 1989 through 1998.³⁹⁹ In 1998, the lower Snake River area at the Lower Granite Dam Reservoir had more than one million visitors. Even the least-visited reservoir behind Lower Monumental Dam had more than 157,000 visitors.⁴⁰⁰ Land-based activities such as picnicking, camping, mountain biking, horseback riding, wildlife viewing, hiking, rock climbing, skiing, and ecotourism are also popular throughout the Region.⁴⁰¹ Many of these recreation opportunities are located in rural areas removed from population centers.⁴⁰² The population in the Region grew about 21% between 1990 and 2000, creating more demand for recreational resources.</p>
POLICY DIRECTION	
Status Quo	<p>The population in the Region is projected to grow about 19% between 2000 and 2015.⁴⁰³ This growth will bring continued pressure for increased recreational resources and ecotourism opportunities. It will also result in a shift away from traditional consumptive uses. Developed recreation is limited in areas where there are listed species of fish and wildlife. Overall, the demand for recreational opportunities is expected to increase as the Region grows.</p>
	Effect in Comparison to the Status Quo Condition:
Natural Focus	<p>Dam breaching would cause the local loss of reservoir recreation; also, the navigation locks would no longer be operational, curtailing navigation for large recreation vessels.⁴⁰⁴ In the short term, many recreation jobs and revenues would be lost. For example, breaching the four lower Snake River dams and the John Day Dam would have dramatic effects on regional recreation, reducing by approximately 88,000 acres of surface water area—the supply of lakes and slower moving water that supports flatwater recreation.⁴⁰⁵ Lake or flatwater recreation activities, including swimming, water skiing, sailing, windsurfing, and sightseeing in tour boats would no longer be possible. Other activities such as hiking, camping, and wildlife viewing would also be curtailed as access was restricted. Developed recreation would be prohibited in areas that are protected. Recreation activities would change considerably from those under Status Quo, and the number of recreation opportunities would be much less than Status Quo.</p>
Weak Stock	<p>The overall effects from dam breaching would be similar to those from Natural</p>

³⁹⁹ Corps 2000, Section 10.2.3.2 Existing Recreation Use and Value.

⁴⁰⁰ Corps 2002b, Section 4.13.1.2 Visitation.

⁴⁰¹ Corps 2002b, Section 4.13.1 Recreation; and Corps 2000b, Section 4.17 Recreation, Table 13.

⁴⁰² Corps 2002b Section 2.1.12 Recreation.

⁴⁰³ Data taken from US Census Bureau <http://www.census.gov/population/projections/state/stpjpopt.txt> (last visited 03-14-02).

⁴⁰⁴ Corps 2002b, Section 3.4 Alternative 4—Dam Breaching.

⁴⁰⁵ Corps 2002b, Section 5.13.3.1 Existing Recreational Activities and Displaced Users; and Corps 2000, Section 4.18.5 General Habitat Description.

EFFECT AREA: RECREATION: Other Recreation more opportunities = better	
Focus	Focus, but access would not be restricted. There would be a shift from flatwater to river-based recreation. For example, breaching the four lower Snake River dams would reduce flatwater recreation area by about 34,000 acres and expose about 14,000 acres of inundated land. ⁴⁰⁶ Activities such as hiking, camping, and wildlife viewing could still occur in this area along a near-natural area. Some new recreation opportunities (such as drift boating, rafting, kayaking, and jet boating) that require, or are more favorable under, natural or near-natural river conditions would expand. ⁴⁰⁷ However, weak stock restrictions would further limit recreation. Developed recreation would be further restricted to protect listed species of fish and wildlife. Recreation activities would change in some areas from those under Status Quo, and overall other recreation would be worse than Status Quo.
Sustainable Use Focus	Management actions to maintain fish and wildlife populations for harvest would incorporate the need to accommodate other types of recreation. Other recreation would benefit from land acquisitions and management for habitat. Changes in fish and wildlife management could change the types of recreational activities available; however, the amount of recreation should not be affected. Overall, effects from this Policy Direction would be about the same as those under Status Quo.
Strong Stock Focus	There would be somewhat more opportunities for reservoir and river recreation as flow and spill regimes no longer fluctuate erratically for weak-stock management. Developed recreation could increase as long as healthy populations of fish and wildlife are not adversely affected. Other recreation opportunities would increase compared to Status Quo.
Commerce Focus	Fewer restrictions on development would allow for increased developed recreation. Land use may shift if its value for recreation purposes is higher. More water-based recreation would be developed as reservoirs are stabilized and navigation increases. The ecotourism industry would expand resulting in increased demand for other recreation. Some types of recreation would be limited by increased development and crowding. However, in general other recreation would be better than compared to Status Quo.

EFFECT AREA: ECONOMIC DEVELOPMENT: Industrial, Residential, and Commercial Development fewer impacts = better	
Existing Conditions	Impacts to economic development from policies implemented for fish and wildlife activities are concerns for developers. Between 1990 and 2000, the Region experienced about a 21% growth in population. ⁴⁰⁸ This growth has fueled the development in the industrial, residential, and commercial sectors. The implementation of fish and wildlife policy in the Region has had major effects on three states—Idaho, Oregon, and Washington. These states have had similar experiences with divergent forces affecting urban and rural economies. Major urban areas have undergone significant growth in high-tech industries and corresponding

⁴⁰⁶ Corps 2002b, Sections 5.13.3.1 Existing Recreational Activities and Displaced Users, and 5.2 Geology and Soils.

⁴⁰⁷ Corps 2002b, Section 5.13.3.1 Existing Recreational Activities and Displaced Users; and Corps 2000, Section 7.16 Recreation Impacts.

⁴⁰⁸ Data taken from US Census Bureau, <http://www.census.gov> (last visited February, 2003).

EFFECT AREA: ECONOMIC DEVELOPMENT: Industrial, Residential, and Commercial Development fewer impacts = better	
	economic development, while rural areas continue to rely on traditional industries experiencing little economic growth. ⁴⁰⁹ Industrial, residential, and commercial development is largely market-driven, but the concern is how fish and wildlife activities affect local land use plans. For example, the ESA has restricted development in areas with listed species or designated critical habitat. Over the past decade, the uses of habitat conservation plans have become more common.
POLICY DIRECTION	
Status Quo	Industrial, residential, and commercial development is highly market-driven and because the region's population is expected to grow 19% between 2000 and 2015, ⁴¹⁰ it is likely there will be continued development Regionwide. However, this development will continue to be restricted based on environmental requirements, such as the ESA. The impacts from fish and wildlife activities tend to be felt more by more local and rural communities, which often rely on natural resource-based economies. It is expected that future recovery efforts will continue to affect them disproportionately. ⁴¹¹
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The development of any industrial, residential, or commercial facilities would be limited in areas exposed by breaching the six dams. There would also be little new development in sensitive areas, such as riparian lands. Development in critical habitat would continue to be prohibited. These effects would be localized, mainly in rural areas. Water supply and power costs to industrial, commercial, and residential customers would increase from lost hydropower (see Power and Ratepayers sections for more details). For example, the economic effects of drawdown and breaching would be most concentrated in the area(s) adjacent to and immediately upriver from the dam(s), primarily agricultural and natural-resource-oriented areas. There would be increased costs for municipal water uses and some industrial water uses. Breaching of the dams would allow large sediment loads to be deposited downstream where they could present problems with existing water withdrawal intakes, including those used for drinking water supply. In general, costs to make the changes have been projected in the range of several hundred million dollars. There would be short-term construction increases connected with the drawdown and other implementing actions for fish and wildlife, such as building replacement power plants. There would also be increased development as the transportation (roads and railroads) infrastructure shifts away from navigation. However, this would likely be offset by the loss of already developed ports. It is also likely that in the short term there would be a decrease in residential development near areas affected by breaching, but in the long term this development may increase, especially along the boundaries of restricted natural areas. Overall, conditions for industrial, residential and commercial development would be much worse than those under Status Quo.
Weak Stock Focus	The effects from dam breaching would be similar to those for Natural Focus, but to a lesser degree. Any industrial, residential, or commercial development adversely affecting listed species would be limited. In addition to land use restrictions, increased costs (e.g., water supply and power) could limit development. For

⁴⁰⁹ Corps 2000, Section 10.4.3 Study Area Overview.

⁴¹⁰ Data taken from US Census Bureau, <http://www.census.gov> (last visited February, 2003).

⁴¹¹ Corps 2000, Section 10.4.3 Study Area Overview.

EFFECT AREA: ECONOMIC DEVELOPMENT: Industrial, Residential, and Commercial Development fewer impacts = better	
	example, breaching the four lower Snake River dams could increase costs for municipal and industrial water supplies by about \$100 million ⁴¹² and could increase rates. ⁴¹³ Overall, there would be more impacts to industrial, residential, and commercial development than under Status Quo.
Sustainable Use Focus	This Policy Direction allows for industrial, residential, and commercial development compatible with fish and wildlife and their habitats. There might be limits on development where it would interfere with rebuilding fish and wildlife populations to sustainable harvest levels. Overall, impacts to development are expected to be about the same as under Status Quo.
Strong Stock Focus	Industrial, residential, and commercial development would increase, mostly as development restrictions for weak stocks were removed and economically costly weak-stock recovery efforts were abandoned. Development would be monitored to ensure that healthy stocks would not be seriously affected. Overall, there would be fewer impacts to industrial, residential, and commercial development compared to Status Quo.
Commerce Focus	Growth would increase as development restrictions for weak stocks were removed and economically costly weak-stock recovery efforts were abandoned. Fewer restrictions on river operations would allow for more hydropower production and less restricted navigation that could potentially stimulate industrial and commercial development. Growth would continue to be limited by land availability, demand, and land use restrictions. Overall, conditions would be better than under Status Quo.

EFFECT AREA: ECONOMIC DEVELOPMENT: Employment more employment = better	
Existing Conditions	Impacts to employment from fish and wildlife mitigation and recovery activities are a Regionwide concern. Total employment in the four-state Region was recently about 5.5 million persons. Services, trade, and government activities accounted for most regional employment and the shares of employment in these sectors have been growing for the last few decades. ⁴¹⁴ Generally, the economy of the Basin is evolving away from its dependence on agriculture, range, and timber, toward information-based technologies and services. In 1996, the employment mix in the Region included about 3% farming, 2% forestry/fishing/farm services, 18% construction/manufacturing, and 5% transportation/utilities. In 1997, agriculture, forestry, fisheries, lumber, paper, mining, and electric and gas utilities accounted for less than 10% of employment. ⁴¹⁵ Employment in Washington, Oregon, and Idaho increased in all sectors from 1969 to 1998 but the percent relative to the total regional employment declined for farming (from 6% to 3%), manufacturing (from 19% to 12%), and transportation (from 5% to 4%), while it increased from 1% to 2% for agriculture (other than farming), forestry, and fishing. The construction share increased from 5% to 6%. ⁴¹⁶

⁴¹² Corps 2002b, Section 5.11.2.4 Alternative 4—Dam Breaching.

⁴¹³ Corps 2002b, Section 5.10.3 Financial Impacts to Ratepayers under Alternative 4—Dam Breaching.

⁴¹⁴ Council 2000a, Section 3.2.4.1 Current Regional Economic Conditions; and USDA/USFS and USDO/BLM 1997, p. 1734.

⁴¹⁵ Extracted from Council 2000a, Appendix A, Table A-1.

⁴¹⁶ Corps 2002b, Section 4.14.1.1 Employment.

EFFECT AREA: ECONOMIC DEVELOPMENT: Employment more employment = better	
POLICY DIRECTION	
Status Quo	The appeal of the Pacific Northwest includes inexpensive, reliable power; a managed, multipurpose Columbia River; and reasonably good environmental quality. This appeal is expected to continue. The population in the Region is projected to grow about 19% between 2000 and 2015. Despite periodic downturns, employment is projected to increase significantly over the period, especially in manufacturing and services. Some of these increases are attributable to fish and wildlife mitigation and recovery actions. Resource-based industries such as farming, durable goods manufacturing (timber and plywood), and nondurable goods will likely continue to decline as a share of total employment. ⁴¹⁷ However, agriculture and timber production will remain important parts of the region's economic base in small communities. ⁴¹⁸
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Land retirement and productivity reduction, as a result of habitat protection efforts, could cause jobs to be lost. However, most employment effects under this Alternative would be associated with breaching dams. Dam breaching would create many temporary construction jobs. For example, breaching the John Day Dam and four lower Snake River dams would be expected to increase temporary construction jobs by about 8,000 to 10,000 jobs. At the end of the deconstruction period, however, there would be a negative result in local effects as employment and other activities were withdrawn. ⁴¹⁹ In the long term, substantial job losses would result from increased power costs, transportation costs (due to loss of barging), and water supply costs; and loss of various recreational opportunities. In the very long-term (10 to 100 years), a restored river system and fish runs could provide some compensating employment benefits. Long-term, about 3,000 permanent jobs would be created in anadromous fisheries, power plant operation, and railroad transportation needed to offset lost barging capabilities. However, overall it is estimated that more than 10,000 permanent jobs would be lost from agriculture, barging transportation, and other related jobs. ⁴²⁰ Overall, employment is much worse than compared to conditions under Status Quo.
Weak Stock Focus	The employment effects would be the similar to those under Natural Focus; however, the effects would be smaller because fewer dams are breached and habitat is actively improved. For example, short-term employment gains in the lower Snake River study area would be temporary; however, in the long term, there would be a net loss of several thousand jobs. Regionwide, job losses would occur from increased transportation and utility costs and from the loss of river navigation. Also, rural communities would lose jobs as farms go out of business due to rising irrigation and transportation costs. These losses would only be partially offset by gains in transportation- and power generation-related employment. ⁴²¹ However, employment may increase in these same areas from increased recreation and tourism

⁴¹⁷ Corps 2002b, Section 5.14.1 Regional Demographics and Employment.

⁴¹⁸ Marcin, T.C. 1993.

⁴¹⁹ Corps 2000, Section 10.4.6.2 Social Effects by Area of Impact; Corps 2002b, Section 5.11.2.4 Alternative 4—Dam Breaching.

⁴²⁰ The numbers are extracted from the referenced report to best match this EIS's definition of the Natural Focus Policy Direction. Corps 2000, Table 92.

⁴²¹ Corps 2002b, Section 5.14.1 Regional Demographics and Employment, *Total Regional Impacts*.

EFFECT AREA: ECONOMIC DEVELOPMENT: Employment more employment = better	
	(including some from increased fish runs). Employment directly related to fish and wildlife mitigation and recovery actions would continue. Overall, there would be less employment than Status Quo.
Sustainable Use Focus	Land management under a multiple-use approach would likely cause a slight increase in employment associated with agricultural and forest products industries. Active habitat enhancement actions would continue to create jobs through the use of construction and related services. Employment opportunities could also increase because of increased hatchery production and harvest opportunities. There would also be increases in fish harvest and associated employment. Overall, employment would be slightly better than Status Quo.
Strong Stock Focus	There would be an increase in employment associated with increased commercial, residential, and industrial development. Lifting weak stock restrictions would allow increased economic opportunities. Jobs associated with fish harvest would also increase. Decreases in hydro operation restrictions also result in increased barging and irrigation, increasing employment opportunities in those and related economic sectors. Overall, employment is better than compared to conditions under Status Quo.
Commerce Focus	Priority is given to enhancing the economic value associated with the Columbia/Snake River System resulting in increased employment opportunities Regionwide. Decreases in restrictions associated with land use and hydrosystem operation would help stimulate growth in employment. Other areas of industry would also increase including agriculture, forest products, transportation, residential and commercial development, and recreation. There would also be increases in harvest-, hatchery- and fish farm-related employment. Overall, employment is much better than compared to Status Quo.

5.3.3.2 Funding Costs

The Pacific Northwest is home to the worlds largest, most expensive fish and wildlife mitigation and recovery program. Since the passage of the Regional Act and its express provisions requiring BPA to mitigate fish and wildlife, BPA has incurred costs over \$6 billion. Other funding sources, such as Federal taxpayers, states, tribes, and private/commercial interests, have also contributed extensive resources to this program. There has been growing concern in the Region over the amount of money that is spent and the way in which it is used. As a result of this concern, the Region is seeking a long-term plan that would include predictability and stability in funding and accountability for results.

The implications of changes in funding costs affect both BPA ratepayers as well as other funding sources; therefore the analysis of the environmental consequences for funding costs is two-fold. BPA's ability to fund fish and wildlife mitigation and recovery is limited by its maximum sustainable revenue (MSR; see Section 2.3.2.3). The ability of other funding sources to fund fish and wildlife mitigation and recovery is also limited. For example, other Federal agencies are constrained by their annual budgets and appropriations from Congress, while state funding is limited by revenues generated from the sale of licenses and state taxes. Similarly, the tribes' ability to fund would also be limited by the sale of licenses and revenue generated from other sources. Further,

Federal, state, and tribal sources, as well as private/commercial funding sources, can be affected by changes in the overall economy. As the Region continues to pursue mitigation and recovery for fish and wildlife, it is possible that BPA's contribution will be limited by its MSR. Other funding sources may need to contribute additional funding in order to meet the Region's fish and wildlife goals.

Table 5.3-6A shows how the funding costs would be affected by the Policy Directions. Effects are shown, by shading, to indicate whether under any given Policy Direction there would be an increase or decrease (as compared to Status Quo) in the ability to fund a fish and wildlife program. This ability is affected by revenues (or other sources of monies) and funding costs. An increase in the ability to fund is characterized as "better" in the table.

Table 5.3-6A: Funding Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Ratepayers						
Other Funding Sources						



Summary of Effects: The Natural Focus Policy Direction would have large effect on funding for both ratepayers and other funding sources. As a result of dam breaching, funding costs to ratepayers and other funding sources would be much higher, and their ability to fund would be much worse than under Status Quo.

Under the Weak Stock Focus effects on funding would be similar to Natural Focus. Although there would be fewer dams breached, required weak stock actions would result in the need for additional funding. Funding costs to ratepayers and other funding sources would be much higher, and their ability to fund would be much worse than under Status Quo.

Sustainable Use Focus would have costs similar to those under Status Quo, for both ratepayers and other funding sources. However, other funding sources could generate higher revenues through increases in the sale of licenses, tags, and user fees. The ability for both ratepayers and other funding sources to fund these costs would be about same as Status Quo.

Strong Stocks Focus would result in less funding costs as weak stock restrictions are lifted. Moreover, the ability of both ratepayers and other funding sources to fund fish and wildlife actions would be better than under Status Quo.

Commerce Focus would have lower funding costs for ratepayers and Federal taxpayers. Other sources might contribute more funding through the allocation of a portion of revenues from river uses and from user fees, however their ability to fund these actions would be better than under Status Quo.

The reasoning for these effects is described in greater detail in Table 5.3-6B.

Table 5.3-6B: Funding Effects Across the Policy Directions Analysis

EFFECT AREA: FUNDING COSTS: Ratepayers increased ability to fund = better	
Existing Conditions	Increased costs for fish and wildlife including foregone revenue constitute the main concerns for ratepayers with regard to fish and wildlife funding. The trend for fish and wildlife expenditures from 1996 through 2000 has been toward increased expenditures, with no plan for guiding fish and wildlife mitigation and recovery costs. Under the Memorandum of Agreement, BPA's Fish and Wildlife Program expenses (including direct program costs, reimbursables, and expenses associated with capital investments) were kept relatively stable. However, other fish and wildlife costs (related hydro operations) have resulted in overall expenses steadily increasing. This has resulted in BPA's total fish and wildlife costs ranging from approximately \$260 million in 1996 to \$560 million in 2000. ⁴²² These expenditures have led to a total cost of nearly \$2 billion during this 4-year period.
POLICY DIRECTION	
Status Quo	As a result of high market prices and increased customer demand, BPA was required to purchase power on the market at substantially higher and uncertain prices. ⁴²³ From 2000 to 2001, power purchases went from about \$60 million to over \$1.3 billion. ⁴²⁴ This extreme escalation in power replacement costs of well over one billion dollars was a demonstration of the influence of market prices. BPA needed to ensure that rates and revenues would be sufficient to recover its costs with a high degree of certainty. To address this problem, BPA was forced to raise its rates and incorporated several cost recovery adjustment clauses (CRACs) in its rates proposal. Drastic changes, such as those in 2001, are not expected frequently, however, BPA still needs to develop a long-term plan to stabilize fish and wildlife expenditures. Absent a plan to control costs, costs to BPA's ratepayers are anticipated to continue an escalating trend. In 2001, BPA's ratepayers funded more than \$220 million for its direct program, reimbursables, and fixed expenses. BPA's <i>entire</i> Fish and Wildlife Program expenditures in 2001, including power replacement costs and foregone revenues, were more than \$1.7 billion.
Effect in Comparison to the Status Quo Condition:	
Natural Focus	The removal and modification of dams under this Policy Direction would reduce the available hydropower generation, and power purchase costs would increase. For

⁴²² See Chapter 2 of this EIS.

⁴²³ See Chapter 2 of this EIS.

⁴²⁴ See Chapter 2 of this EIS. Note that the \$1.7 billion was during drought conditions and great market price fluctuation. Even in light of the unusual drought conditions, fish and wildlife costs were expected to increase overall on an annual basis.

EFFECT AREA: FUNDING COSTS: Ratepayers increased ability to fund = better	
	<p>example, breaching the John Day Dam and four lower Snake River dams would decrease generating capacity by about 2,000 aMW.⁴²⁵ The cost of replacement power for lost hydropower alone would be in the hundreds of millions of dollars on an annual average net basis. Power rates (ratepayer costs) would go up to cover these changes.⁴²⁶ It is unclear whether ratepayers or taxpayers would bear the costs of the debt service on the breached dams and the cost of breaching. However once breached, ratepayers would no longer be required to mitigate for impacts to fish and wildlife from those dams. The necessary transmission reliability and ancillary services due to the dam breaching would add additional costs in the tens of millions of dollars annually. These increased costs for transmission system infrastructure investments would result in higher transmission rates. In addition, ratepayers would continue to pay for some limited land acquisition to protect high quality habitat. However, investments in habitat would be less than that under Status Quo. There would be a reduction in funding costs from the elimination of hatcheries under this Policy Direction. The amount of the overall costs borne by ratepayers would be limited by BPA's MSR.⁴²⁷ This Policy Direction could result in much higher costs for ratepayers and the ability to fund would be much worse than under Status Quo.</p>
Weak Stock Focus	<p>The effects of dam breaching on power and transmission would be similar to those under Natural Focus; however, the degree of impact would be less. For example, the breaching of four lower Snake River dams would reduce generation by about 800-1,000 aMW.⁴²⁸ Possible wholesale rate increases to power customers could range from 0.67 to 5.86 mills/kWh.⁴²⁹ It is unclear whether ratepayers or taxpayers would bear the costs of the debt service on the breached dams and the cost of breaching. However once breached, ratepayers would no longer be required to mitigate for impacts to fish and wildlife from those dams. The amount of additional lost hydropower from additional constraints for listed stocks would depend on the severity of the restrictions. The ratepayers would likely pay a large part of the increased costs for the direct actions (e.g., active habitat protection and enhancement, hatchery reformation and operation, and hydro modifications) taken to recover <i>all</i> listed species: these costs could be additional millions of dollars.⁴³⁰ The costs to ratepayers would be limited by BPA's MSR. This alternative would result in much higher costs for ratepayers and the ability to fund would be much worse than would occur under Status Quo.</p>
Sustainable Use Focus	<p>Ratepayers would continue to fund costs for enhancing and managing fish and wildlife habitat and reforming hatchery production. These costs would not escalate to the levels required to recover all listed species. Instead funding levels would be established to achieve sustainable populations for harvest. Some savings could be</p>

⁴²⁵ See Effect Area–Power above, Natural Focus.

⁴²⁶ It can be concluded from the Corps' Final Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement (Corps 2002b) that the breaching of the John Day and drawdown of McNary dams would substantially increase costs and the BPA rates since the power from the four lower Snake River dams together only amounts to what John Day dam produces. See the Weak Stock discussion for specifics on the lower Snake River dam breaching estimates.

⁴²⁷ See Chapter 2, Section 2.3.2.3 Current Policies—Conflicting Priorities, Managing the Money Resource, Challenges to Funding.

⁴²⁸ Corps 2002b, Section 5.10.1.2 Power System Models.

⁴²⁹ Corps 2002b, Section 5.10.3.1 Possible Power Rate Increases and Table 5.10-5: Possible Wholesale Rate Impacts Under Alternative 4 - Dam Breaching.

⁴³⁰ See Appendix J, Table A.

EFFECT AREA: FUNDING COSTS: Ratepayers increased ability to fund = better	
	realized by maximizing fish transport and modifying the hydrosystem to benefit fish and wildlife—approximately \$8.5 million. ⁴³¹ Overall, however, costs and the ability to fund would be similar to Status Quo.
Strong Stock Focus	Some funding would be necessary for fish and wildlife habitat and fish hatchery programs in order to maintain and support strong stocks. However, these funding levels would likely be less than that under Status Quo. Maximizing fish transport and hydrosystem modifications to benefit strong stocks could result in a savings of approximately \$8.5 million. ⁴³² Increased ability to generate power from the existing hydrosystem—as weak stock restrictions are removed—would likely result in fewer power market purchases and/or less construction of replacement power. Because funding to recover weak stocks is no longer required, the overall costs to ratepayers for fish and wildlife mitigation and recovery would be less and there would be an increased ability to fund compared Status Quo.
Commerce Focus	Increased ability to generate power from the existing hydrosystem—as weak stock restrictions are removed—would likely result in fewer power market purchases and/or less construction of replacement power. However, increased development could accelerate the need for more power generation and transmission. As the need to fund recovery costs is eliminated, ratepayers continue to fund mitigation for the effects of the hydro- and transmission systems on fish and wildlife. Hatchery costs could increase as fish production increases. Overall, costs to ratepayers would be less and there would be an increased ability to fund compared Status Quo.

EFFECT AREA: FUNDING COSTS: Other Funding Sources increased ability to fund = better	
Existing Conditions	Increased funding costs for fish and wildlife are a major concern for other funding sources. In addition to ratepayers, funding for fish and wildlife comes from Federal taxpayers, states, tribes, and private/commercial contributions. Their contributions include monies from Federal appropriations, state taxes, fishing/hunting/trapping licenses and tags revenues, and user fees, among other sources. Many of the costs for fish and wildlife are spread across numerous categories of funding sources and programs, making it very difficult to accurately capture the funding expenditures for fish and wildlife mitigation and recovery.
POLICY DIRECTION	
Status Quo	The amount and share of costs from other funding sources would likely increase. There has been an upward trend for salmon expenditures by Federal agencies. Another example of rising costs is the increased price of fishing and hunting licenses for the states of Oregon and Washington. ⁴³³ Non-consumptive users of fish and wildlife could have taxes imposed on outdoor products to finance mitigation not historically covered by hunting and fishing license dollars. An accurate accounting of all fish and wildlife expenditures remains difficult because of the fragmentation in funding and programs.

⁴³¹ Corps 2002b, Section 5.10.2.2 Alternative 2—Maximum Transport of Juvenile Salmon and Alternative 3—Major System Improvements; Corps 2000, Section 10.2 National Economic Development.

⁴³² Corps 2002b, Section 5.10.2.2 Alternative 2—Maximum Transport of Juvenile Salmon and Alternative 3—Major System Improvements; Corps 2000, Section 10.2 National Economic Development.

⁴³³ State of Oregon, Archives Division 2001; State of Washington 2002a.

EFFECT AREA: FUNDING COSTS: Other Funding Sources increased ability to fund = better	
Effect in Comparison to the Status Quo Condition:	
Natural Focus	The removal and modification of dams under this Policy Direction would reduce the revenues generated by the multiple uses of the hydrosystem. It is unclear whether ratepayers or taxpayers would bear the costs of the debt service on the breached dams and the cost of breaching. Federal taxpayers could be required to pay substantial costs for dam breaching, including appropriations to the Federal operating agencies. Federal land management agencies may be required to fund more habitat actions. In addition, regulatory costs (e.g., restricting human access, monitoring commercial harvest) might also be high. Some funding sources may lose revenue as restrictions in access and harvest affect license revenues and user fees. Further costs may be incurred if BPA's funding is limited by its MSR. However, the ability of other funding sources may be limited by economic conditions. The costs to other funding sources would be much higher and their ability to fund would be much worse than under Status Quo.
Weak Stock Focus	The impact of dam breaching on funding costs would be similar to that under Natural Focus; however, the effect would be less as fewer dams are breached. Federal taxpayers could be required to pay substantial costs for dam breaching, including appropriations to the Federal operating agencies. Other funding sources would likely pay a large part of the increased costs for the direct actions. For example, Federal land managers, states and tribes would likely pay for habitat and hatchery actions, while Federal operating agencies would fund hydro modifications at the remaining dams. Other actions could be taken in harvest, such as fleet buybacks. These costs could be additional millions of dollars. ⁴³⁴ Further costs may be incurred if BPA's funding is limited by its MSR. However, the ability of other funding sources may be limited by economic conditions. Revenues from licenses and fees would likely be similar to Status Quo. The costs to other funding sources would be much higher and the ability to fund would be much worse compared to Status Quo.
Sustainable Use Focus	The Region would face costs for fish and wildlife habitat and increasing hatchery production—costs which would be partially funded by other funding sources. These costs would not escalate to the levels required to recover all listed species; instead funding levels would be established to achieve sustainable populations for harvest. Other funding sources could generate more revenue from the sale of licenses, tags and user fees as fish and wildlife are enhanced and managed for harvest. The costs to other funding sources, and their ability to fund, would be about the same or slightly better than Status Quo.
Strong Stock Focus	With the change in focus away from recovering listed species, there would likely be a decreased financial burden on other Federal agencies, states, and tribes. Funding would still be required for the maintenance of strong fish and wildlife populations. Some funding would be used for fish and wildlife habitat and hatchery programs developed to maintain and support strong stocks. There would likely be less financial burden on other funding sources and their ability to fund would be better than under Status Quo.
Commerce Focus	No additional financial burden on Federal taxpayers would be likely, but state and private/commercial costs could increase and be spread among the various resource users. Their ability to fund fish and wildlife actions could be achieved by increased revenues from user fees and commercial development. Also, other fish and wildlife actions would be funded through incentive-based programs. Overall, there would

⁴³⁴ See Appendix J, Table A.

EFFECT AREA: FUNDING COSTS: Other Funding Sources increased ability to fund = better	
	likely be less financial burden on other funding sources and their ability to fund would be better than under Status Quo.

5.3.3.3 Tribal Interests

Native American Indians have unique concerns that transcend their roles in the non-tribal economy. The inherent values of the land, water, plants, and fish and wildlife are vital to the spirituality, tradition, and health of the Northwest tribes. Stewardship of the earth's natural resources and the use of these resources for subsistence and ceremonial uses are important parts of tribal culture. The Columbia River Inter-Tribal Fish Commission notes that the "tribal vision" is one of a healthy Columbia River Basin where plants, fish and wildlife are healthy and self-sustaining.⁴³⁵

Table 5.3-7A shows how the Policy Directions could affect tribal culture. The effects of these Policy Directions on tribal harvest, health, spirituality, and tradition are in addition to those economic and social impacts that tribal members experience in common with others in the Pacific Northwest. Tribal health is associated with consumption of traditional foods, and with additional fishing income that enables a healthier life style and better health care. Spirituality is associated with a connection to the earth and with the ability to observe and practice religious and cultural traditions. Traditions include the ability to use traditional resources and places at traditional times in traditional ways (i.e., tribal land use).

Potential changes are shown, by shading, to indicate whether a given Policy Direction would tend to have effects in the identified subcategory that are the same as, better than, or worse than Status Quo. More harvest and more health, spirituality and tradition are characterized as "better" in the table.

Table 5.3-7A: Effects on Tribal Interests Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Fish Harvest						
Health						
Spirituality						

⁴³⁵ CRITFC 1999.

		Focus of Alternative Policy Directions				
Effect Subcategory	Status Quo	Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Tradition						

Much Better	Better	Same	Worse	Much Worse

Summary of Effects: Under the Natural Focus alternative, tribal harvest opportunities would be much worse, compared to Status Quo, because hatcheries would be eliminated, access restricted, and harvest would be limited until populations become stable. Tribal health and tradition would be worse due to the decrease in harvest. Health could further be reduced by potential increased toxicity of fish and loss of economic opportunities. However, spirituality could be improved based on the return of a more natural river and naturally-spawning salmon.

Under Weak Stock, tribal harvest would be worse than under Status Quo because harvest would be reduced and hatcheries would be reformed to assist weak stock. However, health would be about the same as Status Quo as employment opportunities offset a reduction in fish harvest. Spirituality and tradition would be better because of access to previously inundated ancestral lands and increased traditional fishing opportunities.

Sustainable Use Focus would provide increased harvest opportunities as populations of naturally-spawning and hatchery-produced anadromous and resident fish increase. The establishment of sustainable resident fish populations would allow for increased harvest in blocked areas. Tribal health, spirituality, and tradition would be better because of increasing fish and wildlife populations as habitat is enhanced.

Under the Strong Stock Policy Direction, tribal harvest would be better compared to Status Quo, largely because of hatchery supplementation of strong stocks. Tribal health would also be better because of the increased harvest of fish and wildlife. However, spirituality and tradition would be worse than Status Quo, as some species important to particular tribes are lost and some areas of spiritual value are developed.

Under Commerce Focus, tribal fish harvest would likely be better than Status Quo, as hatchery and fish farm production increases. However, tribal health is likely to be worse because of the increased potential from higher rates of fish toxicity from pollution in an increasingly developed river. Tribal spirituality and tradition would be much worse as commercial development increases, and traditional fishing sites and areas of spiritual importance are adversely affected.

The reasoning for these effects is described in greater detail in Table 5.3-7B.

Table 5.3-7B: Tribal Effects Across the Policy Directions Analysis

EFFECT AREA: TRIBAL INTERESTS: Fish Harvest more tribal harvest = better	
Existing Conditions	A major concern for tribal harvest, as it relates to fish and wildlife management, is the availability of sufficient numbers of fish for harvest. Anadromous fish (such as salmon, steelhead, and lamprey) and resident fish (such as white sturgeon, bull trout, and cutthroat trout) are of great cultural significance to Native American Indian peoples. Salmon are a major food source and trading commodity for most Columbia Basin tribes. The cultural significance of the salmon is honored in tribal cultures just as much today as in the past. Native American Indians revere salmon (steelhead included) as one of many divinely provided traditional foods, and as a designated "lead fish" essential on the tables at community dinners. A large catch of fish (enough to consume, sell, and give away) brings social esteem to both the fisherman and the skilled salmon handlers who prepare and serve the catch. ⁴³⁶ The tribal harvest has been substantially reduced from historic levels, especially for anadromous fish. ⁴³⁷ The ability of the Federal government to meet trust responsibilities as it pertains to fish harvest has been limited because of the diminished resident and anadromous fish populations. ⁴³⁸ Most of the upriver anadromous fishing opportunities have been lost.
POLICY DIRECTION	
Status Quo	The tribal harvest has continued to fall below the levels desired by the tribes. Although many fish habitat projects have been planned and implemented, harvest opportunities are expected to be restricted for many more years. In 1999, the Columbia River Basin hatcheries produced more than 140 million anadromous fish to help supplement the fisheries. ⁴³⁹ Recently, some upriver harvest opportunities have been developed: for instance, upriver bright fall chinook are being reared in hatchery facilities for release in the Hanford Reach of the mid-Columbia River to enhance the upriver fishery. About 12 million smolts are released annually—a number about four times greater than the projected natural smolt yield. ⁴⁴⁰ However, expectations are that the declining trends in some of the fish populations will continue, further limiting harvest. ⁴⁴¹
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Initially, tribal fish harvest would be restricted allowing only ceremonial and subsistence fishing. As wild anadromous fish populations increase, more harvest could occur, but it would be limited to surpluses above naturally stable populations. In the long-term, dam breaching could restore some fish runs. For example, based on breaching the four lower Snake River dams, the Tribal Circumstances report ⁴⁴² indicated that wild stocks of spring/summer and fall chinook salmon and steelhead would likely be stabilized, and in the long run lead to increases in the populations to near recovery levels: this could mean almost 2.5 times more tribal harvest opportunities of Snake River wild and hatchery fish. In addition, drawdown of the

⁴³⁶ Corps 2002b, Appendix N, Section 1.2.4.4.

⁴³⁷ Corps 2002b, Section 4.1.2 Human Environment.

⁴³⁸ USDOE/BPA, Corps, and Bureau 1995, Section 4.3.

⁴³⁹ NMFS 1999c.

⁴⁴⁰ Corps 2000, Section 4.18.4 Hatchery Production.

⁴⁴¹ Corps 2002b, Section 5.8.1.2 The Alternatives and Their Effects.

⁴⁴² Corps 2002b, Section 4.8 Native American Indians.

EFFECT AREA: TRIBAL INTERESTS: Fish Harvest more tribal harvest = better	
	John Day Dam to natural river level could possibly result in an estimated 8- to 10-fold increase in fall chinook salmon spawning capacity below McNary Dam. However, eliminating the hatchery programs would likely cause a decrease in numbers of harvestable fall chinook in the John Day reach. ⁴⁴³ Hatchery fish account for about 80%, 50%, and 90% of projected total tribal harvest of fall chinook, spring/summer chinook, and steelhead, respectively. ⁴⁴⁴ Harvestable numbers of resident fish would be reduced in areas behind the breached dams, although some native species could fare reasonably well. Although lost habitat could cause some resident fish (e.g., sturgeon) to decline, other resident species would increase—allowing harvest. ⁴⁴⁵ Treaty fishing sites would need to be relocated and modified if a drawdown is implemented. ⁴⁴⁶ Overall, the tribal fish harvest under this Policy Direction would likely be much worse than under Status Quo.
Weak Stock Focus	The effects from dam breaching would be similar to those under Natural Focus, but to a lesser extent. The active habitat restoration for listed species would increase the population levels of naturally-spawned anadromous fish; modifying the hatcheries would also increase the overall production of weak stocks. Closing hatcheries for all but conservation purposes—using hatcheries only for preserving genomes, not for supplementation or production for harvest—could severely reduce the number of fish available for harvest. The tribes would likely adopt more selective harvest methods to avoid weak stocks. Tribal harvest would be reduced to assist the recovery of weak stocks. Overall, the long-term effects of this Policy Direction on tribal fish harvest would be worse than those under Status Quo.
Sustainable Use Focus	Tribal fish harvest would improve as the naturally-spawning and hatchery-produced fish populations increased. Habitat management, changes in hydro operations, and the increase in hatchery production would increase the overall number of harvestable resident and anadromous fish. The creation of a sustainable resident fishery would likely increase upriver fish harvest. The tribal fish harvest would be better than under Status Quo.
Strong Stock Focus	Tribal fishing would increase, as the healthy stocks are maintained and hatcheries are operated to support them. As weak stock restrictions are lifted, harvest of these stocks could increase initially. However, this source of harvest would be temporary because of the limited viability of these stocks. An increase in hatchery-produced strong stocks would likely compensate for the loss of weak stocks and would be used to maintain or increase tribal harvest. Overall, tribal fish harvest would be better compared to that under Status Quo.
Commerce Focus	There may be some loss of anadromous fish production in upstream areas as weak stock programs are discontinued. Increased tribal fish harvest would be created through the artificial production and fish farming of desirable fish. More emphasis would be placed on establishing hatchery-supported resident fisheries in upriver areas. Overall, tribal fish harvest would be better than that under Status Quo.

⁴⁴³ Corps 2000, Section 7.17.5 Potential Change in Harvest Benefits from Restored Natural Production Below McNary Dam.

⁴⁴⁴ Corps 2002b, Sections 5.8.1.1 Projected Harvest Numbers, Hatchery Fish Assumptions, and 5.8.1.2 The Alternatives and Their Effects.

⁴⁴⁵ Corps 2002b, Section 5.8.1.2 The Alternatives and Their Effects; Corps 2000, Section 7.17.7 Potential Impacts on Resident Fish and Habitat.

⁴⁴⁶ Corps 2000, Section 7.20 Tribal Impacts.

EFFECT AREA: TRIBAL INTERESTS: Health, Spirituality, and Tradition more = better	
Existing Conditions	<p>A major concern for tribes is the effect of fish and wildlife management activities on their health, spirituality, and tradition. Native American Indians believe that there is a close physical and spiritual interrelationship between humans and nature. They view human existence as an integral part of the natural and spiritual worlds. "For the tribes there has been a common understanding—that their very existence depends upon their respectful enjoyment of the Basin's rich and vast land and water resources."⁴⁴⁷ The river itself, the salmon, oral traditions, useful plants, cultural sites, and the resting places of ancestors are interconnected in the tribal worldview.⁴⁴⁸ Numerous fish, wildlife, and plants (e.g., salmonids, lamprey, sturgeon, whitefish, sculpin, deer, eagles, bear, cou, Indian carrots, chokecherries, and tules) retain cultural significance to Native American Indian tribes.⁴⁴⁹ In fact, "salmon are a part of [their] spiritual and cultural identity."⁴⁵⁰ As a primary food source for thousands of years, salmon continue to be an essential component of the tribes' nutritional health. In addition, salmon are vital to traditional practices. "The annual return of salmon allows for the transfer of traditional values from generation to generation."⁴⁵¹ Health, spirituality, and tradition have been impaired by the loss of subsistence and ceremonial fish harvest, wildlife, and access to traditional lands. For example, the fisheries on and adjoining the lower Snake River system have been significantly altered over the past 150 years in terms of access to usual and accustomed places and habitat quality. Tribes that desired to take fish such as Pacific lamprey (largely a ceremonial and subsistence activity) have had their fishermen displaced from local fishing stations.⁴⁵²</p>
POLICY DIRECTION	
Status Quo	<p>The Native American Indian community is concerned with the continued degradation of the air, land, and water, and the effects of this degradation on the places they hold sacred. This deterioration of the natural world also includes the decline and loss of some species of plants, fish, and wildlife that have sustained them. Recently, there has been increased concern about heavy metal bioaccumulation in salmon and its disproportionate affect on tribal health (as their consumption of salmon is higher than salmon consumption in the general population). Tribal governments have increasingly sought legal avenues to have their tribal rights honored. As part of agreements made when the tribes ceded lands to the U.S. Government, tribes typically retained rights to hunt, fish and gather. Efforts have been made recently to assess the impact of Federal agency activities on tribes and to ensure that tribal interests and rights are adequately considered before Federal actions are undertaken.⁴⁵³ Ensuring tribal health, spirituality, and tradition is likely to become more challenging with the increasing pressure on natural resources from population growth and urbanization.</p>

⁴⁴⁷ CRITFC 1999, p.2.

⁴⁴⁸ Corps 2000, Section 4.20.1 Tribal Cultural Resources Perspectives.

⁴⁴⁹ Corps 2002b, Section 4.8 Native American Indians.

⁴⁵⁰ CRITFC 1996, Executive Summary.

⁴⁵¹ CRITFC 1996, Executive Summary.

⁴⁵² Corps 2002b, Appendix Q.

⁴⁵³ Corps 2002b, Appendix Q.

EFFECT AREA: TRIBAL INTERESTS: Health, Spirituality, and Tradition more = better	
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The breaching of six dams in the Columbia River and its tributaries would in the long term return the previously inundated lands to a more natural appearance. However, tribal access would continue to be limited. The removal of the six dams would disturb heavy metal-laden sediment that could bioaccumulate in salmon and further reduce tribal health. The elimination of hatcheries and a decrease in overall harvest could allow naturally spawning anadromous fish to increase, which could enhance spirituality, but reduce tribal health and tradition. Over the long-term, passive restoration efforts would likely increase the abundance of some wildlife and naturally spawning fish. Overall, tribal health and tradition would be worse, while spirituality would be better than under Status Quo.
Weak Stock Focus	The effects would be similar to those of Natural Focus, although dam breaching would be limited to the lower Snake River dams, and habitat for listed fish and wildlife species would be actively restored. For example, approximately 14,000 acres of inundated land would be exposed by the dam breaching in the lower Snake River reach, ⁴⁵⁴ and rehabilitated. The newly exposed lands would be accessible to the tribes for spiritual and traditional use. Some tribes believe that dam breaching would allow tribal communities to renew their close religious/spiritual connection with the ancestral lands. ⁴⁵⁵ Breaching the four lower Snake River dams and active habitat restoration would increase listed species including salmon, creating a positive effect on the tribes' ceremonial harvest. ⁴⁵⁶ Further habitat enhancements would result in increases in important native plant and wildlife species. Tribal health would be reduced due to lower fish harvests, but could be slightly improved as weak stock actions result in improved tribal employment opportunities. Overall, tribal health would be about the same as Status Quo while spirituality and tradition would be better than Status Quo.
Sustainable Use Focus	The health, spirituality, and tradition of some tribes, especially downriver, would improve from increased fish and wildlife harvest opportunities created by enhancing and managing habitat. As the upriver focus further shifts to resident fish, harvest opportunities would increase and benefits to health would follow. Important wildlife populations would also increase as habitat was enhanced. These increases in fish and wildlife could help enhance spirituality. Improved hydro operations for fish and wildlife, increased hatchery production, and decreases in commercial activity where it would affect fish and wildlife production would likely further increase harvest opportunities, improving tribal health. Tribal health could be further improved as fish and wildlife management actions and harvest result in improved tribal employment opportunities. Overall, tribal health, spirituality, and tradition would be better than under Status Quo.
Strong Stock Focus	There would be an increase in strong fish and wildlife populations—especially resident and hatchery-produced fish—allowing increases in harvest that would improve tribal health. However, further loss of weak populations of native fish and wildlife could be damaging to tribal traditions and spirituality. This damage to tradition and spirituality would result from the loss of species important to individual tribes. Spirituality and tradition could further be affected by increased development

⁴⁵⁴ See Weak Stocks explanation under Land Habitat above.

⁴⁵⁵ Corps 2002b, Section 4.8 Native American Indians.

⁴⁵⁶ See Weak Stocks explanation under the anadromous fish discussion for the Fish and Wildlife section above.

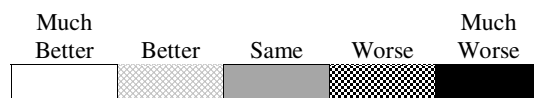
EFFECT AREA: TRIBAL INTERESTS: Health, Spirituality, and Tradition more = better	
	in areas of cultural importance. Overall, tribal health would be better, while spirituality and tradition would likely be worse than under Status Quo.
Commerce Focus	Tribal tradition and spirituality would be adversely affected by loss of traditional fishing practices and locations, changes in fishing techniques, and more competition from an increase in the non-Indian use of natural resources. The likely increase in development would also negatively affect tribal traditions and spirituality. These same increases in commercial activity, as well as the creation of tribal hatcheries and fish farms, could increase employment opportunities for tribal members. Increases in fish production would result in better health for tribal members, although this might be offset by other factors, such as heavy metal accumulation in the fish from increases in pollution. The more commercial the river, the more opportunities there would be for impacts on tribal spirituality and tradition. Overall, tribal health would be about the same as under Status Quo; spirituality and tradition would be much worse than under Status Quo.

5.3.3.4 Cultural and Historic Resources

Table 5.3-8A shows how the Policy Directions might affect cultural and historic resources. Historic resources are broadly defined to include "any prehistoric or historic district, site, building, structure, or object included in or eligible for the National Register of Historic Places."⁴⁵⁷ Cultural resources include properties of religious and cultural importance to Native American Indian tribes. Changes are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same as, better than, or worse than Status Quo. Changes that result in the loss of cultural and historic resources are characterized as "worse" in the table; changes that preserve cultural and historic resources are "better."

Table 5.3-8A: Cultural and Historic Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Cultural and Historic Resources						



Summary of Effects: The most important sources of effects are exposure of inundated sites and destruction of historic structures. Both Natural Focus and Weak Stock Focus Policy Directions would result in the exposure and possible destruction of many inundated sites as a result of dam breaching. Also, the resulting loss of power would require more generation and transmission construction, potentially disturbing other sites. The effects of these two Policy Directions would be much worse than the effects under

⁴⁵⁷ National Historic Preservation Act. Section 106 Regulations, 36 CFR Sec. 800.16 Definitions.

Status Quo. Under Sustainable Use and Strong Stock, reservoir levels would be more stable, though development would increase, resulting in similar impacts to cultural and historic resources as Status Quo. Although there would be more stable reservoir levels and less exposure to inundated sites, the increased development under Commerce Focus would cause greater impacts to cultural and historic resources than Status Quo.

The reasoning for these effects is described in greater detail in Table 5.3-8B.

Table 5.3-8B: Cultural and Historic Effects Across the Policy Directions Analysis

EFFECT AREA: CULTURAL AND HISTORIC RESOURCES fewer impacts = better	
Existing Conditions	Impacts to cultural and historic resources are a concern related to actions taken for fish and wildlife. Many cultural and historic sites carry special significance and are protected by law. Sites that are potentially eligible for the National Register of Historic Places, but which have not been evaluated as to eligibility, are required to be protected under the National Historic Preservation Act. There are many cultural and historic resources within the Pacific Northwest. However, many states lack accurate information about site locations, elevations, characteristics, densities, and depths of deposit; the location of many resources are unrecorded. There is evidence that both archaeological and historic sites are more numerous, generally larger, and more complex, along the former riverbanks. ⁴⁵⁸ The losses of cultural and historic resources in the Region have been extensive. Many sites have been inundated by reservoirs or covered by sediment as a result of the construction of the FCRPS. Many other sites have been disturbed or destroyed by development. The major impacts on cultural and historic resources are from high water flows, wave action, and human activities (e.g., development, vandalism). ⁴⁵⁹ Also, unrecorded sites are exposed as a result of ongoing operations at hydroprojects. ⁴⁶⁰
POLICY DIRECTION	
Status Quo	Efforts related to cultural and historic resources include funding of resource mitigation, and recording of Traditional Cultural Properties, oral histories, and place names. The recorded sites continue to be formally evaluated for National Register eligibility because the vast remainder of the recorded sites may be potentially eligible for inclusion in the Register. ⁴⁶¹ Local, state, and Federal regulations of cultural and historic resources provide some protection from new development. Even with the protection in place, additional losses of historic and cultural resources would likely occur. These losses would result from residential, commercial, and industrial development; hydrosystem operations; and recreational activities.
	Effect in Comparison to the Status Quo Condition:
Natural Focus	The breaching and drawdown of dams to natural river levels would expose more sites. Formerly inundated areas would lack protective vegetation and mantling soils. Many exposed sites would become more vulnerable as targets for vandalism and

⁴⁵⁸ Corps 2000, Section 4.20 Cultural Resources

⁴⁵⁹ Corps 2002b, Appendix N Cultural Resources.

⁴⁶⁰ Corps 2000, Section 4.20 Cultural Resources.

⁴⁶¹ Corps 2000, Section 4.20 Cultural Resources.

EFFECT AREA: CULTURAL AND HISTORIC RESOURCES fewer impacts = better	
	<p>looting, and more prone to damage by erosion as the river returns to a more natural state.⁴⁶² Limiting human access to important fish and wildlife habitats would help reduce this vulnerability. Protection of the exposed sites would substantially increase the costs to maintain cultural and historic resources. For example, within the John Day Dam and the four lower Snake River dam reservoir areas are more than 600 known sites, some of which are partially or completely inundated.⁴⁶³ As drawdowns occurred, sites would need to be recorded and assessed, and law enforcement would need to be increased. Additional support and training for prosecuting cases under the Archaeological Resources Protection Act would also be required.⁴⁶⁴ Loss of hydropower production would require new generation construction, which could potentially disturb cultural and historic sites. To the extent that changes in the transmission system would result from hydropower losses, impacts on sites could result from construction, operation, and maintenance of transmission-line corridors.⁴⁶⁵ The overall impact would be much worse than that under Status Quo.</p>
Weak Stock Focus	<p>The type of effects would be similar to Natural Focus; however, the extent of impacts would be less. For example, within the reservoirs of the four lower Snake River dams there are approximately 375 known sites, some of which are partially or completely inundated.⁴⁶⁶ Under this Policy Direction, these sites would be exposed. While exposure would make cultural resources accessible for study and tribal use, it would also subject them to the fluctuations of a near naturally flowing river, erosion, increased human access, and trampling by animals. Human recreational activities at the exposed sites could result in vandalism and looting. Sites would be protected where new industrial, residential, and commercial development was restricted for listed species. Overall, impacts to resources would be much worse than those under Status Quo.</p>
Sustainable Use Focus	<p>Historic and cultural properties could be affected by improvements in hydrosystem operation strategies for fish and wildlife. For example, certain river operations to improve fish populations may involve the modification of structures such as spillways, dam embankments, turbines, and fish passage facilities, potentially causing direct effects on historic or cultural properties. Overall, however, the impacts to resources from this Policy Direction would be similar to those under Status Quo.</p>
Strong Stock Focus	<p>Since no actions would be taken to benefit listed species of fish, reservoirs would remain more constant, resulting in less exposure of sites. However, there could be some losses of unprotected sites as development and urbanization increases. The local, state, and Federal protections existing under Status Quo would be similar. Overall, the impacts on cultural and historic sites would be similar to those under Status Quo.</p>
Commerce Focus	<p>There would likely be less exposure of inundated sites than under Status Quo, as flow and spill regimes for listed anadromous fish would be abandoned. However, there would be increased losses of unprotected sites as development and</p>

⁴⁶² Corps 2000, Section 7.19 Cultural Resource Impacts.

⁴⁶³ Corps 2002b, Appendix N Cultural Resources; Corps 2000, Section 4.20.5 Existing Cultural Resources.

⁴⁶⁴ Corps 2000, Section 7.19 Cultural Resource Impacts.

⁴⁶⁵ Consult Appendix J of this EIS for an estimate of the affected area, and the discussion of Transmission in this section for an understanding of why transmission could be affected by this alternative.

⁴⁶⁶ Corps 2002b, Section 4.7.5 Identified Historic and Archaeological Sites.

EFFECT AREA: CULTURAL AND HISTORIC RESOURCES fewer impacts = better	
	urbanization increased. The local, state, and Federal protections existing under Status Quo would be similar. Overall, the impacts on cultural and historic resources would be worse than those under Status Quo.

5.3.3.5 Aesthetics

Table 5.3-9A shows how the Policy Directions might affect aesthetics. Aesthetics is described in terms of scenery—the product of both natural processes and human culture, combined in various proportions that change over time. However, sounds and smells are also aesthetics parameters. Aesthetics is a value judgment: an attribute that someone finds aesthetically pleasing may be displeasing to someone else. Aesthetics includes the difficult-to-measure qualities of the environment that are important to the emotional well-being of the residents of the Pacific Northwest. The alternatives are compared by evaluating the impacts on the landscape. Changes are shown, by shading, to indicate whether a given Policy Direction would tend to have effects on the landscape that are the same as, better than, or worse than those under Status Quo. Diminished aesthetics are characterized as "worse" in the table.

Table 5.3-9A: Aesthetics Effects Across the Policy Directions Summary

Effect Subcategory	Status Quo	Focus of Alternative Policy Directions				
		Natural	Weak Stocks	Sustainable Use	Strong Stocks	Commerce
Aesthetics						

Much Better	Better	Same	Worse	Much Worse

Summary of Effects: Under the Natural Focus Policy Direction, a stretch of natural, free-flowing river would be restored. However, reservoir bottoms would be exposed as a result of the breaching of up to six dams. This could affect the value of the area's aesthetics until natural regeneration occurred. Also, much of the aesthetic value gained from breaching would not be enjoyed because of restricted access. Therefore, although there would be an increase in potential aesthetic value, that value likely would not be realized. In fact, aesthetics would be worse than under Status Quo.

Under Weak Stock, the exposed reservoir bottoms would regenerate much faster than under Natural Focus because of active habitat improvements. Also, the aesthetic value of the areas would be enjoyed because access would not be as limited as under Natural Focus. The aesthetic value under Weak Stock Focus would be substantially better than that under Status Quo. Under the Sustainable Use, some fish and wildlife habitat would be improved and some shoreline fluctuations might result from hydro modifications to improve fish populations. Aesthetics under this Policy Direction would be about the

same as those under Status Quo. Under the Strong Stock Focus Policy Direction, the relaxing of restrictions to benefit listed species would result in increased development. Aesthetics would be worse than under Status Quo. The increase in commercial, industrial, and residential development, as well as the decrease in habitat activities, would result in worse aesthetics under Commerce Focus than under Status Quo.

The reasoning for these effects is described in greater detail in Table 5.3-9B.

Table 5.3-9B: Aesthetics Effects Across the Policy Directions Analysis

EFFECT AREA: AESTHETICS fewer impacts = better	
Existing Conditions	Impacts to aesthetics, particularly scenery, is a major concern related to fish and wildlife activities. Approximately 26% of the landscape has been transformed by humans to the degree that the overall images are no longer near natural in appearance, but are culturally dominated. ⁴⁶⁷ Five themes describe landscape aesthetics in the Pacific Northwest: (1) naturally evolving forest and shrub/grasslands (7% of the landscape); (2) natural-appearing forestlands (37% of the landscape); (3) natural-appearing shrub/grasslands (30% of the landscape); (4) agricultural lands (20% of the landscape); and (5) developed areas (6% of the landscape). ⁴⁶⁸ Landscape aesthetics, including viewing scenery, is an important concern for nearly 20% of the region's human population. ⁴⁶⁹ Aesthetics is also important to the ever-increasing number of visitors and the economies that depend on them. Therefore, the demand for good visibility is high. The vast majority of landscape settings within the Pacific Northwest have excellent air quality. ⁴⁷⁰ However, monitoring data from the U.S. Forest Service and National Park Service indicate that some Class I areas (as defined under the Clean Air Act) are impaired. ⁴⁷¹ There are also increasing concerns about regional haze, especially in the Columbia River Gorge National Scenic Area.
POLICY DIRECTION	
Status Quo	The Region has a projected population growth of about 19% between 2000 and 2015 and would result in a projected regional firm energy load growth of nearly 2400 MW. This load growth would be met mostly with combustion turbines, and some renewable energy resources, such as wind. ⁴⁷² Effects on aesthetics would be greatest where new or existing generating facilities cause changes in the character or condition of the landscape, especially where visibility is an issue. ⁴⁷³ More land would likely be developed as population growth continued, reducing the quality of those natural landscapes. Changes in reservoir operations, primarily drafting, can also have pronounced aesthetic effects on the reservoirs and adjacent lands. Overall, a future decrease in aesthetics is expected.

⁴⁶⁷ USDA/USFS and USDO/BLM 1997, p. 1960.

⁴⁶⁸ USDA/USFS and USDO/BLM 1997, p. 1961.

⁴⁶⁹ USDA/USFS and USDO/BLM 1997, p. 1964.

⁴⁷⁰ USDA/USFS and USDO/BLM 1997, p. 1964.

⁴⁷¹ USDOE/BPA 2002f, Section 3.17 Cumulative Effects.

⁴⁷² See above Table 5.3-5B Economic Effects Across the Policy Directions.

⁴⁷³ See Clean Air Act, 42 U.S.C. §§ 7401-7492 (2000).

EFFECT AREA: AESTHETICS fewer impacts = better	
	Effect in Comparison to the Status Quo Condition:
Natural Focus	Dam breaching and drawdown of the reservoirs would expose land that would be barren until naturally revegetated, impairing aesthetic values in the short-term. The aesthetic feeling and attraction that water provides would be gone from many of the shoreline parks, which provide for the general enjoyment of the river. ⁴⁷⁴ Long-term landscaping would be difficult to establish without irrigation and frequent maintenance due to the arid environment (and inherent temperature extremes in summer and winter). ⁴⁷⁵ An increased probability of severe wildfires could also reduce scenic quality in the short term. ⁴⁷⁶ The physical appearance of the additional generating resources needed to replace the hydropower lost from breaching, as well as the potential visual impairment of viewsheds from increased air emissions, would negatively affect the landscape. Much of the aesthetic value gained from breaching would not be enjoyed because of restricted access. Overall, aesthetics will be worse than those under Status Quo.
Weak Stock Focus	The effects on aesthetics from dam breaching would be similar as those under Natural Focus, but to a lesser degree (e.g., less replacement power required and less reservoir bottom exposure). However, unlike Natural Focus, access to previously inundated areas would be allowed, and active habitat enhancement would further improve the aesthetics of those areas. There would also be aesthetic value gained by a return to a natural river landscape, one uninterrupted by large-scale hydro development. Habitat enhancement for listed fish and wildlife would also take place in other areas, further improving the aesthetic value of the Region. There would be increased opportunities to enjoy the additional aesthetic values created by the restoration of habitat for listed species. There would likely be some short-term adverse effects (from dam breaching) on aesthetics. However, over the long term, aesthetics would be substantially better than under Status Quo.
Sustainable Use Focus	Improvements in hydro operations intended to benefit fish and wildlife could cause some fluctuations in reservoir shorelines. Water rights acquired (e.g., from irrigated lands) and left instream for fish and wildlife could improve aesthetics in other areas. There are unlikely to be changes in hydrosystem operations that require additional power replacement, therefore impacts to visibility would be similar to Status Quo. ⁴⁷⁷ The enhancement of fish and wildlife habitat would result in aesthetic improvements to the landscape. Overall, aesthetics would be about the same as Status Quo.
Strong Stock Focus	Development activities would increase as long as strong fish and wildlife populations were not affected. More land could be developed to meet growing needs. There would likely be more urbanization and development. Restrictions intended to preserve and recover listed species would be removed. Overall, there would be a decrease in aesthetic compared to conditions under Status Quo.
Commerce Focus	Increased urbanization and industrialization would typically result in negative effects on the landscape. However, these effects could be limited by the need to avoid economic losses in tourism, especially for those areas that attract large numbers of visitors. Aesthetics in natural areas would diminish if development would be a more valuable use of the area. Overall, there would be more impacts on aesthetics than under Status Quo.

⁴⁷⁴ Corps 2000, Section 7.19 Cultural Resource Impacts.

⁴⁷⁵ Corps 2000, Section 7.19 Cultural Resource Impacts.

⁴⁷⁶ USDA/USFS and USDO/BLM 1997, Chapter 4.

⁴⁷⁷ See above Table 5.3-5B Economic Effects Across the Policy Directions.

5.4 ENVIRONMENTAL CONSEQUENCES OF RESERVE OPTIONS

Reserve Options are a tool that can be used to respond to changes in fish and wildlife policies. For a complete discussion of Reserve Options please see Section 4.2. All of the Policy Directions, discussed in Chapter 3, were characterized regarding their differences from Status Quo. These differences were divided into six components— habitat, harvest, hatcheries, hydro, commerce, and tribal harvest. These Reserve Options incrementally extend or intensify each of these six components (see Figure 5-20). With each step toward the endpoint of the Reserve Option, natural, economic, and social environmental effects would become more intense and extensive, although the *kinds* of effects anticipated would remain the same. The relationship methodology provides the analytical flexibility needed to assess the Reserve Options.

The Reserve Options are mutually exclusive. Individual Reserve Options can be substituted for the corresponding components in any of the Policy Directions. Some Reserve Options may be incompatible, however; others may result in unexpected synergistic effects.

Reserve Options (RO) 1 through 6 extend the components of the Natural Focus Policy Direction to their extremes. These Reserve Options include the following:

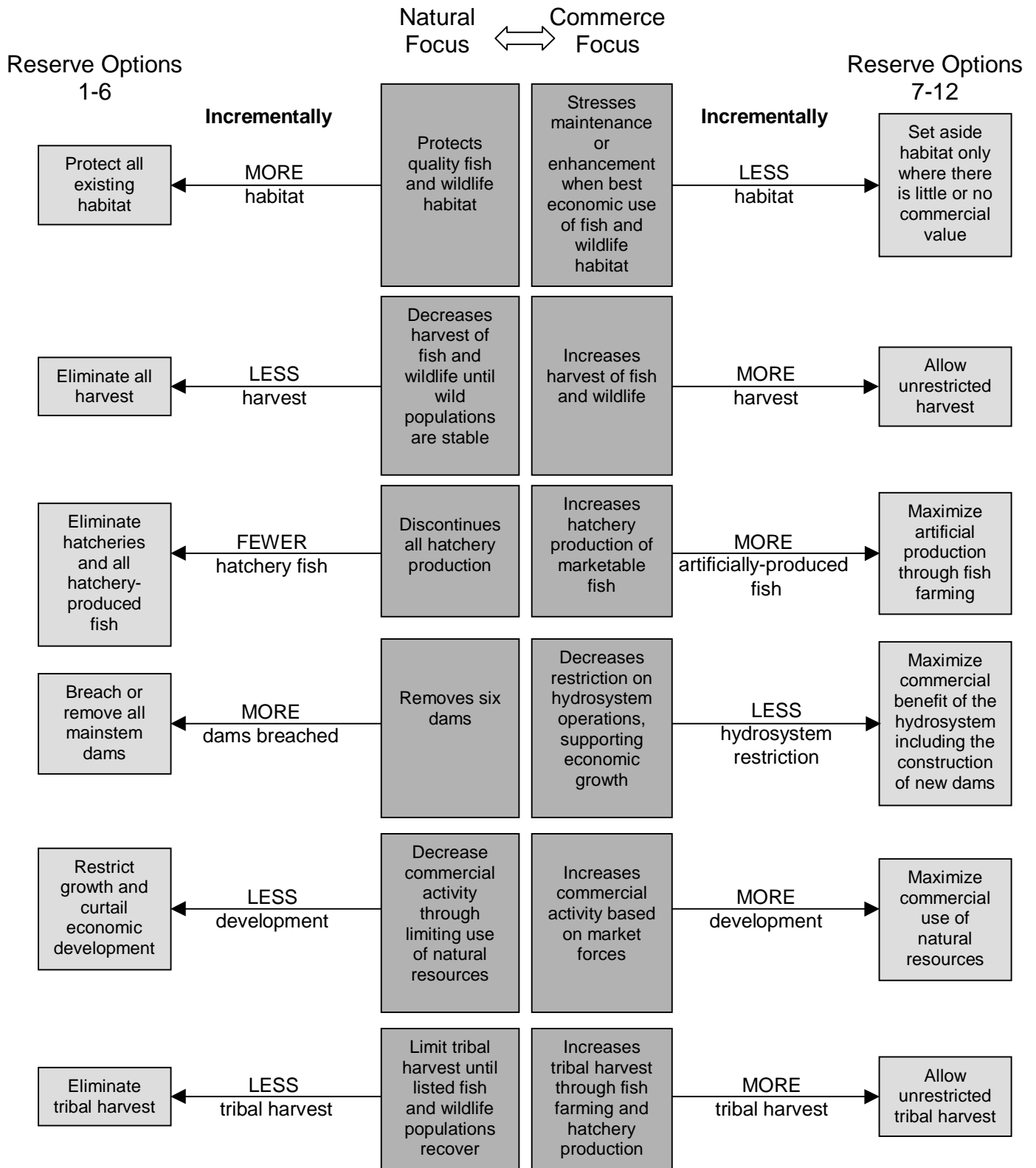
- RO-1: Protect all levels of habitat;
- RO-2: Ban all harvest;⁴⁷⁸
- RO-3: Eliminate hatcheries and all hatchery-produced fish;
- RO-4: Breach or remove all mainstem dams;
- RO-5: Restrict growth and curtail economic development; and
- RO-6: Eliminate tribal harvest.

RO-7 through RO-12 extend the components of the Commerce Focus Policy Direction to their extremes. These Reserve Options include the following:

- RO-7: Set aside habitat only where there is little or no commercial value;
- RO-8: Allow unrestricted harvest;
- RO-9: Maximize artificial production through fish farming (private sector);
- RO-10: Maximize commercial benefits of the hydrosystem, including the construction of new dams;
- RO-11: Maximize commercial use of natural resources; and
- RO-12: Allow unrestricted tribal harvest.

⁴⁷⁸ Allow unrestricted harvest of hatchery-produced fish until they are eliminated.

Figure 5-20: Continuum of Reserve Options



The following is a description of the possible environmental consequences of these Reserve Options compared with Status Quo. The discussion of environmental consequences in Table 5.4-1 considers both short- and long-term effects.

Table 5.4-1: Reserve Options Across the Effect Areas

EFFECT AREA: AIR QUALITY (POLLUTION)	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Overall air quality would improve compared to Status Quo, as habitat is protected and air pollution-causing development is restricted to previously developed areas.</p> <p>RO-4 There would be a large increase in air pollution compared to Status Quo. Substantial amounts of replacement power would be required to compensate for the loss of the hydrosystem. This replacement power would likely come from increased use of natural gas and coal. In addition, increased truck and train traffic needed to compensate for the loss of barging would increase air emissions. Further, dam deconstruction and reservoir drawdown would result in high levels of dust and vehicle emissions, in the short term, although as deconstruction ended and the area naturally revegetated this source of pollution would be reduced.</p> <p>RO-5 Overall air quality would improve compared to Status Quo, as industrial, residential, and commercial development is curtailed, and growth is restricted to previously developed areas.</p> <p>Note: If these Reserve Options are taken together, air quality in the Pacific Northwest could improve substantially. Habitat protection and restricted development would result in the need to import replacement power from other regions in order to compensate for the loss of hydro generation.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 There would be an increased potential for air pollution compared to Status Quo, as considerably less land is set aside for fish and wildlife.</p> <p>RO-10 Fewer thermal resources would be constructed as existing hydro generation is optimized and new hydropower is developed to help meet demand. However, there may be some short term air impacts from dam construction. Increases in barging could also mean a reduction in air emissions from truck and rail traffic. These actions could result in improvements to air quality compared to Status Quo.</p> <p>RO-11 There could be large increases in air pollution, compared to Status Quo, as the commercial uses of natural resources are maximized. Increased development and growth would further result in impaired air quality. The commercial use of natural resources could also result in a decrease in established carbon sinks, further limiting air quality.</p>

EFFECT AREA: LAND HABITAT	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Substantially more land would be preserved, than compared to Status Quo, as more habitat including upland, riparian, and wetland areas, is protected. However, the quality of this habitat could vary radically.</p> <p>RO-4 In the short term, riparian habitat would be eliminated as river boundaries</p>

EFFECT AREA: LAND HABITAT	
	<p>change due to breaching. New riparian habitat would gradually and naturally re-establish along new riverbanks and would fluctuate due to natural disturbances. There would also be more upland habitat, however, there would likely be a loss of permanent wetlands. Breaching the mainstem dams would result in substantially more land habitat compared to Status Quo.</p> <p>RO-5 Restricting growth and development would result in much more available land habitat than Status Quo.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 There would be a dramatic decrease in available land habitat, compared to Status Quo, as less habitat is set aside.</p> <p>RO-10 There would be substantially less land habitat, compared to Status Quo, as the commercial benefits of the hydrosystem are maximized and new dams are constructed. There would be decreases in upland and riparian areas as new reservoirs inundate existing habitat, and ports, recreational and irrigation facilities are developed to meet commercial demand. Loss in riparian areas would likely result from increased fluctuation in reservoir levels as hydropower generation is optimized. However, there may be more adjacent wetland habitat as reservoirs are formed.</p> <p>RO-11 There would be large decrease in all types of land habitat, compared to Status Quo, as natural resources industries increase—forest products, mining, agriculture, and ranching. Further losses would also result from increased industrial, residential and commercial development.</p>

EFFECT AREA: WATER HABITAT	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Overall water quality would improve compared to Status Quo as both land and water habitat are protected. This protection would likely result in decreases in non-thermal pollution, sedimentation, and temperature. Water quantity would also likely increase as protection minimizes consumptive uses of water. This would result in an overall increase in the amount of stream/river and reservoir habitat.</p> <p>RO-4 In the short term, breaching the mainstem dams would result in increases in sedimentation and non-thermal pollution. In the long term, temperatures would fluctuate similarly to a natural river, which could result in periods of higher temperatures than Status Quo as controlled releases to lower temperatures are no longer possible. Nitrogen supersaturation would also be reduced to more natural river levels. Also, non-thermal pollution and sedimentation would improve. Water quantity and the amount of stream/river habitat would vary seasonally and annually, compared to Status Quo, as the ability to regulate the hydrologic regime of the river is lost. However, reservoir habitat would be eliminated as dams are breached.</p> <p>RO-5 Overall water quality would improve compared to Status Quo, as sources of pollution (e.g. erosion from development activities, non-thermal pollution from agricultural runoff, and increased temperature from riparian development) are further restricted. Water quantity would also likely improve as water withdrawals are minimized, resulting in increased stream/river and reservoir habitat.</p>

EFFECT AREA: WATER HABITAT	
RO-7 – RO-12 Extending Commerce Focus	<p>RO-1 Water quality would likely decrease, compared to Status Quo, as less habitat is set aside and more upland and riparian areas are developed causing increases in non-thermal pollution, sedimentation, and temperature. Water quantity, stream/river habitat, and reservoir habitat would also likely decrease as less protections could result in more water withdrawals.</p> <p>RO-9 Maximizing artificial production of fish through private sector fish farms would likely result in decreases in water quality, compared to Status Quo. This decrease would likely be from increased non-thermal pollution and sedimentation from aquaculture discharges. Water quantity and stream/river habitat could be slightly reduced, locally, as water withdrawals increase.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem, including the construction of new dams, could result in decreased water quality. Increased hydropower generation would result in less spill—decreasing nitrogen supersaturation. However, nitrogen supersaturation levels could increase depending on the number of new dams constructed and the amount of spill. Temperatures would also likely increase as new reservoirs are created. Non-thermal pollution could increase as navigation increases. There may also be some short term increases in sedimentation from dam construction activities. Water quantity would be reduced as irrigation, municipal, and industrial withdrawals increase. The amount of stream/river habitat would decrease as dams are constructed resulting in increased reservoir habitat.</p> <p>RO-11 Water quality would likely decrease, compared to Status Quo, as the commercial use of natural resources is maximized. There would be increases in non-thermal pollution, temperature, and sedimentation from activities such as increased logging, mining, and development. Water quantity would also likely decrease as more water is withdrawn for commercial use, this would result in a decrease in stream/river and reservoir habitat.</p>

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced)	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected, native anadromous fish would likely increase compared to Status Quo. Protections of both land and water habitat would result in improvements in water quality and quantity.</p> <p>RO-2 The elimination of fish and wildlife harvest would result in increased native anadromous fish populations compared to Status Quo. However, as more prey species become available, predator numbers would increase. Anadromous fish populations would be limited by natural processes.</p> <p>RO-3 The elimination of all hatchery-produced anadromous fish would likely result in increases in naturally-spawning anadromous fish in the long term. There may be some incidental mortality to naturally-spawning anadromous fish as hatchery-produced fish are actively removed. Overall, however, there would be much less anadromous fish in the river compared to Status Quo.</p> <p>RO-4 The removal of all mainstem dams would result in both short- and long-term effects on native anadromous fish. Short-term adverse effects could include mortality due to elevated turbidity levels from increases in sedimentation, reduced rearing habitat, and reduced migratory habitat quality. However, there could also be reductions in predation on juveniles and increased</p>

EFFECT AREA: FISH AND WILDLIFE: Native Anadromous Fish (Naturally-Spawning and Hatchery-Produced)	
	<p>speed of migration times. The inability to store water for fish in dry years could result in increased fish mortality. Long-term effects could result in reduced passage mortality, improved overall water quality, decreased predation pressure, and increased available habitat. These improvements could result in substantially more anadromous fish compared to Status Quo.</p> <p>RO-5 The restriction of growth and economic development would likely result in increases in native anadromous fish compared to Status Quo. As development decreases, pressure affecting the quality and quantity of their habitat would also decrease allowing for higher populations.</p> <p>RO-6 The elimination of tribal fish and wildlife harvest would result in increased native anadromous fish populations compared to Status Quo. However, as more prey species become available, predator numbers would increase. Anadromous fish populations would be limited by natural processes.</p>
<p>RO-7 – RO-12 Extending Commerce Focus</p>	<p>RO-7 As less habitat is set aside, anadromous fish would likely decrease compared to Status Quo. Both the quality and amount of habitat would be reduced.</p> <p>RO-8 Allowing unrestricted harvest of fish and wildlife would result in substantial decreases in native anadromous fish, potentially resulting in extinctions. There would also be a decrease in other fish species that are dependent on anadromous fish. Over-harvesting could result in a fundamental change in fish community structures.</p> <p>RO-9 As artificial production of anadromous fish is maximized using fish farms, naturally-spawning anadromous fish would experience less pressure and competition from hatchery-produced anadromous and non-native resident fish species. This could result in an increase in naturally-spawning anadromous fish. Traditional hatchery-produced fish would likely be eliminated as private sector fish farming replaces subsidized hatchery production. There could be more pressure on naturally-spawning anadromous fish from the potential introductions of non-native species and disease. There would be a large increase in marketable farm reared anadromous fish.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem could result in decreases in native anadromous fish, as reservoirs would be operated for multiple uses such as flood control, irrigation, power production, and recreation. Building new dams could further reduce anadromous fish habitat, increase passage mortality and further delay migration time. Newly created reservoir habitat could also result in increased predator populations. There would likely be considerable reductions in native anadromous fish compared to Status Quo.</p> <p>RO-11 Maximizing the commercial use of natural resources would likely reduce native anadromous fish compared to Status Quo. Impacts from resource use, extraction, and development would result in a decrease in the amount and quality of habitat and could create increased restrictions to passage.</p> <p>RO-12 Allowing unrestricted tribal harvest of fish and wildlife would result in substantial decreases in native anadromous fish, potentially resulting in extinctions. There would also be a decrease in other fish species that are dependent on anadromous fish. Over-harvesting could result in a fundamental change in fish community structures.</p>

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected, resident fish would likely increase compared to Status Quo. Protections would result in improvements in water quality and quantity.</p> <p>RO-2 The elimination of fish and wildlife harvest would result in increased native resident fish populations compared to Status Quo. As more prey species become available, predator numbers would increase. Resident fish populations would be limited by natural processes.</p> <p>RO-3 The elimination of all hatchery-produced fish would likely result in increases in native resident fish. The reduction in competition with hatchery-produced anadromous fish and hatchery-produced non-native fish would allow for native resident fish expansions.</p> <p>RO-4 The breaching of all the mainstem dams could result in short term decreases in native resident fish as habitat and sources of food are reduced. In the long term native resident fish would likely increase in number and expand in range as blockages are removed.</p> <p>RO-5 The restriction of growth and economic development would likely result in increases in native resident fish compared to Status Quo. As development decreases, the quality and quantity of their habitat would increase allowing for higher populations.</p> <p>RO-6 The elimination of tribal fish and wildlife harvest would result in increased native resident fish populations compared to Status Quo. As more prey species become available, predator numbers would increase. Resident fish populations would be limited by natural processes.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less habitat is set aside, resident fish would likely decrease compared to Status Quo from reductions in quality and amount of habitat.</p> <p>RO-8 Allowing unrestricted harvest of fish and wildlife would result in substantial decreases in targeted native resident fish, potentially resulting in extinctions. There would also be a decrease in other resident fish species that are dependent on targeted ones. Over-harvesting could result in a fundamental change in fish community structures.</p> <p>RO-9 As artificial production of fish is maximized using fish farms there would be less pressure on native resident fish from hatchery-produced anadromous and non-native species. This could result in an increase in native resident fish. However, resident fish may still be limited by previously established non-native species.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem could result in decreases in native resident fish, as reservoirs would be operated for multiple uses such as flood control, irrigation, power production, and recreation. Building new dams could create more habitat for native resident fish, however, they would still be limited by competition with non-native fish.</p> <p>RO-11 Maximizing the commercial use of natural resources would likely reduce native resident fish compared to Status Quo. Impacts from resource use, extraction, and development would result in a decrease in the amount and quality of habitat.</p> <p>RO-12 Allowing unrestricted tribal harvest of fish and wildlife would result in substantial decreases in targeted native resident fish, potentially resulting in extinctions. There would also be a decrease in other resident fish species that</p>

EFFECT AREA: FISH AND WILDLIFE: Native Resident Fish	
	are dependent on targeted ones. Over-harvesting could result in a fundamental change in fish community structures.

EFFECT AREA: FISH AND WILDLIFE: Native Wildlife	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected wildlife would increase compared to Status Quo. Areas that would otherwise have been developed would now provide habitat and wildlife would be limited only by carrying capacity. Species diversity could decrease as climax ecosystems are approached, however, natural disturbance may counteract this effect.</p> <p>RO-2 The elimination of fish and wildlife harvest would result in increased wildlife populations compared to Status Quo. As more prey species become available, predator numbers would increase. Wildlife populations would be controlled through natural processes.</p> <p>RO-3 Eliminating all hatchery-produced fish would result in decreases in wildlife populations that depend on them. This decrease could reverse as naturally-spawning fish return or other prey species are substituted.</p> <p>RO-4 The breaching of all mainstem dams would result in species-specific effects. Some wildlife species dependant on reservoir habitat would decrease in number, while other species needing more natural river conditions would increase. Specifically, some species (e.g. birds) that prey migrating salmon would be reduced as fishladders and juvenile bypass systems are eliminated. Some wildlife populations may also be decreased as land is developed for new generation resources or improved rail and road infrastructure.</p> <p>RO-5 As growth and economic developed is restricted, there would be less pressure on wildlife and more available habitat. This would result in increases in wildlife populations compared to Status Quo.</p> <p>RO-6 The elimination of tribal fish and wildlife harvest would result in increased wildlife populations compared to Status Quo. As more prey species become available, predator numbers would increase. Wildlife populations would be controlled through natural processes.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less habitat is set aside, wildlife populations that require more undisturbed areas would be reduced. However, those species that have adapted well to human development would likely increase. Predator species that rely on prey affected by habitat loss would also decrease.</p> <p>RO-8 Allowing unrestricted harvest of fish and wildlife would result in substantial decreases in targeted wildlife species, potentially resulting in extinctions. There would also be a decrease in other wildlife species that are dependent on targeted ones.</p> <p>RO-9 Maximizing fish production through fish farming would result in the decrease in wildlife dependant on fish. Nuisance wildlife attracted to fish farms would likely be killed, and the decrease in in-river hatchery-produced fish would result in further wildlife decreases.</p> <p>RO-10 As the commercial benefits of the hydrosystem are maximized wildlife populations would likely be impacted. The creation of more dams would decrease populations requiring river conditions while increasing those species dependant on reservoir habitat. Increased development and recreation of the</p>

EFFECT AREA: FISH AND WILDLIFE: Native Wildlife	
	<p>hydrosystem would further limit wildlife populations.</p> <p>RO-11 As the commercial use of natural resources are maximized, wildlife species that depend on those resources would decrease substantially.</p> <p>RO-12 Allowing unrestricted tribal harvest of fish and wildlife would result in substantial decreases in targeted wildlife species, potentially resulting in extinctions. There would also be a decrease in other wildlife species that are dependent on targeted ones.</p>

EFFECT AREA: FISH AND WILDLIFE: Non-Native Species	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected non-native species would increase compared to Status Quo, mainly in areas where they are already established. As areas that would otherwise have been developed are now protected the spread of non-native species may slow and some species may be reduced.</p> <p>RO-2 As harvest of fish and wildlife is eliminated those non-native species that are more adapted and can out-compete native species will increase. However, if harvest was the factor suppressing native species then there expected increase in number could allow them to out-compete non-native species. There also may be an increase in non-native species if they were the target of tribal harvest.</p> <p>RO-3 The elimination of all hatchery-produced fish would likely reduce some non-native species, as non-native species hatchery production would be discontinued. Non-native species that prey on hatchery produced fish would also be reduced.</p> <p>RO-4 The removal of all mainstem dams would likely result in the decrease in non-native species that have adapted to the warm water reservoir environment. The removal of non-native colonization habitat (e.g. intake pipes, screens) would also reduce non-native species. Some opportunistic species may be able to expand their range as blockages are removed. Other opportunities for introductions could occur as land is developed for new generation resources or improved rail and road infrastructure.</p> <p>RO-5 As growth and economic development are curtailed more habitat would become available for non-native species. However, some non-natives dependant on developed landscapes would be reduced.</p> <p>RO-6 As harvest of tribal fish and wildlife is eliminated those non-native species that are more adapted and can out-compete native species will increase. However, if harvest was the factor suppressing native species then there expected increase in number could allow them to out-compete non-native species. There also may be an increase in non-native species if they were the target of tribal harvest.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less habitat is set aside, non-native species that have adapted well to human development would likely increase compared to Status Quo.</p> <p>RO-8 Allowing unrestricted harvest of fish and wildlife would result in substantial decreases in targeted non-native species, potentially resulting in extirpations. There would also be a decrease in other non-native species that are dependent on native fish and wildlife that are harvested. However, there could also be some increases as niches become available as a result of harvested native</p>

EFFECT AREA: FISH AND WILDLIFE: Non-Native Species	
	<p>species.</p> <p>RO-9 Maximizing artificial production through fish farming that target production of non-native species could result in a large increases. Other non-native species may also increase as control programs targeted to benefit native species are discontinued.</p> <p>RO-10 Maximizing navigation and recreation could result in substantial increases in non-native species. Also the creation of more dams could result in more habitat for non-native species colonization.</p> <p>RO-11 The spread of non-native species may increase, compared to Status Quo, as introductions result from increased development.</p> <p>RO-12 Allowing unrestricted tribal harvest of fish and wildlife would result in substantial decreases in targeted non-native species, potentially resulting in extirpations. There would also be a decrease in other non-native species that are dependent on native fish and wildlife that are harvested. However, there could also be some increases as niches become available as a result of harvested native species.</p>

EFFECT AREA: COMMERCIAL INTERESTS	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected, commercial interests would likely be substantially affected compared to Status Quo. More restrictions would be placed on industries in order to preserve protected areas. Expansions of existing industries would also be limited by available space for development. There may be some benefits as existing developed areas and industries are modernized to become more efficient. Natural resource-based industries would be the most affected as areas would be closed off from exploration, extraction, and logging.</p> <p>RO-2 The elimination of all fish harvest would substantially affect commercial fishing compared to Status Quo. The commercial fishing industry would be eliminated and many local communities dependant on commercial fishing and associated industries would be economically crippled. Transportation would also be affected as it pertained to transporting fish products.</p> <p>RO-3 The elimination of all hatchery-produced fish would seriously affect the commercial fishing industry. In-river commercial fishing would be virtually eliminated, as the available amount of harvestable fish is dramatically decreased. Ocean-based commercial fishing could also decline as numbers of fish decrease. The effect might not be as harsh as experienced by in-river commercial fishing since the ocean fishery could target other stocks/species more easily. Many local communities dependant on the fishing industry would also be adversely affected. Transportation would also be affected as it pertained to transporting fish products.</p> <p>RO-4 Breaching all mainstem dams would have far-reaching, substantial effects on commercial interests compared to Status Quo. The ability to generate power from the river would be eliminated, and other sources of generation would be required. The existing transmission system would be largely ineffective as it is largely based on delivering hydro-generated power, and new transmission would be needed to connect new sources of power. Navigation, at least upriver of Portland, would be completely eliminated as the lock system is</p>

EFFECT AREA: COMMERCIAL INTERESTS	
	<p>removed and passage is blocked from newly exposed rocks and falls. Train- and truck-based transportation would expand to meet demand, requiring significant investments in infrastructure development. Irrigated agriculture and ranching would be seriously impacted as reservoirs are lost and the amount of available water is reduced. Large investments would be required to reconfigure irrigation systems, and many farms and ranches would have to shift to dry land farming/ranching or be forced out of business. Agriculture and forest products would be further impacted by the loss of navigation and increased cost of transporting goods to market. The impacts to commercial fishing would vary in degree depending on its location, however, all commercial fishing would experience a decrease in the available fish for harvest, at least in the short-term. The treaty Indian gillnet fishery that extends from Bonneville Dam to McNary Dam would be the most impacted as the river returns to more natural conditions. The non-Indian gillnet fishery, operating below Bonneville Dam, would be also be impacted as dams are removed and fish numbers decrease. Of the three the commercial ocean fishery would likely be least affected. Many local communities dependant on the fishing industry would also be adversely affected. Transportation would also be affected as it pertained to transporting fish products. Other industries would also be severely affected by the loss of all mainstem dams. Many of these industries rely on the inexpensive power generated by the hydrosystem and on water withdrawals. The loss of power would result in increased operating costs, which could lead to closings. As navigation is lost, the cost to transport their goods increases as well.</p> <p>RO-5 The restriction of growth and economic development would likely benefit existing commercial interests, though they would be limited by the inability to expand. Reduced competition would result in benefits to all areas of commerce. The hydropower and transmission system would likely be able to supply the majority of needed power and the navigation system would continue to provide for the inexpensive transportation of goods.</p> <p>RO-6 The elimination of tribal harvest would likely have beneficial effects on commercial fishing as more fish would become available for harvest. This could result in increases in commercial fishing-based industries and transportation.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less land is set aside many commercial interests will benefit, compared to Status Quo. Increased commercial development would result in the need for increased power, transmission, and transportation. Opportunities would exist for the expansion of agricultural, ranching, forest products, and other industries. These commercial interest would be less affected by costs associated with environmental and land use regulations and limited only by market forces. Commercial fishing could be adversely affected if increased non-fishing commercial activity resulted in decreased water quality and reduced numbers of fish.</p> <p>RO-8 Allowing unrestricted harvest would substantially benefit the commercial fishing industry. It would no longer be limited by ESA restrictions on harvest. In turn, communities dependant on commercial fishing would likely flourish and fish product transportation could increase. However, these are only short-term effects. In the long term, unrestricted harvest could result in the collapse of the commercial fishing industry.</p> <p>RO-9 Maximizing artificial production through fish farming would likely affect the commercial fishing and transportation industries. Traditional commercial fishing would be adversely affected as private sector fish farming expands and</p>

EFFECT AREA: COMMERCIAL INTERESTS	
	<p>the amount of hatchery production decreases. However, the fish processing industries and fish product transportation would benefit as more fish are being produced for market.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem, including the construction of additional dams, would likely result in benefits to most commercial interests compared to Status Quo. The ability to generate inexpensive power would increase, although additional transmission would be required. Existing dams would be operated for power production, navigation, flood control, and irrigation. These would provide benefits to navigation, and the industries that use it; agriculture, ranching, and forest products; and many other industries.</p> <p>RO-11 Maximizing the commercial use of natural resources would benefit most sectors of commercial interests. Agriculture, ranching, forest products, and mining would increase as restrictions are lifted and more use and production is allowed. With the increase in raw material supply, other industries would also increase production, limited by demand. There would also be increases in transportation as more materials are being transported. The increased production of goods would result in the need for more power production, which would require transmission expansions. Commercial fish harvest may be somewhat adversely affected as water quality and quantity are reduced—further decreasing naturally-spawning fish.</p> <p>RO-12 The elimination of tribal harvest would result in some benefits to commercial fishing as more fish would be available for harvest.</p>

EFFECT AREA: RECREATION	
Reserve Options	Effect in Comparison to the Status Quo Condition:
<p>RO 1 – RO-6 Extending Natural Focus</p>	<p>RO-1 Protecting all levels of habitat would benefit recreation more than Status Quo. Newly protected areas could result in higher natural fish and wildlife production, potentially benefiting sport fishing and hunting. Other natural resource-based recreation would also increase as more areas become available for use. Developed recreation would likely decrease as development restrictions in protected areas would limit growth. Recreation could be limited if overuse resulted in habitat degradation.</p> <p>RO-2 The elimination of all fish and wildlife harvest would impact sport fishing and hunting more than Status Quo, however, increased wildlife viewing opportunities could result in beneficial effects on other recreation.</p> <p>RO-3 The elimination of all hatchery-produced fish would have substantial effects on sport fishing, though hunting and other types of recreation would be unaffected. Since a substantial amount of recreational freshwater fishing is dependant on hatchery-produced fish, the elimination of these fish would severely restrict sport fishing opportunities.</p> <p>RO-4 Breaching all mainstem dams would have major impacts on all types of land- and water-based recreation that have developed around the Federal hydrosystem. All reservoir sport fishing would be eliminated, as well as other types of flatwater recreation. The loss of navigation would eliminate the use of the river for large recreational boats. There may also be some reductions in hunting opportunities, especially for waterfowl. Some recreation, such as</p>

EFFECT AREA: RECREATION	
	<p>kayaking and rafting, might increase.</p> <p>RO-5 Restricting growth and economic development would likely result in increased recreational opportunities, however, developed recreation would likely decrease. There may also be a decrease in recreation support services as economic development is limited. Sport fishing and hunting opportunities would likely increase in response to growing populations of fish and wildlife.</p> <p>RO-6 The elimination of tribal fish and wildlife harvest would likely result in increased opportunities for sport fishing and hunting as competition with tribal fishermen and hunters is reduced, and more fish and wildlife become available. Other types of recreation would unlikely be affected.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less land is set aside, sport fish and hunting and other types of recreation would likely be impacted more than under Status Quo. As the amount of area available for recreation is reduced, crowding would increase and recreational enjoyment would be reduced. Some recreation could increase, especially developed recreation, if the commercial value of an area for a particular type of recreation is higher than setting it aside. There may also be some increases in recreational support services catering to tourism.</p> <p>RO-8 Allowing unrestricted harvest would result in many more opportunities for sport fishing and hunting compared to Status Quo. However, other types of recreation could be impacted as species, especially wildlife, become scarce.</p> <p>RO-9 Maximizing artificial production of fish through fish farming could impact recreational interests. Sport fishing would be worse since the amount of harvestable fish in the rivers would be dramatically less, as production shifts from hatcheries to fish farms. However, fishing opportunities for other fish species would still be available. Hunting and other types of recreational activities would be largely unaffected.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem could result in substantial impacts to recreation. As new dams are built, river-based recreation would likely be reduced. However, recreation based around reservoirs would increase. There would be a decrease in sport fishing for those who enjoy fishing in a river environment; however, there would be increases in reservoir fishing opportunities. Reservoirs would be managed, in part, for recreational purposes, allowing expanded uses for camping, swimming, and fishing. There would likely be some lost hunting opportunities as areas are inundated for reservoirs; however, the creation of wetland and reservoir habitat would allow expanded waterfowl hunting.</p> <p>RO-11 Maximizing the commercial use of natural resources would likely reduce recreational opportunities more than Status Quo. As areas used for land-based recreation (including hunting) are cleared, recreational opportunities would decrease. Water-based recreation (including fishing) would be impacted by changes to hydrology, water quality, and reduced populations of fish.</p> <p>RO-12 Allowing unrestricted tribal harvest could result in decreases in sport fishing and hunting. As tribal harvest increases, there would likely be less fish and wildlife available for harvest and more competition for the resource. Other types of recreation would probably not be affected.</p>

EFFECT AREA: ECONOMIC DEVELOPMENT	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 The protection of all levels of habitat would result in decreases to economic development compared to Status Quo. Industrial, residential, and commercial development would be restricted as areas that could be developed are protected. This restriction could also have effects on employment as the expansion of commercial interests is restricted and new employment opportunities are lost.</p> <p>RO-2 The elimination of all harvest would result in economic development conditions that are worse, compared to Status Quo. As the regional commercial fishing industry collapses, unemployment in the fishing industry would increase. This would have serious effects on entire communities dependant on the commercial fishing industry. Besides high unemployment, there be would effects to industrial, residential, and commercial development in these coastal and fish-dependant communities. Some economic development may occur as the local economies shift to another revenue source. However, it would not compensate for the loss of commercial fishing.</p> <p>RO-3 The elimination of all hatcheries and hatchery-produced fish would have substantial effects on economic development. The loss of hatchery-produced fish would have serious consequences to the commercial and recreational fishing industries. This reduction in harvestable fish would result in higher unemployment from hatchery closures and loss of fishing opportunities. Many local communities dependant on the fishing industry would also be adversely affected. This would in turn curtail industrial, residential, and commercial development.</p> <p>RO-4 Breaching all mainstem dams would have substantial effects on economic development compared to Status Quo. Unemployment rates would rise quickly as industries dependant on inexpensive power, irrigation, reservoir recreation, and navigation would experience huge cost increases or complete loss. There may be some increases in other recreation, however, it would not offset the effects of breaching. High unemployment and operation costs would further restrict industrial, residential, and commercial growth.</p> <p>RO-5 Restricting growth and curtailing economic development would have substantial effects on regional economic development compared to Status Quo. Restricting growth would result in higher unemployment in the Region and depressed industrial, residential, and commercial development. This would likely result in a higher poverty and increases in accompanying social problems.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 As less habitat is set aside, economic development would likely do much better compared to Status Quo. With more available land, industrial, residential, and commercial development would increase. Along with increases in other commercial sectors, this increase in development would further increase the number of new jobs available, reducing unemployment.</p> <p>RO-8 Allowing unrestricted harvest would likely lead to increased economic development. As harvest limitations are removed, there would be more employment opportunities in the commercial fishing industry. The increase in revenue created by increased harvest would result in more industrial, residential, and commercial development as money gets reinvested in the local economies. This would further increase employment opportunities. However, these are only short-term effects. In the long term, unrestricted harvest could result in the collapse of the commercial fishing industry.</p>

EFFECT AREA: ECONOMIC DEVELOPMENT	
	<p>RO-9 Maximizing artificial production of fish through private sector fish farming would likely have positive effects on economic development compared to Status Quo. There would likely be some trade-offs as the commercial fishing industry is impacted, but those impacts would be limited to particular sectors of the commercial fishing industry. Employment could increase as production increases. As more revenue is created, more development could occur.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem, including constructing new dams, would have substantial benefits to economic development compared to Status Quo. Most economic sectors would experience increases in employment and industrial, residential, and commercial development. Increased revenue as a result of inexpensive power and reduced operation costs would result in increased regional economic growth. There may be some losses associated with the commercial fishing and recreation industries; however, increases in other commercial sectors will offset them.</p> <p>RO-11 Maximizing the commercial use of natural resources would result in substantial increases to regional economic development compared to Status Quo. As more raw materials are produced (e.g. timber, sand and gravel, crops) other commercial sectors would increase. There would be substantial increases in employment as all sectors involved in natural resource production, processing, and manufacturing would increase. However, these are only short-term effects. In the long term, unrestricted development could result in the serious depletion of natural resources resulting in economic decline.</p>

EFFECT AREA: FUNDING COSTS	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 As all levels of habitat are protected funding costs would increase compared to Status Quo. Ratepayer funding of habitat protection would be limited by MSR and limited to the obligations to mitigate or aid in endangered species recovery. Other sources, such as Federal and state government agencies, would also be required to meet their obligations and would be expected to provide additional funding if more habitat is protected.</p> <p>RO-2 The elimination of fish and wildlife harvest would have some effects on funding costs compared to Status Quo. Responsibilities to compensate for declining fish stocks would be shorter lived as the elimination of fish harvest would likely result in increased natural production. Other funding sources would likely be negatively impacted from the elimination of harvest. For example, some sources obtain their revenue and funding through the sale of fish and wildlife hunting licenses and fees. This lack of revenue may make it more difficult for other sources to fund fish and wildlife costs.</p> <p>RO-3 The elimination of all hatcheries and hatchery-produced fish would likely result in a decrease in the ability to fund fish and wildlife costs. Other funding sources would also be limited in their funding as reductions in hatchery-produced fish may result in decreased revenues from fishing licenses. Ratepayer funding would be limited to MSR and any increased costs would likely be transferred to other funding sources.</p> <p>RO-4 Breaching all mainstem dams would have substantial effects on funding costs. Ratepayers would no longer be responsible for mitigation or recovery costs associated with the dams. However, ratepayers may still be required to</p>

EFFECT AREA: FUNDING COSTS	
	<p>pay for some transmission-related mitigation. Other funding sources would be required to fund any continuing recovery or mitigation efforts. If species continue to decline, other funding sources may not be able to meet their costs.</p> <p>RO-5 Restricted growth and economic development would likely result in more difficulty in covering funding costs compared to Status Quo. Reduced demand for power from a decrease in economic development would result in less revenue and therefore less ability to fund fish and wildlife costs. Other funding sources would be affected similarly as reduced employment and economic growth results in less tax revenue and fishing and hunting licenses sold.</p> <p>RO-6 The elimination of tribal harvest would have some effects on funding costs. This would be a change in current Federal policy and, depending upon the circumstances, could be a taking of treaty rights requiring compensation from Federal appropriations.</p>
<p>RO-7 – RO-12 Extending Commerce Focus</p>	<p>RO-7 As less habitat is set aside, ratepayers would likely be able to maintain their ability to fund fish and wildlife costs, although funding priorities may shift. Ratepayer funding would be limited to MSR and any increased costs would likely be transferred to other funding sources. Other Federal funding sources could benefit, as there would a decrease in habitat mitigation efforts. However, state funding may be limited because of reductions in revenues from hunting and fishing licenses.</p> <p>RO-8 Allowing unrestricted harvest would likely have no effect on ratepayer funding costs. However, other sources may be required to increase artificial production efforts or other measures to sustain the harvest. This could result in substantial funding costs for other sources. In order to meet funding requirements, many of the costs associated with maintaining unrestricted harvest may be passed on to the industry.</p> <p>RO-9 Maximizing artificial production through fish farming would likely reduce the amount of funding costs for ratepayers and other sources. Private sector aquaculture would reduce the need for mitigation/supplementation hatchery production. There would still be funding costs associated with fish and wildlife mitigation and recovery activities, though they may be reduced.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem, including constructing new Federal dams, would have substantial effects on funding costs. Some of the revenue generated by increased power production would likely be used to meet new fish and wildlife mitigation and recovery activities as more land is inundated and more blockages to anadromous fish migrations are constructed. Ratepayer funding costs would likely increase dramatically, however, there would likely be matched with increased revenues. Other funding sources could have more difficulty in meeting their funding costs. Although there would be more tax revenue from commercial development, there would be a decrease in revenue associated with the anadromous fish harvest.</p> <p>RO-11 Maximizing the commercial use of natural resources would likely have some effects on funding costs. There would unlikely be any additional costs to ratepayers. However, other funding sources would likely experience increased funding costs required to mitigate for increased resource development. Some of the revenues generated from this increased development would be used to meet fish and wildlife costs. Therefore, other funding sources would likely be able meet their funding costs.</p> <p>RO-12 Allowing unrestricted tribal harvest would have little effect on ratepayer funding costs, compared to Status Quo. However, other funding sources may</p>

EFFECT AREA: FUNDING COSTS	
	experience increased funding costs as monies are spent to increase fish production. This increase in production would be needed to compensate non-tribal harvest.

EFFECT AREA: TRIBAL INTERESTS	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Protecting all levels of habitat would benefit tribal interests more than Status Quo. Newly protected areas could result in higher natural fish production, potentially benefiting tribal fish harvest. Other areas where important wildlife and plants are found would also be protected. This protection would allow for increased tribal tradition and health, as well as spirituality as areas return to a more natural appearance.</p> <p>RO-2 The elimination of all non-tribal fish and wildlife harvest would likely result in increase tribal hunting and fishing opportunities, as competition with non-tribal fishermen and hunters is reduced, and more fish and wildlife become available. Increased harvest opportunities would result in increased tribal health, tradition, and spirituality.</p> <p>RO-3 The elimination of all hatchery-produced fish would likely impact tribal harvest, health, and tradition more than Status Quo, as reduced fish numbers would result. Spirituality could benefit from the knowledge that the rivers are only full of naturally-spawning fish, however it may also be adversely affected as the availability of salmon for ceremonial use would decrease.</p> <p>RO-4 Removing all mainstem dams would likely result in short-term decreases in tribal fish harvest, until populations recover. This reduction in harvest could impact tribal health, spirituality and tradition. Further health problems could arise from increases in heavy metal bioaccumulation in fish. However, spirituality may be improved as a more natural river develops.</p> <p>RO-5 Restricted growth and economic development would likely impact tribal health as unemployment rates increase. Spirituality and tradition could also decline as poverty and accompanying social problems increase.</p> <p>RO-6 Since fish and wildlife are such an important component of native American Indian diet and culture, the elimination of tribal fish and wildlife harvest would substantially impact tribal fish harvest, health, spirituality, and tradition compared to Status Quo.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 The reduction in the amount of habitat set aside would result in substantial impacts to tribal interests compared to Status Quo. There would be fewer opportunities to harvest fish, wildlife, and plants, as well as experience the spiritual values of undeveloped lands important to the particular tribe.</p> <p>RO-8 Allowing unrestricted harvest could have two different effects on tribal interests. Increased commercial and recreational harvest could result in increased competition to tribal subsistence and ceremonial harvest affecting tribal harvest, health, spirituality, and tradition. However, increased harvest for commercial tribal harvest would likely result in increased tribal health, as employment increases.</p> <p>RO-9 Maximizing artificial production of fish through fish farming could impact tribal interests compared to Status Quo. Tribal fish harvest for subsistence and ceremonial purposes would be worse since the amount of</p>

EFFECT AREA: TRIBAL INTERESTS	
	<p>harvestable fish in the rivers would be dramatically less. However, salmon would be readily available thereby allowing tradition to continue, though somewhat more limited. Since salmon are important for health, increased salmon production would allow for increased tribal health. Spirituality could be impacted based on the decreased number of fish in the rivers.</p> <p>RO-10 Maximizing the commercial benefits of the hydrosystem could result in substantial impacts to tribal fish harvest, health, spirituality, and tradition. As new dams are built, lands used for traditional and spiritual uses would be lost. Fish harvest will be severely impacted by changes in hydro operations for irrigation, transportation, and power generation. There may still be some harvest opportunities as reservoirs are managed for recreational purposes.</p> <p>RO-11 As commercial uses of natural resources increase, tribal harvest, health, tradition, and spirituality would be adversely affected. The loss of habitat through resource use, extraction and development could affect fish and wildlife habitat, destroy important plants, and destroy places of spiritual value.</p> <p>RO-12 Allowing unrestricted tribal harvest of fish and wildlife would result in beneficial effects on tribal harvest, health, tradition, and spirituality. As more ceremonial and subsistence harvest is allowed, health, tradition, and spirituality increases.</p>

EFFECT AREA: CULTURAL AND HISTORIC RESOURCES	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Protecting all levels of habitat would reduce the effects on cultural and historic resources, compared to Status Quo, as resources are less likely to be disturbed.</p> <p>RO-4 Breaching the mainstem dams would result in the exposure of many cultural and historic sites. These sites could be impacted by exposure to the elements, vandalism, and theft. Construction of new power resources and transmission facilities could further impact cultural and historic sites.</p> <p>RO-5 Further restricting growth and curtailing economic development would likely result in decreased effects on cultural and historic resources compared to Status Quo. The decrease in ground disturbance and land clearing for development purposes would reduce exposure and destruction of these sites.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 Compared to Status Quo, there would likely be more impacts to cultural and historic resources, as less land is set aside and more development occurs.</p> <p>RO-10 Operation of the hydrosystem to maximize commercial benefits would result in less fluctuation of river and reservoir levels, thereby resulting in less exposure and damage to cultural and historic resources. Further construction of dams would result in the inundation of more land, limiting the accessibility of these sites.</p> <p>RO-11 The maximized commercial use of natural resources would result in more impacts to cultural and historic resources as these activities would disturb more ground and result in more land clearing.</p>

EFFECT AREA: AESTHETICS	
Reserve Options	Effect in Comparison to the Status Quo Condition:
RO 1 – RO-6 Extending Natural Focus	<p>RO-1 Protecting all levels of habitat would likely increase the aesthetics compared to Status Quo. By protecting a variety of habitat types, more aesthetic value could be extended to more people.</p> <p>RO-4 In the short term, breaching the mainstem dams would result in exposed mud flats that could be offensive to the olfactory and visual senses. However, in the long term, aesthetics would be increased as a free-flowing river is established. Aesthetic value could be diminished for those who prefer developed landscapes.</p> <p>RO-5 Aesthetics for those who enjoy natural landscapes could increase as growth and economic development is curtailed. However, aesthetics for those who appreciated developed landscapes could be reduced.</p>
RO-7 – RO-12 Extending Commerce Focus	<p>RO-7 Aesthetics for those who enjoy natural landscapes could decrease as less habitat is set aside, however, aesthetics for those who appreciated developed landscapes would increase.</p> <p>RO-10 Aesthetics for those who enjoy natural landscapes could decrease, compared to Status Quo, as the hydrosystem is further developed. However, aesthetics would increase for those who appreciate the commercial values of the river and prefer developed landscapes.</p> <p>RO-11 Maximizing the use of natural resources would likely result in decreased aesthetics, compared to Status Quo. Increased urbanization and industrialization typically would result in negative visual effects. Some industrial development could result in increased odors or sounds, further limiting an areas aesthetic appeal. However, aesthetics would increase for those who prefer developed landscapes.</p>

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Preparation for

CHAPTER 1
Purpose and
Need for
Action

CHAPTER 2
Policy
History

Implementing a
Decision

Comparison of
Alternatives

CHAPTER 3
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Chapter 6

Governance as an Issue

Governance Models

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Governance

**the Fish & Wildlife
Mitigation &
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CHAPTER 6 – GOVERNANCE

- **Defines some of the key issues, including fish and wildlife, surrounding the management of the Columbia River Basin.**
- **Describes the governance structures that have been tried in the past and that exist today.**
- **Proposes possible future governance models for fish and wildlife management in the Region and provides a methodology for analyzing them.**

Establishing a regionally acceptable governance structure is difficult. This chapter provides information that the Region may use to gain perspective on governance issues. The simplified model may offer a foundation for establishing an acceptable future structure for managing fish and wildlife in the Region.

6.1 GOVERNANCE AS AN ISSUE

Governance: *To direct or manage the public policy and affairs of rule.*
(Webster's II: New Riverside Dictionary, 1984)

*Note: The purpose of this EIS is to provide the reader with enough policy background (Chapter 2) and understanding of the alternatives and their environmental consequences (Chapters 3, 4, and 5) that an informed decision may be made about funding and implementing a coordinated fish and wildlife mitigation and recovery plan in the Basin. The actions of the Plan may then be implemented by any governing body. **The form that governance takes is less important to the outcome than the degree to which the governing parties are able to act in concert.** Because the choice of governance structure comes after the necessary decisions about the Plan, information on governance is placed after the chapters on the alternatives.*

For 180 days in 1997, the Council met to review Fish and Wildlife Governance Issues. They heard repeatedly that it seemed as though no one was "in charge" of Columbia River fish and wildlife policy. Some criticized—and still criticize today—the lack of a single entity with the comprehensive knowledge, insight, and authority to make long-term decisions regarding fish and wildlife issues. Others condemned—and still condemn—the dominant role of the federal government in regional fish and wildlife mitigation and recovery. These varied viewpoints reflect the complexity of the governance issue.

In fact, as discussed below and in Chapter 2 of this EIS, over the past several decades, the designation of who is "in charge" of the various aspects of fish and wildlife management in the Region has shifted constantly among federal and state agencies, courts, and other

entities. What is important to note, however, is that there has been no corresponding shift in environmental effects. The method of governance has no direct bearing on the environmental effects. The effects on the environment come when agencies, organizations, and individuals take *actions* on the ground, in the air, or in the water, regardless of whether they are following an overall plan or whether, as today, they are working under multiple plans and authorities.

Thus, the key element for governance is not the particular form that governance has taken or will take, but the level of commitment to work together as a cohesive unit. Success or failure will be determined, not by the structure used for governance, but by the degree of commitment of the involved parties to any plan. For example, many river-basin agreements have collapsed because the parties could not agree and/or commit to a single plan. Over time, these failures have led to independent and uncoordinated actions; the actions in turn have led to some of the troubles the Region faces today with its fish and wildlife mitigation and recovery efforts.

The entries below trace some of the major efforts to establish umbrella organizations to govern management of the Columbia River. They also show how the lack of ability to gain commitment affected the eventual outcome.

6.1.1 1937: The Columbia Valley Authority

In 1937, as Congress was debating how best to guide natural resource management in the Northwest, the Columbia Valley Authority (CVA) was proposed as a comprehensive federal plan to develop the Basin. The CVA would have inherited general jurisdiction over development for navigation, flood control, power generation, reclamation, and recreation in the Basin. It could have engaged in mining development and encouraged conservation of soils, forests, and rangeland. It also would have had the authority now exercised in the Basin by the USFWS. It would have been authorized to plan for "the unified development of the Columbia Valley region," including virtually all aspects of federal natural resource development and conservation.

However, because the proposal generated considerable opposition, it was abandoned in a 1937 compromise. Instead, BPA was created as a "temporary" entity to market the federal dams' energy output. Little or no attention was paid to other issues such as fish and wildlife management. The decisionmakers rejected a *centralized* approach to river governance, and favored a *decentralized* approach. Abandoning the idea of the CVA meant that individual federal agencies would continue to make decisions about those resources that had traditionally been under their jurisdictions. This policy of dividing control of resources continues to the present. The policy mirrors the development of the Northwest, where "discrete spheres of economic interest"¹ divided the natural resources of the Basin among them and sought to use these resources fully, without regard to how their activities might affect other resources.

¹ Lichatowich, J. 1999, p. 50.

6.1.2 Governance in the 1940s

By the 1940s, so many projects and players—federal, state, local, private—had an interest in "governing" the significantly altered river flows in the Pacific Northwest that harnessing their efforts as one team was beyond negotiation. That default policy already exhibited two major characteristics that form the basis of today's criticisms of river governance: control was primarily *federal* and it was *fragmented* (divided among several agencies—the "no one is in charge" problem).

Specifically, operation of the dams on the mainstem of the Columbia and Snake rivers was federal. Water diversions, especially from the tributaries, fell mainly under jurisdiction of the states and the Bureau. Private property rights were inextricably interspersed with public issues. The mix would later be further complicated by the international nature of the Columbia River (see Section 6.1.4, below).

6.1.3 1950: The Columbia River Compact

During this period of time, the states were also trying to work toward cooperative governance. They tried to form a Columbia River Compact that would coordinate interstate river governance. An interstate compact was first proposed in 1911 by Governor Oswald West of Oregon. Congress passed enabling legislation in 1925, the same year as the Rivers and Harbors Act. In 1943, the governors of Idaho, Montana, Oregon, Washington, and Wyoming formed the Northwest States Development Association, in part to evaluate potential for a water compact. The upswing in federal water development that followed World War II gave the idea new impetus. In 1949, several governors asked Washington's Governor Langlie to lead an effort to develop a compact. The compact commission met in 1950, beginning nearly two decades of active negotiations.

However, hydrology and politics posed formidable obstacles to agreement. Forty-four percent of the river flow originates in Canada. In the United States, 70% of the flow comes from headwater states (Idaho, Montana, Nevada, Utah, and Wyoming). Yet, during the early negotiations, 63% of the population was in the lower basin, in Oregon and Washington. Those who had water and those who needed it lived in different places and had different interests and points of view. The numbers themselves best illustrate the parties' positions (see Table 6.1-1 on the following page).

Under typical water compacts, water allocation is the central question. However, the proposed Compact raised more diverse issues, such as the allocation of electric power generated by the dams. The negotiations also addressed water allocation issues in the Snake River. At the time, the Columbia River was thought to have enough water that a specific allocation was not necessary. In the case of the Snake River, Idaho argued that downstream non-consumptive uses should be subordinated to upstream irrigation. The United States insisted on preventing upstream depletion in order to protect federal projects downstream.

Table 6.1-1: Distribution of Water Resources vs. Population

	Percent of Water	Percent of Population
Idaho	47.6	9.4
Montana	17.1	9.5
Washington	15.3	38.3
Oregon	12.9	24.5
Wyoming	6.1	4.0
Nevada	1.0	2.5
Utah	—	11.8

Source: Doerksen, H. "Columbia River Interstate Compact," quoted in A River in Common, Report to the Western Water Policy Review Advisory Commission (Volkman, 1997, p. 45).

6.1.4 1964: The Columbia River Treaty and the Coordination Agreement

Upstream complications were not limited to those within the borders of the United States. The 1964 Columbia River Treaty (between Canada and the United States), adopted for power and flood control purposes, committed the United States to coordinate internal hydro operations on the U.S. side of the border. Without coordination, full advantage could not be taken of the new storage created by the construction of three new dams (Mica, Duncan, and Keenleyside) on the northern portion of the Columbia River and of the U.S.'s Libby Dam on the Kootenai River.

The Corps, BPA, the Columbia River Treaty's U.S. Entity, and some of the Region's utilities entered into the Pacific Northwest Coordination Agreement (PNCA), which still governs power operations of the hydro system. The PNCA, built on 20 years of voluntary cooperation through the Northwest Power Pool,² was based on the concept that the Columbia River power system is both hydraulically and electrically connected, and that upstream storage operations therefore affect downstream generation. Coordinating these facilities as though they had a single owner would enable all parties to benefit more than if each were acting for its own account. This agreement enabled much greater power generation than before; however, it did not address navigation, recreation, irrigation, municipal use, or effects on fish and wildlife.

6.1.5 Governance in the 1960s and 1970s

With the development of the PNCA, most of the organizational arrangements for the Columbia and lower Snake river systems were in place. The fourteen federal dams in the Columbia and lower Snake rivers are called the FCRPS (Federal Columbia River Power System). The PNCA requires that operation of the non-federal dams controlled by various utilities be coordinated with FCRPS operations. Mechanisms to coordinate hydropower and flood control, navigation, and irrigation were hammered out over a period of many years.

² The Pacific Northwest Power Pool, formed during World War II; serves as a forum in the electrical industry for reliability and operational adequacy issues in the Northwest. The group promotes cooperation among its members in order to achieve reliable operation of the electrical power system, coordinate power system planning, and assist in transmission planning in the Northwest area.

Entering the 1970s, river management in the Basin was founded on optimizing power generation. With the completion of the dams, locks, and canals built during the 1930s, 1940s, and 1950s, the river also provided a good avenue for navigation, irrigation, and a significant measure of flood control. The limited governance focus was successful for these issues. At the same time, the "uncoordinated" approach—the dominant "every man for himself" basin economic policy for many years—worked well to reap economic benefits for many.

However, in the 1960s and 1970s increasing questions, concerns, and actions rose out of the environmental movement. The *US v. Oregon* decision (Belloni decision) affirmed the right of Columbia River treaty tribes to up to half of the salmon available for harvest. People became more informed, and more concerned, about the shortage of fish and other environmental effects arising from the policy of generating the maximum economic benefit from the Region's natural resources. From the perspective of the fish and wildlife resource, governance was uncoordinated, and resources were being depleted year after year without replacement—results of the fragmented, multiple-jurisdiction approach to natural resource management. The policies that had enabled commercial success were beginning to be perceived as taking an unacceptable toll on the environment.

6.1.6 Governance in the 1980s to the Present

Although the federal government retained a critical role in management of the Columbia River and its fish and wildlife resources, in the 1980s legislation and policies were enacted that attempted to provide for a shared approach to governance. As noted in Chapter 2, changes in the governance of the Columbia River were profound after Congress passed the Regional Act in 1980. The Act gave the Pacific Northwest states, Indian tribes, local governments, consumers, customers, users of the FCRPS, and the general public in the Region a greater role in Columbia River Basin decisions. The Act established the Council to facilitate cooperation among the states of Idaho, Montana, Oregon, and Washington. As members of the Council, the four states became the primary overseer of the Regional Act's planning provisions. But even with the assistance of this Act, the debates over governance have continued. Concerns over the multiple—and frequently conflicting—uses have increased. River governance has reached a point where veto has become commonplace, and consensus has often been unattainable.

6.1.7 Governance: Key Elements

Given the difficulties outlined above, the Region is taking a serious look at developing alternative—better—governance models. The next section (6.2) presents those models. The three basic concerns when governance is discussed are:

1. Is the model to be centralized or de-centralized?
2. Does decisionmaking rest with an individual person or organization or with group collaboration (such as a Board)?
3. Does the Region have control, or does control rest with others outside the Region?

These three questions have been the subject of many regional debates, which have so far failed to produce consensus. Because no one has been able to agree on the answers or the proper direction, these issues remain unresolved, and the parties fall back on today's governance structure—multiple plans and uncoordinated efforts. Today, the evolution of governance continues to be an issue throughout the Region, as multiple new models for the future are proposed. These models are described below.

6.2 FUTURE GOVERNANCE MODELS

The governance models described below have been "ranked" or evaluated with regard to the three distinct concerns discussed above:

- **Centralization:** the degree to which a model places the decisionmaking authority in a single entity.

A rating of "1" in this category means a single decisionmaking authority; a rating of "10" would represent multiple decisionmakers.

- **Coordination:** the degree to which a model allows for the contribution from interested parties in the Region (e.g., federal, state, and tribal governments; business groups; environmental organizations; etc.).

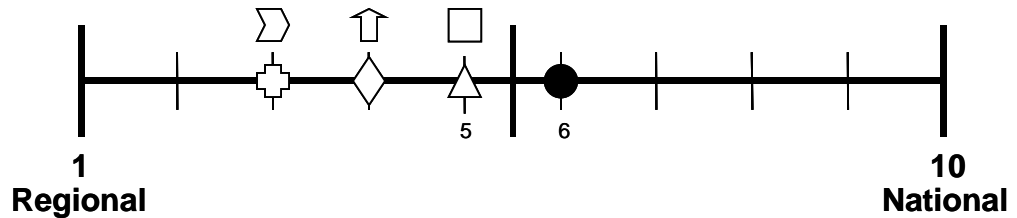
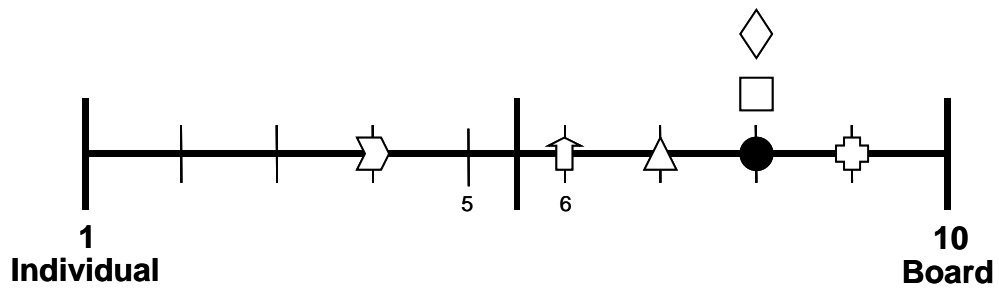
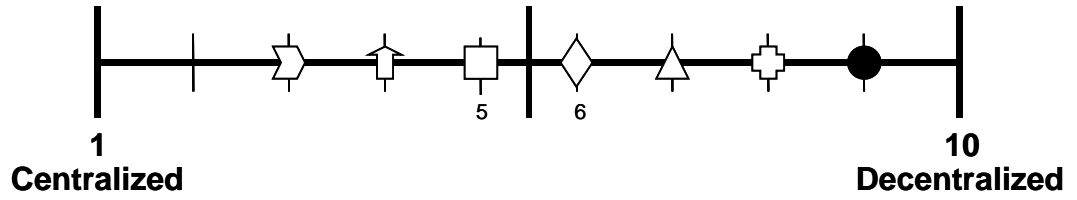
A "1" in this category would indicate absolute power in a single entity without any need to coordinate, while a "10" would represent decisionmaking only through complete agreement among all interested persons.

- **Regional Authority:** the extent to which a particular model limits decisionmaking to regional entities.

A "1" in this category would confine decisionmaking to in-region authorities, while a "10" would equate to all decisionmaking authority outside of the Region.

Figure 6-1 shows the different proposed models (Current Model, Columbia River Basin Forum, Power Council/Tribal Member, Regional Resources Council, Regional Resources Council plus Watershed Council, Regional Endangered Species Agency for Hydropower, and Comprehensive Agency for the River) and where they fall in a ranking based on the three concerns. Other models are certainly possible and may be considered, if an agreement can be reached and a plan established.

Figure 6-1: Evaluating Governance Models



- **Current Model**
- △ **Columbia River Basin Forum (formerly the Three Sovereigns)**
- **Power Council with Tribal Member**
- ◇ **Regional Resources Council**
- ⊕ **Regional Resources Council plus Watershed Council**
- ↑ **Regional Endangered Species Agency for Hydropower**
- ⤵ **Comprehensive Agency for the River**

6.2.1 Current Model

Ranking:	Centralization	9
	Coordination	8
	Regional	6

This model includes federal management of hydropower, flood control, navigation, and irrigation. The states manage permitting processes for water diversions from the river, instream flow programs in tributaries, and water quality pursuant to the CWA. The Council develops a program to mitigate the fish and wildlife effects of the federal dams. Indian tribes, many of which do not perceive that their interests are adequately protected in federal or state forums, have their own mitigation plans asserted in administrative, judicial, and legislative processes. Federal agencies consult with Indian tribes in a "government-to-government" process.

6.2.2 The Columbia River Basin Forum (formerly referred to as the "Three Sovereigns")

Ranking:	Centralization	7
	Coordination	7
	Regional	5

The "Three Sovereigns" refers to the federal government, state governments, and Northwest tribes. This proposal would provide a high-level policy forum in which federal, state, and tribal governments would address, collaborate on, and coordinate basin-level policy; planning, decisionmaking, and implementation issues; and processes that affect the Columbia River Basin ecosystem. Focus would be first on fish, then on other affected resources. Supported by a staff, state, federal, and tribal representatives would participate in a forum. Collaborative decisionmaking would be used for some major issues, and particularly those in which the "Three Sovereigns" jointly investigate, analyze, debate, create a decisionmaking record, and recommend a decision regarding an issue. This proposal would "equalize" the power of all participants and give credence to their joint recommendations.

The principals' forum would have four states, thirteen tribes and one federal representative, reflecting the principle that each entity is a sovereign and should, if possible, bring a single perspective to the policy table. However, as a practical matter, a smaller group more closely reflecting operational authority would implement policy. Thus, the operational work would be handled by a committee of four state, four federal, and four tribal representatives. This Model recognizes that government entities are charged with certain responsibilities by law and must discharge these responsibilities, regardless of whether they are consistent with the position taken by the single representative in the process.

6.2.2.1 Analysis of the Proposal

The Issue: The (implicit) issue that the former Three Sovereigns model tries to address is the lack of a forum in which federal, state, and tribal governments can (1) collaborate on terms of equality, and (2) unify federal, regional, and tribal fish and wildlife policies.

Existing forums are perceived as constraining participants to certain subjects, processes, decision rules, and decisionmakers that some parties mistrust. The Region now has multiple fish and wildlife mitigation and recovery plans that compete for attention and resources. The Basin has no unified policy to which everyone subscribes, and there is no single forum in which to try to bring these plans together.

Authority: The Three Sovereigns' process would confer no legal authority, but it would respond to its problem statement by equalizing the authority of all participants, at least within the Three Sovereigns process, and establishing a common commitment to finding joint solutions. The assumption is that shared information, process, and commitment to finding solutions will foster consensus. Once an issue leaves the Three Sovereigns' process, it would re-enter a legal arena in which parties and processes have disparate power and goals. However, the assumption is that if the Three Sovereigns agree on a recommendation, the recommendation will continue to carry significant weight.

6.2.3 Appoint Tribal Members to the Council; Use the Council Process to Address a Wider Range of Issues

Ranking:	Centralization	5
	Coordination	8
	Regional	5

The governors would appoint some tribal representatives as members of the Council, and the Council and its staff would support collaborative work on a broader range of issues touching the river than the Council currently addresses. This approach assumes that, with its existing authority, the Council can facilitate collaborative work on almost any river-related issue that its members agree to consider.

This model is essentially the same as the current model, except that tribal members would be directly appointed to the Council. This would increase regional coordination compared to the current model.

6.2.3.1 Analysis of the Proposal

The Issue: The alternative assumes that the primary issue with the existing Council is that it lacks members from tribes.

Authority: The alternative assumes that the existing Council authorities are sufficient to permit the Council to facilitate collaborative efforts on any key Columbia River Basin issue.

6.2.4 A Regional Resources Council

Ranking:	Centralization	6
	Coordination	8
	Regional	4

A new more broadly representative and authoritative council would be authorized to develop an integrated resource plan to offset the effects of hydropower facilities on anadromous fish, resident fish, and wildlife in the Columbia River Basin. This Resources Council plan would link and integrate fish and wildlife obligations, power system operations, energy conservation, and resource needs. There would be some number of state and tribal representatives; a super-majority vote would be required for major decisions; and there would be mandatory deadlines for action.

6.2.4.1 Analysis of the Proposal

The Issue: The new Resources Council model aims to fix problems in the Council's fish and wildlife process. The model asserts four issues with the existing Council:

- (1) although tribal recommendations play an important role in the process, the model lacks tribal representation, which can limit its effectiveness;
- (2) it lacks sufficient authority with regard to federal agencies;
- (3) the Council's program must be based on disparate recommendations of fish and wildlife agencies, tribes and others, which ensures a fragmented plan; and
- (4) the Council lacks the power to monitor and evaluate the results of its program.

Authority: All federal agencies (including NMFS, USFS, and others) would have obligations with regard to the Resources Council's plan. Currently, only the agencies that operate the hydropower system have such obligations. However, the Resources Council would retain the limitation in the Council's current authority: although federal agencies' actions must be consistent with the Resources Council plan, that plan would be implemented only if consistent with federal authorities. In this sense, the Resources Council would represent an incremental increase in authority vis-a-vis federal agencies.

The Resources Council would participate in federal agency consultations under the ESA, not supplanting existing federal agency authorities, but ensuring the Council an opportunity to assert a system-wide perspective in hydropower operations. The Resources Council would play a strong role in federal agency fish and wildlife budgeting.

The Resources Council would have greater autonomy in developing fish and wildlife policy, working from its own information and analysis—including independent scientific analysis—instead of from recommendations of fish and wildlife agencies and tribes. This would respond to Return to the River's criticism that the current system, which gives legal weight to disparate recommendations, fosters fragmented policy.

6.2.5 A Regional Resources Council plus Watershed Council

Ranking:	Centralization	8
	Coordination	9
	Regional	3

This proposal adopts many of the features of the Regional Resources Council Model, with the addition of a local "Watershed Council" to propose and approve local measures. This proposal would add another level of decisionmaking not present in any other models.

6.2.5.1 Analysis of the Proposal

This approach would focus decisions on watershed conditions and only incidentally on fish and wildlife species. In theory, healthy watersheds provide the conditions for healthy fish and wildlife populations.

Section 4(h) of the Regional Act would be amended to substitute the words "conserve and restore the biological productivity of natural watersheds," in lieu of "protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat." The program development guidelines in Section 4(h)(6) of the Act would be otherwise unchanged, as would the Act's requirement that the Council's Fish and Wildlife Program be designed to deal with the Columbia River and its tributaries as a system. The Resources Council would adopt a program to satisfy the revised purpose of the Act by identifying measures to protect and restore biological functions in watersheds, as measured by the biological needs of key species. The Resource Council's program would directly address the following: (1) conditions in the mainstem of the river; (2) artificial production policies, insofar as they raise issues that transcend individual watersheds; (3) standards to guide watershed planning; and (4) criteria for setting priorities for funding watershed actions. Watershed organizations would develop habitat, natural production, and other measures for individual watersheds. The Resources Council would establish membership and procedural standards for watershed organizations. Watershed groups satisfying these standards would submit proposals for planning funds to the Resources Council. After development and approval of watershed plans, implementation funds would be allocated consistent with the Resources Council's criteria.

The program would be designed to satisfy the habitat conservation plan requirements of Section 10 of the ESA, which exempts an activity from the prohibitions and requirements of the Act if and when an appropriate plan has been adopted and implemented. The Resources Council's program would be considered a systemwide habitat conservation plan. In the absence of a final Resources Council program, all provisions of the ESA would remain in effect. The ESA would not need to be amended.

Any of the approaches to independent scientific review could be applied to this program, but they would be focused on watershed functions rather than species effects *per se*.

Judicial review of Resources Council decisions would be available, and financing would be shared between hydropower revenues and federal appropriations in the same proportion as currently occurs now.

6.2.6 A Regional Endangered Species Agency for Hydropower

Ranking:	Centralization	4
	Coordination	6
	Regional	4

A Northwest Rivers Commission would be established "to protect and restore a healthy, sustainable Northwest fishery," particularly ESA-listed species. An advisory council would assist the Commission with subcommittees for river operations; fish resources and facilities management; fish harvest; agriculture and irrigation; and public land management. The Commission would assume most ESA functions, subject to approval by the President. The Commission would: determine whether proposed actions jeopardize listed species; develop recovery effort plans for ESA species; approve incidental take permits; and develop habitat conservation plans. The President would have the power to veto the Council's actions only if they are inconsistent with the ESA. The 10-person Commission would include two governor-appointed members from each state, and two tribal members appointed by Secretary of Interior. The pattern of representation—eight state and two tribal representatives—implies that state interests should be better represented in ESA decisions.

6.2.6.1 Analysis of the Proposal

The Issue: The primary issue with this approach is federal implementation of the ESA.

Authority: The approach would leave ultimate ESA decisionmaking authority with the President, but would authorize the Region to make judgments under the Act first. As such, it would give the Region significant participation in decisions on river operations, harvest, habitat, and hatchery operations.

6.2.7 A Comprehensive Agency for the River

Ranking:	Centralization	3
	Coordination	4
	Regional	3

This agency (a unified Commission) would develop and implement comprehensive long-term and annual plans for federal project operations, species conservation, and water quality and quantity. Integrated policies would cover management of federal (and federally licensed) water projects; interstate standards for water banking, conservation and related issues; mitigation planning for fish and wildlife affected by the waters of the system; and water quality for the Columbia River. This model sees the problem as the multi-government's fragmented approach to a hydrologically and ecologically integrated

and managed river system. The model would not tie Commission authorities to the current ESA, the Regional Act, the CWA, and other laws. Regardless of how these laws change, the river agency would manage the river in an integrated way to meet evolving needs.

Membership would be made up of the governors of the four states (or their designated alternates); one or more Presidentially-appointed federal representative(s); and tribal representatives. Determining the balance of state and tribal representation involves many of the considerations mentioned in connection with other models, with this difference: this model is broader than fish and wildlife and encompasses an evolving spectrum of interests in the river.

6.2.7.1 Analysis of the Proposal

The Issue: This model addresses the issue as not just fish and wildlife, hydropower, or the ESA. Rather, the issue is government's fragmented approach to a hydrologically and ecologically integrated river system. Although the river supports different uses and resources, each is affected by how the river is managed for any of the others.

Authority: The alternative is loosely modeled on the Delaware River Basin Commission, a federal-state compact with broad authority over water quality, quantity, reservoir operations, and development permitting. This model would adapt the Delaware model by bringing in species conservation issues.

The ESA and other federal laws (CWA, treaty obligations, etc.) would apply to the river agency as though it were a federal agency. The agency would not supplant NMFS, USFWS, EPA, and others, but would be required to consult with them to determine whether the river agency's plans and projects comply with applicable laws. Regardless of how these laws change, the river agency would manage the river in an integrated way to meet evolving needs. As an alternative: the river agency could "stand in the shoes" of NMFS, EPA, and other agencies, and assume their role as arbiters of compliance with the ESA, the CWA, and other laws.

6.2.8 General Governance Comments on the 5-Year Implementation Plan

In the summer of 2001, the 5-Year Implementation Plan³ prepared for implementation of the most recent BiOps was submitted to the public for comment. Many parties included suggestions that bear on the issue of future regional governance.

We have included, in tabular form, these general suggestions in this section of the EIS, so that future decisionmakers will have the benefit of these ideas when considering various governance options. Of course, as noted earlier, the key element for governance is not the particular *form* that governance will take, but *the level of commitment to work together as a cohesive unit*. Success or failure will be determined by the degree of commitment by the involved parties to any plan. Table 6.2-1 below, presents these

³ USDO/Bureau, Corps, and BPA 2001a.

comments, together with an identifying number so that the reader may locate these in the larger comment document prepared for the 5-Year Implementation Plan.

Table 6.2-1: General Governance Comments on the 5-Year Implementation Plan

Commenter	Comment
<p>Dirk Kempthorne, Governor of the State of Idaho</p>	<p>"Establish for each Basin State a committee, which will be chaired and led by the State, to assess the effects of mitigation actions on resident fish populations and to develop standards or affirmative measures to avoid unnecessary or unlawful harm to such populations."</p>
	<p>"Include representatives from the Basin States on the Technical Oversight and Data Support System Committees, or any other committee whose purpose includes risk-assessment evaluation of recovery options, and should adopt written procedures to ensure ongoing, iterative collaboration with the States in all aspects of the development and implementation of the Agencies' RM&E program."</p>
	<p>"Establish a committee for each Basin State, which will be chaired and led by the State, to review sources of funding that may be available for Columbia River Basin mitigation-related actions undertaken by nonfederal entities and to make recommendations concerning simplification or integration of funding mechanisms."</p>
	<p>"[Support] the ongoing harvest discussions/negotiations in <i>United States v. Oregon</i> [and use them] as a mechanism to augment further technical analysis on the effect of harvest activities and development of methods to minimize incidental take of listed fish."</p>
	<p>"Idaho questions how this balancing [of the needs of ESA listed anadromous fish and those of resident ESA listed fish like the Kootenai River Population of White Sturgeon] can be achieved under current law. If such balancing can be successfully achieved, the States must be on equal footing with the Federal Government. In formulating recovery measures, the Action Agencies must engage in affirmative Basinwide governmental and community outreach efforts to ensure affected interests are fully identified and considered. Goal 4 should acknowledge that the FCRPS and related conservation measures will be managed to prevent further listings of species, in addition to the existing language about balancing conservation measures."</p>
	<p>"Performance standards [in the Four Governors Plan] must be grounded in the best available science ... technically valid as a measure of the success of actions taken to achieve salmon recovery... [and] subject to peer review."</p>
	<p>"[Include] language in the introduction of Chapter 4 [Implementation Plan] providing for the creation of a performance-standards technical committee composed of federal, state, tribal, and public representatives that would have responsibility for assessing the preliminary standards' scientific integrity and recommending modifications."</p>
	<p>"[Include] language in the section 4 [Implementation Plan] introduction providing for the creation of a crediting-system technical committee composed of federal, state, tribal, landowner and public (e.g., environmental group) representatives to develop for recommendation to the Action Agencies a crediting system that is scientifically sound and consistent with the Agencies' limited off-site authority."</p>
	<p>"[Improve] coordination between NMFS and the NWPPC."⁴</p>

⁴ Note: This EIS uses "Council" as the acronym, rather than "NWPPC;" they refer to the same entity.

Commenter	Comment
	"Implement a decision-analysis structure that evaluates (a) the biological benefits and risks of alternative management options, (b) the risks attendant to scientific uncertainties associated with these options, and (c) the evidence supporting key alternative hypotheses, and then provides a framework for assessing alternatives to provide scientifically defensible advice to decision makers."
	"[Give states] the authority to prioritize ... actions in individual sub-basins using the NWPPC's subbasin planning approach ... on the state level."
	"Develop Snake Basin fall chinook plan with state, tribal, and federal parties."
	" <i>United States v. Oregon</i> -directed supplementation, as identified in Mountain Snake Provincial Review."
	"[Include] Idaho ... in the formulation of the RM&E Plan, including a role in the policy guidance to the [Technical Oversight Committees] States should play a role larger than just technical review of proposals and products."
	"[Identify] a process and standards for coordinating federal recovery planning and NWPPC subbasin planning."
	"[Integrate] ongoing instate natural production monitoring ... with basinwide recovery planning and evaluation."
State of Washington, Department of Fish and Wildlife	"Include coordination with Canada to improve the quality of water entering the FCRPS and [expedite] the installation of flow deflectors at Chief Joseph Dam and other facilities."
Northwest Power Planning Council	"The action agencies [should] fully engage in provincial review to propose, encourage, and help shape the projects that are proposed [in the Biological Opinion] to be responsive to the habitat Action Items and ... use the Council's documentation process to help show how [the action agencies] are addressing each Action Item."
John A. Kitzhaber, Governor of the State of Oregon	"The ... action agencies should describe whether, when and how the [Oregon Department of Fish and Wildlife's] recommendations will be addressed."
	"Communication efforts with the states and tribes [similar to the October 2, 2001, open Federal Caucus meeting] for 2003 [should] occur earlier in the process."
State of Oregon, Department of Fish and Wildlife	"[Develop and implement] an RM&E program ... collaboratively [with] federal, state, and tribal entities, and ... rely on independent scientific review for quality control."
	"[Include the states and tribes as] members of the RM&E Technical Oversight Committee and Data Management Technical Oversight Committee. ... Incorporate formal peer review in [the committees'] planning process ... by including independent scientific review."
	"Work with the states and tribes to define the types of RM&E actions we, as a region, agree are necessary for each level and management scale."
Spokane Tribe of Indians	"[Carefully observe] the separation between the NWPPC's Program and ESA Implementation Ensure that the NWPPC's Program – and associated budget – are not reduced to being mechanisms for review and approval of only ESA projects. The NWPPC Program must be adequately funded to meet non-ESA needs, particularly mitigation monies."
	"[Develop] draft plans ... <i>with</i> Tribes and States, <i>then</i> [release them] for public comment. ... [With regard to adaptive management, have] an established, repeating participatory process for federal, state and tribal input through the implementation period."

Fish and Wildlife Implementation Plan EIS
Chapter 6: Governance

Commenter	Comment
	"[Allow] flexibility to incorporate ... existing processes under the umbrella of a Three-Sovereigns-type policymaking body that offers full representation of the Basin's Federal, State, and Tribal governments. At this crucial time, the region cries out for leadership to collectively supervise the implementation of the BiOps, with ongoing policy-level reassessment over time."
Colville Confederated Tribes	"[Identify] the need to conduct trans-boundary coordination where appropriate, [such as in the Okanogan subbasin, which] is unique in that it crosses an international boundary."
	"[Identify a] mechanism ... to allow direct coordination with the Public Utility Districts of the Mid-Columbia."
	"[Coordinate] recovery efforts with Grant, Chelan, and Douglas County PUD's."
	"[Identify] a specific mechanism to effect coordination between the Action Agencies, local governments and interest groups, the Northwest Power Planning Council, and the Governor's Salmon Recovery Program."
Jan Castle	"[Forge] a creative partnership with other entities such as cities (Portland would be first on the list), environmental groups, churches and civic organizations ... to produce a powerful plan to reduce power use across the board."
Save Our Wild Salmon Coalition	"Address how the agencies expect to coordinate their efforts with those of state, tribal, and private landowners Incorporate a more thorough explanation of how the multi-level cooperation necessary for achieving the BiOp's goals will occur."
	"[Do not let the convenience of relying] on past and current planning processes and project solicitations ... [such as] the habitat and harvest priorities established in large part by non-ESA related regional efforts ... to outweigh the scientific determinations that must be made to assess which actions are the most crucial for species survival and recovery."
	"Propose a water plan for use in dry years, action, such as sliding scale that identifies where and when spill and flow augmentation should be initiated and increased, depending on the water year and other considerations such as the number and priority of fish in the river that would benefit from spill and power system reliability."
Upper Columbia Regional Fisheries Enhancement Group	"[Explicitly recognize] landowner-based restoration programs such as the Upper Columbia RFEG and the more general State-wide RFEG program ... in section 9.0 and subsection 9.5 Provide a mechanism that encourages and ensures willing participation of private landowners [Explicitly recognize] landowner-based restoration programs, such as [the WDFW's Regional Fisheries Enhancement Group's program] ... in section 9.0."
Maia E. Genaus	"[Include] FERC ... in the agencies involved."
	"[Include] all affected human parties in this process [in] a forum in which each affected human party can see all the other affected human parties, as well as the larger environmental picture."
Bernie A. Swift	"[Do not implement] the planned action ... strictly in conjunction with the ESA at the expense of farmers and the general public's needs for water and electricity."
WaterWatch of Oregon	"Require the immediate development of memorandums of agreements or understandings between federal agencies and state water resources agencies ... [to] aid federal and state water use enforcement programs that will protect and restore streamflows."

Commenter	Comment
Idaho Water Users Association	"[Allow] the ongoing mediation effort ... to run its course without additional complications or pressures. [Do not permanently acquire] flow augmentation water ... until the 'efficacy' of the flow targets at Lower Granite Dam is resolved."

It is important for the reader to remember that the governance structure lies behind and supports the overall makeup of the regional fish and wildlife policy being followed. Any governance structure and the people implementing it will have to keep in mind concerns for the following:

- natural environment;
- socioeconomics of the Region;
- differences in regional values among groups and individuals;
- legal parameters and limitations; and
- political pressures to act in certain ways.

However we as a Region choose to carry out our responsibility for public policy on fish and wildlife and determine the appropriate human intervention, we will need a governance structure to assure it is actually carried out. Any structure selected will need commitment of all parties to succeed.

➔ **See the Sample Implementation Actions, Volume 3, for more specific suggestions on possible actions for implementing a Policy Direction.**

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Chapter 7

Consultation, Review, and Permit Requirements

CHAPTER 7 – CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS

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- **This section addresses Federal statutes, regulations, and Executive Orders** that potentially apply to the proposed Policy Directions. In each case, the text provides a brief description of the applicable law or order and the compliance with the respective requirements. The conclusions stated here are based upon the analysis within the EIS and the appendices.
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7.1 NATIONAL ENVIRONMENTAL POLICY ACT

This EIS was prepared pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.), which requires Federal agencies to prepare environmental impact statements for major Federal actions that may significantly affect the quality of the human environment. Pursuant to CEQ regulations for the implementation of NEPA, major Federal actions include the adoption of formal plans or official policies that guide or prescribe alternative uses of Federal resources, upon which future agency actions will be based. Information about the potential environmental consequences of the actions must be made available to decisionmakers and to the public before decisions are made and before actions are taken. Decisions will be based on understanding of the environmental consequences and actions will be taken to protect, restore, and enhance the environment. Additionally, this EIS is a broadly scoped policy-level analysis. By design, BPA intends to tier those site-specific actions that are consistent with the selected Policy Direction to this EIS.

7.2 ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT

The Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536), as amended, requires Federal agencies to ensure that their actions are not likely to jeopardize endangered or threatened species or result in the destruction or adverse modification of their critical habitats. BPA, the Corps, and the Bureau have consulted with NMFS and USFWS regarding a fish and wildlife mitigation and recovery strategy and the effects of potential future actions related to the FCRPS configuration, operations, and maintenance upon listed threatened and endangered species. Consequently, NMFS and USFWS have issued Biological Opinions (BiOps).¹ BPA's decision to fund or implement fish and wildlife mitigation and recovery activities will reflect these ESA consultations. Therefore, no separate or distinct consultation is planned or necessary with respect to the alternative

¹ See Chapter 1, Section 1.3.2, for more on these Biological Opinions.

Policy Directions. A complete listing of species in the Region listed as endangered or threatened is included in Appendix C.

If site-specific implementing actions were to affect listed species in a manner or to an extent inconsistent with the BiOps, additional consultations might become necessary. Accordingly, the appropriate offices of the USFWS and NMFS would be contacted for lists of species. As necessary, Biological Assessment(s) analyzing the effects of the actions on any listed species would be prepared. These Biological Assessments would be forwarded to the USFWS and/or NMFS for their consideration, and the outcome of such consultations would be reflected in any subsequent NEPA process.

7.3 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 to promote conservation of non-game fish and wildlife species and their habitats. BPA is fully considering fish and wildlife needs in developing the alternative Policy Directions, assessing their impacts, and identifying potential mitigation measures. The Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) requires Federal agencies undertaking projects affecting water resources to consult with the USFWS when any body of water is impounded, diverted, controlled, or modified for any purpose. Most Policy Directions promote actions consistent with the 2001 USFWS BiOp on FCRPS operations. To the extent that BPA needed to re-consult with the USFWS, with respect to a Policy Direction or future site-specific implementing actions, the Agency would do so.

The National Wildlife Refuge System Administration Act consolidates various categories of wildlife ranges and refuges for management under a single program. The Act provides protection for both wildlife and refuge lands from destruction and injury. Several major National Wildlife Refuge areas are located within the scope of this analysis, including: (1) the Umatilla National Wildlife Refuge, (2) the McNary National Wildlife Refuge, (3) the Julia Butler Hansen National Wildlife Refuge, and (4) the Tualatin National Wildlife Refuge. Generally, any actions implementing the Policy Directions would only minimally affect these refuges. However, impacts are possible. Therefore, depending upon the potential impacts associated with the final decision, BPA will consider mitigation for the impacts on refuge lands.

The Migratory Bird Treaty Act requires that lands, waters, or interests acquired or reserved for purposes established under the Act be administered under regulations promulgated by the Secretary of Interior. These regulations conserve and protect migratory birds in accordance with certain international treaties; protect other wildlife, including threatened and endangered species; and restore or develop adequate wildlife habitat. BPA will comply with such regulations in implementing any actions consistent with the alternative Policy Direction.

The Pacific Northwest Electric Power Planning and Conservation Act (Regional Act) (16 U.S.C. 839 et seq.) contains provisions intended to protect, mitigate, and enhance the fish and wildlife (including their spawning grounds and habitat) of the Columbia River and its tributaries. The Pacific Northwest Electric Power and Conservation Planning Council (Council), established under the Regional Act, was entrusted with adopting a Fish and Wildlife Program for the Columbia River Basin and developing a Regional Electric Power and Conservation Plan (Plan). In implementing its mandate to assure an adequate, efficient, economical, and reliable power supply, BPA must give due consideration to the protection, mitigation, and enhancement of the Region's fish and wildlife resources. Any actions BPA takes (including implementing actions as well as acquisition of major resources, i.e., resources with a planned capability greater than 50 average megawatts acquired for more than 5 years) must be consistent with the Plan, except as otherwise provided for in the Regional Act or unless an exemption is granted by Act of Congress. BPA is coordinating with the Council to integrate any strategic system policy alternatives with the Council's Program and Amendments.

7.4 HERITAGE CONSERVATION

A number of Federal laws and regulations have been promulgated to protect the Nation's historical, cultural, and prehistoric resources. BPA must consider whether its actions might have an effect on a property listed or eligible for listing on the National Register of Historic Places, a property listed on the National Registry of Natural Landmarks, a property listed as a National Historic Landmark, a property listed on the World Heritage List, a property listed on a state-wide or local list, or the ceremonial rites or access to religious sites of Native Americans. This EIS is a policy-level analysis; however, consistent with Section 106 of the National Historic Preservation Act (16 U.S.C. 470), BPA will consult with the appropriate State Historic Preservation officers, and corresponding Tribal Historic Preservation officers, before undertaking any site-specific actions.

In addition, for over 10 years BPA has had a Programmatic Agreement with the Bureau; the Corps; USFS; the Advisory Council on Historic Preservation; the Idaho, Montana, and Washington State Historic Preservation Officers (SHPOs); the Colville Confederated Tribes; and the Spokane Tribe of Indians. This Programmatic Agreement addresses impacts on cultural resources from changes in elevation at the five major Federal storage reservoirs on the Columbia River system, satisfying BPA's responsibilities under Section 106 of the National Historic Preservation Act. The Programmatic Agreement also supports BPA's compliance with the American Indian Religious Freedom Act and the Native American Graves Protection and Repatriation Act by providing for BPA participation in the disposition of Native American burials if such sites are discovered.

7.5 ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Although this order does not create any enforceable rights, benefits, or trust responsibilities, it does direct Federal agencies to implement the order consistent with, and to the extent permitted by, existing law. Pursuant to this order, agencies should provide opportunities for community input in the NEPA process. Moreover, agencies should "identify potential effects and mitigation measures in consultation with affected communities."

The Order specifically applies to actions affecting Native Americans. Additionally, in 1996, BPA adopted a Tribal Policy.² The fundamental principles in the policy include the recognition of the unique character of each tribe, as a sovereign, and a commitment to government-to-government consultations to ensure consideration of tribal concerns before BPA takes actions that may affect tribal resources. Accordingly, BPA has worked to reflect tribal ideas, issues, and concerns into this EIS. Members of the EIS team presented displays and literature discussing the EIS and invited comments on our proposed action at the 17 Region-wide meetings during the spring of 2000 on the Draft NMFS FCRPS BiOp and the Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (Conceptual Plan).³ Separate EIS-only scoping meetings were also held during this period in Portland, Oregon, after notice in the *Federal Register*. In addition, following publication of the Draft EIS in June 2001, several public comment meetings were held throughout the BPA service area during the Draft EIS public comment period in the summer of 2001 (see Volume 2, which contains Appendix K, with the comment letters and meeting summaries).

As a result of these meetings, BPA was able to obtain valuable input from the tribes concerning potential regional fish and wildlife mitigation and recovery efforts. For example, this EIS includes a policy alternative (the "Weak Stock" alternative) that is based in part on the treaty tribes' recovery plan, Spirit of the Salmon (Wy-Kan-Ush-Mi Wa-Kish-Wit).⁴ Chapter 2 of the EIS includes discussion of historic impacts on tribal cultures from Euro-American settlement and resource use, as well as a discussion of current demographics of the Basin's Native American population. Chapter 5 includes specific actions and mitigation developed from plans written by the treaty tribes. The impact analysis for each policy alternative includes discussion of impacts on tribal resources and other resources upon which the Region's tribes depend. Thus, throughout

² USDOE/BPA 1996b.

³ Federal Caucus 1999b. [Formerly known as Draft "All-H" Paper.]

⁴ CRITFC 1996.

this EIS process, BPA has complied with the Environmental Justice order by engaging the tribes and examining the potential impacts on their communities and resources.

7.6 STATE, AREA-WIDE, LOCAL PLAN AND PROGRAM CONSISTENCY

The CEQ regulations for implementing NEPA (40 CFR §1506.2) require agencies to consider the consistency of a proposed action with approved state and local plans and laws. In accordance with Executive Order 12372, this EIS will be circulated to the appropriate state clearinghouses to satisfy review and consultation requirements.

7.7 COASTAL ZONE MANAGEMENT CONSISTENCY

The Coastal Zone Management Act of 1972 requires Federal actions to be consistent, to the maximum extent practicable, with approved state Coastal Zone Management programs. The Policy Direction alternatives examined here are not expected to have coastal zone impacts. If an action that could affect the coastal zone were undertaken in a subsequent site-specific document that is tiered to this EIS, BPA would consult with the appropriate state(s) to ensure consistency with the state programs.

7.8 FLOODPLAINS MANAGEMENT

Executive Order 11988 (Floodplain Management) and DOE regulations implementing the Executive Order (10 CFR Part 1022) direct BPA to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Avoiding impacts on floodplains by siting structures outside such areas will be addressed, as appropriate, during follow-on site-specific environmental studies that may be associated with the implementation of any of the Policy Direction alternatives addressed in this EIS.

7.9 WETLANDS PROTECTION

Executive Order 11990 (Protection of Wetlands) and DOE regulations implementing the Executive Order (10 CFR Part 1022) direct BPA to minimize the destruction, loss, or degradation of wetlands; and to preserve and enhance the natural and beneficial values of wetlands. Any site-specific actions tiered to this EIS will be evaluated to determine whether they include actions in or affecting a wetland or result in a net loss of wetlands. If a wetland would be affected, a finding must be made that there is no practicable alternative to affecting that wetland and that all practicable measures have been taken to minimize harm.

7.10 FARMLAND PROTECTION

The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) requires Federal agencies to identify and take into account the adverse effects of their programs on the preservation of farmlands. Any subsequent actions considered in an environmental document tiered to this EIS would be evaluated to determine whether those actions would convert farmland to other uses or cause physical deterioration and/or reduction in productivity of farmlands. A farmlands assessment would be prepared if any prime or unique farmland or farmland of statewide importance were affected.

7.11 RECREATION RESOURCES

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. The Act establishes requirements applicable to water resource projects affecting wild, scenic, and recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory. Under the Act, a Federal agency may not assist in the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. The terms of this act apply to several tributaries and reaches in the Basin's rivers. Any site-specific actions tiered to this EIS will be evaluated to determine whether they affect a component of the National Wild and Scenic Rivers System.

On November 17, 1986, Congress established the Columbia River Gorge National Scenic Area as a Federally recognized and protected area. The Act also created a Columbia River Gorge Commission, which adopted a management plan on October 15, 1991. Any site-specific actions tiered to this EIS will be evaluated to determine whether they affect the visual, recreational, or other conditions within then Scenic Area, and whether such actions would be compatible with the Management Plan.

The Wilderness Act of 1964 establishes the National Wilderness Preservation System. Areas designated as wilderness under the original Act and subsequent wilderness legislation are to be administered for the use and enjoyment of the public in such a manner as to leave them unimpaired as wilderness. Any site-specific actions tiered to this EIS will be evaluated to determine if they affect any wilderness areas within the Region.

The Land and Water Conservation Fund Act assists in preserving, developing, and ensuring accessibility of outdoor recreation resources. The Act establishes specific Federal funding for acquisition, development, and preservation of lands, water or other interests authorized under the ESA and National Wildlife Refuge Areas Act. Any site-specific actions tiered to this EIS will be evaluated to determine whether they would impair acquired or developed sites or preclude intended uses.

In 2000, then-President Clinton created the Hanford Reach National Monument. A number of the policy alternatives include actions that could affect the natural resources and recreational values of this monument. Before undertaking such actions, BPA would work with the Department of the Interior agencies managing the Monument to coordinate the actions and minimize adverse impacts.

7.12 GLOBAL WARMING

A discussion of possible global warming effects from the regional operation of thermal resources (mostly combined-cycle combustion turbines, as well as the potential to increase operation of coal) and changes in operation of extra-regional resources has been incorporated by reference from BPA's Business Plan EIS⁵ and presented in this EIS.

7.13 PERMITS FOR STRUCTURES IN NAVIGABLE WATERS

If a proposed action subsequent to this EIS were to include a structure or work in, under, or over a navigable water of the United States; a structure or work affecting a navigable water of the United States; or the deposit of fill material or an excavation that in any manner alters or modifies the course, location, or capacity of any navigable water of the United States, the required Section 10 Permit under the Rivers and Harbors Appropriations Act of 1899 would be sought from the Corps.

7.14 PERMITS FOR DISCHARGES INTO WATERS OF THE UNITED STATES

A Section 404 Permit (Permit for Discharges into the Waters of the United States) under the Federal Water Pollution Control Act (Clean Water Act) of 1972, as amended, would be required from the Corps if a subsequent action were to include the discharge of dredged or fill material into waters of the United States. Such a permit would be sought.

7.15 PERMITS FOR RIGHTS-OF-WAY ON PUBLIC LAND

If a subsequent action were to involve the use of public or Indian lands not in accordance with the primary objective of the management of those lands, under the Federal Land Policy and Management Act (43 U.S.C. 1701 et seq.), a Federal permit for a right-of-way across such lands would be required. Such a permit would be sought.

⁵ USDOE/BPA 1995a.

7.16 ENERGY CONSERVATION AT FEDERAL FACILITIES

None of the alternatives analyzed in this EIS includes the operation, maintenance, or retrofit of an existing Federal building; the construction or lease of a new Federal building; or the procurement of insulation products. Therefore, the requirements for energy conservation at Federal facilities do not need to be addressed.

7.17 POLLUTION CONTROL AT FEDERAL FACILITIES

In addition to their responsibilities under NEPA, Federal agencies are required to carry out the provisions of other Federal environmental laws. For example, to the extent applicable to an alternative presented in this EIS, compliance with the standards contained in the following legislation is mandatory:

- Title 42 U.S.C. 7401 et seq., The Clean Air Act, as amended.
- Title 33 U.S.C. 1251 et seq., The Clean Water Act, as amended.
- Title 42, U.S.C. 300 F et seq., The Safe Drinking Water Act, as amended.
- Title 42 U.S.C. 9601 [9615] et seq., The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.
- Title 7 U.S.C. 136 et seq., The Federal Insecticide, Fungicide, and Rodenticide Act, as amended.
- Title 42 U.S.C. 6901 et seq., The Resource Conservation and Recovery Act of 1976, as amended.
- Title 15 U.S.C. et seq., The Toxic Substances Control Act, as amended; Title 40 CFR Part 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions."
- Title 42, U.S.C. 4901 et seq., The Noise Control Act of 1972, as amended.

Specifically, with regard to certain of these statutes:

The Clean Air Act establishes a comprehensive program for improving and maintaining air quality throughout the United States. The goals of the Clean Air Act are achieved through permitting of stationary sources, restricting the emission of toxic and other pollutants from stationary and mobile sources, and establishing Ambient Air Quality Standards (AAQSs). The EPA has generally delegated responsibility for attaining and maintaining the national standards to the states, through approval of state implementation plans. Increased fugitive dust emissions and additional air emissions from new or modified thermal power plants would be the major sources of air impacts from actions emanating from the selected Policy Direction. Such actions would be tiered to this EIS and would undergo any necessary permitting requirements when they are better defined.

The Clean Water Act sets national goals and policies to eliminate discharge of water pollutants into navigable waters, to regulate discharge of toxic pollutants, and to prohibit discharge of pollutants from point sources without permits. The Clean Water Act also authorizes EPA to establish water-quality criteria that are used by states to set specific water quality standards. The primary water-quality issues pertaining to the operation of the hydrosystem are increased turbidity, gas-saturation levels, and water temperatures. Historically, efforts to reduce temperatures and gas levels have often conflicted with the recommendations from NMFS for salmon recovery. The operating agencies will continue to address this issue as they balance fish and wildlife recovery measures with operation of the hydrosystem.

7.18 INDIAN TREATIES

The existing Indian tribal and reservation structure in the Columbia River Basin is largely the result of treaties between the United States government and the tribes during the period of Euro-American settlement of the West. A treaty is a contract between sovereign nations. The preservation of treaty rights is a responsibility of the entire Federal government.

7.19 OTHER

The Estuary Protection Act establishes a program to protect, conserve, and restore estuaries. It includes provisions for Federal management of estuarine areas in coordination with states and requires that all Federal projects consider impacts on estuarine areas. The purpose of the Watershed Protection and Flood Protection Act is to protect watersheds from erosion, floodwater, and sediment damages. Both of these statutes must be considered with respect to site-specific actions that may be tiered to a selected policy alternative.

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Chapter 8

Summary of Comments on the DEIS and Responses to Comments

CHAPTER 8 – COMMENTS ON THE DEIS AND RESPONSES

- **Summarizes the public involvement process for reviewing and commenting on the Draft EIS.**
 - **Describes the four forms in which comments are responded to in Appendix K: Umbrella Responses, the Comment Response Matrix, Responses to Meeting Comments; and Responses to Crossover Comments.**
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8.1 PROCESS AND RESULTS

After public release of the Draft FWIP EIS in June 2001, BPA held six public meetings and workshops (in Portland and Astoria, Oregon; Clarkston and Boise, Idaho; Seattle, Washington; and Kalispell, Montana) to receive comments (about 60 specific comments). During the comment period, the agency received 45 written comment letters (for a total of about 400 individual comments). Related comments received on the draft Endangered Species Act 2003/2003-2007 Implementation Plan for the FCRPS (July 2002) were also reviewed. BPA arranged for opportunities to interact directly with the interested members of the public and share ideas on specific aspects of the Draft EIS. In addition, the EIS Team contacted several commenters to clarify their concerns and ensure their issues were completely understood.

The comment letters and public meeting discussions confirmed three basic premises that we had established in the Draft EIS. They are as follows:

- **Different groups have different values and priorities, leading to different (and often conflicting) ideas about what recovery and mitigation efforts should be.** These differing positions on the correct approach to fish and wildlife mitigation and recovery still exist. No one policy direction or mixture of policy directions emerged as "best" from the comments. Some thought harvest should be reduced; others thought levels should stay the same, or even increase. Some thought that salmon as a species were not endangered or threatened--and provided some data and information to back their position. Others thought that even more stocks should be listed. Some thought dams should be removed; others thought the dams should stay in place.
- **There is no clear and agreed-upon scientific answer to the problem.** The science is still unclear. Several of the commenters advocated certain studies and findings, while others denounced the same or similar studies as not useful or unfounded. For example, comment letters number 18 and 31 denounced the use of the PATH analysis (Plan for Analyzing and Testing Hypotheses—a multi-agency scientific group tasked with assessing the likely effects of drawdown and other management options on Snake River spring/summer chinook) as outdated,

while letters number 34 and 44 encouraged reliance on the PATH data because it is the best science. Clearly, agreement has still not been reached on the "best" science across the Region.

- **Conflicting directives and jurisdictions of regional authorities have meant that funds dedicated to fish and wildlife mitigation and recovery efforts have often been used less efficiently and effectively that they otherwise could have been.** The wide variety of opinions and concerns about mitigation and recovery efforts expressed in the comment letters underscored that delays, inconsistencies, a piecemeal approach, and contradictory actions have hampered the Region's efforts. Several commenters criticized the lack of a regionally accepted plan and expressed concerns about the how much and how well money was spent.

In addition, many commenters expressed concerns over what is "reasonable" to consider. Some believe that removing the dams is not reasonable; others thought that leaving the dams in place was unreasonable. Some thought anything that couldn't be done under current laws or regulations was unreasonable. Still others appreciated a review of options that were not confined by existing laws or processes.

The EIS Team provided a means to "Build Your Alternative" (Draft EIS, Appendix I), so that readers could develop new alternatives; however, no one used this tool. From our own experience, we recognize how difficult it is to design a complete alternative. However, we are retaining the "Build Your Own Alternative" appendix (Appendix I) to use as the Region continues to work towards a solution for fish and wildlife mitigation and recovery issues. That way, different approaches may be developed as needs and conditions change over time. Refer to the analysis on the preferred alternative (PA 2002) in Section 3A of Chapter 3 for an example of how to apply the process described in Appendix I.

8.2 COMMENT TRACKING AND RESPONDING

It is important for decisionmakers and individual readers to be able to track what comments were made, how the EIS Team responded to those comments, and where in the document any changes might have been made as a result of the comments. Because the volume of material associated with the comments and the responses was substantial, we have placed the following materials in Appendix K:

- **Umbrella Responses.** Where a number of commenters addressed the same subject, we have written a general response that applies to several comments at once—an "umbrella" response. Umbrella Responses cover the following topics:
 1. Stating a Party's Preference
 2. Claims that BPA Advocated Certain Preferences in the Draft EIS
 3. The Concept of Tiered RODs
 4. Scope of the FWIP EIS

5. Hybrid Alternatives
 6. Reason for the EIS
 7. Qualitative versus Quantitative Analysis
 8. The Clean Water Act.
- **The Comment Response Matrix.** This extensive table contains individual comments from each submitted comment letter. A response has been prepared to each comment. Each comment letter received an individual number; each comment within the letter also received a unique identifying number. (For instance, the very first comment on the list comes from comment letter number 1, and is comment number 1. Therefore the comment is identified as 1/1.)
 - **Responses to Meeting Comments.** Several meetings or workshops were held during the public comment period. Informal notes were taken at each of these meetings. Comments excerpted from those notes and responses to those comments are included at the end of the Comment Response Matrix. Comments are tracked by meeting/comment number, similar to the tracking method used for comment letters.
 - **Responses to Crossover Comments.** Several letters submitted to the Action Agencies during the review of the draft Endangered Species Act 2003/2003-2007 Implementation Plan for the FCRPS contained comments directly related to the FWIP EIS. These comments, and the responses to them, appear in the Crossover Comments: Implementation Plan and the FWIP EIS Table.

Photocopies of all 45 comment letters received on the Draft EIS have been included in Appendix K. The individual comments have been marked.

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Glossary/Acronym List

GLOSSARY AND ACRONYMS

GLOSSARY

Term	Meaning
Action	The components of a NEPA alternative in terms of what would be done to implement an alternative. Most actions considered in the Fish and Wildlife Implementation EIS are classified as one or more of the following: harvest, hatchery, hydrosystem or habitat actions. <i>See also</i> Implementation Action and 40 CFR §1508.18.
Adaptive management	Feedback based on knowledge or data generated by monitoring and evaluation actions, of the effects or results of an implemented action. The information and data are purposefully collected and used to improve future management plans and actions.
Adfluvial	Possessing a life history trait of migrating between lakes or rivers and streams.
Alevin	The developmental life stage of young salmonids and trout that are between the egg and fry stage. The alevin has not absorbed its yolk sac and has not emerged from the spawning gravels.
Alternative	In NEPA, one of several options for implementing a project, plan, law, or policy. Alternatives often consist of an overall theme or direction, and more specific actions. <i>See also</i> Policy Direction.
Anadromous fish	Fish that hatch and rear in fresh water, migrate to the ocean (salt water) to grow and mature, and migrate back to fresh water to spawn and reproduce.
Artificial propagation	Any assistance provided by man in the reproduction of Pacific salmon. This assistance includes, but is not limited to, spawning and rearing in hatcheries.
Average megawatt (aMW)	The average amount of energy (number of megawatts) supplied or demanded over a specified time.
Broodstock, captive breeding	Adult fish maintained in captivity, used to propagate the subsequent generation of hatchery fish.
Broodstock, wild	Adult fish harvested from indigenous populations used to propagate the subsequent generation of hatchery fish.
Bypass systems	Juvenile salmonid bypass systems consist of screens lowered into turbines intakes to divert fish away from turbines at hydroelectric dams. Bypassed fish are either returned directly to the river below the dam or into barges and trucks for transport to a release site downstream from Bonneville Dam. PIT-tag detectors identify all PIT-tagged fish passing through the bypass systems. In addition, the systems are equipped with subsampling capabilities that allow hands-on enumeration and examination of a portion of the collection for coded-wire tags (CWT), brands, species composition, injuries, etc. Recovery information at bypass systems is used to develop survival estimates, travel time estimates, and run timing; to identify problem areas within the bypass system; and as part of the basis for flow management decisions during the juvenile migrations.
Capacity	The maximum amount of power that can be produced by a generator or carried by a transmission facility.
Captive-breeding program	A form of artificial propagation involving the collection of individuals (or gametes) from a natural population and the rearing of these individuals to maturity in captivity. For listed species, a captive broodstock is considered part of the evolutionarily significant unit (ESU) from which it is taken.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Conservation easement	Acquiring through lease, purchase, or donation the right to protect, improve, or maintain habitats or particular habitat conditions.
Conservation hatchery program	A program that uses artificial propagation to recover Pacific salmon by maintaining the listed species' genetic and ecological integrity.
Critical habitat	The geographic area occupied by or essential to a species.
Cultural resource	A term for which the meaning is largely derived from and limited by Federal law, regulation, and Executive Orders, and Departmental or agency standards or policies. Cultural resources are specific places that may be or are important in the history of the nation and its peoples. These resources include prehistoric or historic period archeological sites; buildings, or structures of architectural, engineering, or historical associative value; places of importance in history or tradition; and traditional cultural properties, which are resources important in maintaining the traditional lifeways of a community. Within the broad range of cultural resources are those that have recognized "historical significance." Locations or buildings that retain physical integrity and meet the criteria for listing on the National Register of Historic Places specifically are "historic properties" (see below). A fishing ground or site may be an example of a "cultural resource" (and may even be a historic property if it meets the National Register eligibility criteria).
De-listing	Removal of a species or evolutionarily significant unit (ESU) from endangered or threatened status under the Endangered Species Act (ESA).
Dewatering	Removing all the water from an artificial or natural container or channel. Typically refers to the immediate downstream habitat effects associated with a water-withdrawal action that diverts the entire flow of a stream or river to another location.
Dissolved gas	The amount of chemicals in normally occurring as gases, such as nitrogen or oxygen, which are held in solution with water. Usually measured in parts per million.
Dissolved oxygen (DO)	The amount of oxygen that is dissolved in a particular volume of water. The amount of DO can be an important indicator of the condition of a water body.
Drafting (reservoir)	Lowering of the elevation of a storage reservoir.
Drawdown	The distance that the water surface of a reservoir is lowered from a given elevation as water is released from the reservoir. Also, refers to the act of lowering reservoir levels.
Ecosystem	The biotic and abiotic characteristics of given area. An ecosystem can be as small as a wetland or as large as a biome (e.g., Great Basin Shrub-steppe Deserts, Tropical Rain Forests of the Lower Amazon Basin, The Columbia River Estuary). They are typically defined by some major habitat characteristics. Each has a unique set of physical, chemical, and climatic characteristics to which the plant and animal life have adapted.
Ecosystem Diagnosis and Treatment (EDT)	An expert opinion and empirical modeling approach to stream and watershed assessments.
Effect	The environmental consequences of an Alternative. Environmental effects can be ecological, aesthetic, historical, cultural, economic, social, or health-related. See also, 40 CFR §1508.8.
Emergence	The process during which fry leave their gravel spawning nest and enter the water column.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Endangered (ESA)	A species of plant or animal in danger of extinction throughout all or a significant portion of its range.
Endangered Species Act (ESA)	An act passed by Congress in 1973, intended to protect species and subspecies of plants and animals that are of "aesthetic, ecological, educational, historical, recreational and scientific value." The ESA may also protect the listed species' critical habitat, the geographic area occupied by or essential to the species. The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) share authority to list endangered species, determine critical habitat and develop recovery plans for listed species.
Energy	The ability to produce electrical power over a period of time.
Environmental Impact Statement, or EIS	A document defined by NEPA that presents analysis of the potential environmental effects of implementing a project, law, policies or new directives. It is required when the environmental effects from that change may be significant.
ESU (evolutionary significant unit)	A salmonid population or group of populations that are substantially reproductively isolated from other conspecific population units, and contribute substantially to ecological/genetic diversity of the biological species as a whole.
Escapement	The number of salmon and steelhead that return to a specific measuring location after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.
Estuary, estuarine	The area where the fresh water of a river meets and mixes with the salt water of the ocean.
Existing conditions	The most recent status of the environment. A description of existing conditions is provided to help the reader understand and gauge environmental effects on the environmental variables.
Exotic Species	An introduced species; a non-native species.
Extirpate	To destroy or remove completely, as a species from a particular area, region, or habitat.
Fisheries	In-river – Harvest occurring within freshwater areas. Marine or ocean – Harvest occurring in marine areas. Mixed-stock – Harvest occurring at such a time or location as to potentially catch fish from multiple stocks.
Fishery	Indian – See "Tribal Fishing Rights." Non-Indian – Fisheries conducted by non-tribal members.
Floodplains	The area along a stream or river that is subject to flooding.
Flow augmentation	Increasing river flows during the juvenile out-migration by reducing water drafts at FCRPS storage reservoirs to provide higher spring flows and a higher probability of reservoir refill; by drafting reservoirs during the out-migration season (April through August); and by acquisition of water from non-federal sources.
Flow requirements	Quantity of flow necessary for fish survival in a given stream reach. These requirements may vary by species and life stage.
Fluvial	Of or pertaining to a river or stream. This includes the slope, shape, and channel, its substrate characteristics, its flow characteristics, its sediment transport characteristics and geomorphic conditions that contribute to these conditions.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Fragmented habitat	Habitat that is cut off from other portions of the habitat. Refers to areas where free movement of individuals is restricted from one portion of the habitat to other portions.
Fry (emergence)	The first free-swimming life stage of a salmonid.
Gas bubble disease	Conditions caused when dissolved gas in supersaturated water comes out of solution and equilibrates with atmospheric conditions, forming bubbles within the tissues of aquatic organisms. This condition can kill or harm fish.
Gas supersaturation	The overabundance of gases in turbulent water, such as at the base of a dam spillway. In fish, can cause fatal condition similar to the bends.
Generation	Act or process of producing electric energy from other forms of energy. Also refers to the amount of electric energy so produced.
Genetic Diversity	The array of genetic traits that exists within a population, due to a large number of slightly dissimilar ancestors, that enables it to adapt to changing conditions.
Genetic introgression	The introduction of genetic material from one species or population into another.
Habitat conservation plan	Plan to protect, improve, or maintain the status or condition of a given habitat.
Harvest	Selective – Harvest targeted to specific fish or fish runs. Sustainable – A degree of fish harvest that does not deplete fish populations below replacement levels.
Hatchery	A facility where fish are collected, spawned, reared, and (typically) released.
Hatchery and Genetic Management Plan (HGMP)	A document detailing the continued operation of an artificial propagation program.
Healthy stock	A stock of fish sustaining a long-term production rate adequate to ensure its continued survival over a wide range of variations in its life cycle.
Historic property or historic resource	As defined in the National Historic Preservation Act, Title III, Section 301 (16 U.S.C. 470(w)(5)), "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register, including artifacts, records, and material remains related to such a property or resource." The criteria defining eligibility to the National Register are provided in regulations (36 CFR 60.4).
Hydrograph	A graphic representation of stage, flow, velocity, or other characteristics of river water at any given point.
Hydropower	Electrical power generation through use of the gravitational force of falling water at dams.
Hypolimnetic	Referring to the layer of water in a thermally stratified lake that lies below the thermocline, is noncirculating, and remains perpetually cold.
Impact factors	Underlying natural or man-made conditions that may affect the amount, location or timing of an environmental impact. Examples are institutions, markets, demographics, and tastes and preferences.
Implementation action	See <i>Action</i> .
Implementation options	Alternative methods or policy instruments for affecting human behavior to achieve actions; for example, regulation, subsidies, education and purchase.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Implementation plan	Generally, a group of actions and implementation options taken to implement a policy direction. Under the 2000 NMFS FCRPS BiOp, one and five year plans prepared by the action agencies to structure how they will comply with the BiOp.
Impoundment	Any human-made structure for retaining the flow of a river or stream that creates a reservoir.
Incidental take	Take of a threatened or endangered species that is incidental to, and not the directed purpose of, the carrying out of an otherwise lawful activity. See "Take."
Indigenous	Existing, growing, or produced naturally in a region.
Instream flows	The amount of water passing a particular point in a stream or river, usually expressed in cubic-feet per second (cfs). Typically concerned with the minimum flow in a stream needed to protect and maintain aquatic life.
Integrated Rule Curves (IRC)	A set of reservoir operating criteria designed to meet multiple objectives (e.g. flood control, irrigation, recreation, and fish habitat).
Introgression	The insertion of the genes of one species into the gene pool of another. This is an effect associated with hatchery fish into the wild fish populations.
Jeopardy	An action places a listed species in jeopardy if the action would bring that species' continued existence into question. If a proposed action places a species in jeopardy, it means that species is at risk of no longer being in existence. So the jeopardy standard is measured in terms of the odds of avoiding jeopardy. It is not defined in statute.
Key issues	Important concerns about fish and wildlife policy expressed by stakeholders and individual citizens in the Region. Key issues can be actions, effects, or any other stated concern.
Life stage	An organism's period of development to adulthood.
Listed fish, species	Species determined to be threatened (any species in danger of becoming endangered in the foreseeable future) or endangered (a species in danger of extinction throughout all or a significant portion of its range) as allowed under the ESA.
Load	The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.
Mainstem	The principal channel of a drainage system into which other smaller streams or rivers flow. BPA typically uses "mainstem" to mean the Columbia River as opposed to any of its tributaries.
Management responses	Public actions associated with fish and wildlife mitigation and recovery through laws or regulations, development of public policy, or design of official plans, often influenced by the Administration, the general public, or specific interest groups representing a particular concern.
Megawatt (MW)	The electrical unit of power, which is equal to 1,000 kilowatts (or 1,000,000 watts).
Minimum Gap Runners (MGR)	Turbine blades that maintain extremely close tolerance (less than 0.25 inches) between the blade, hub, and encasing drafttube walls (discharge ring).

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Mitigation	Measures taken to reduce or compensate for adverse environmental effects. Under the Regional Act, BPA has a substantive duty to protect, mitigate, and enhance fish and wildlife, and their habitats, affected by the construction and operation of the FCRPS.
Mitigation hatchery fish	Artificially produced fish that are propagated to compensate for loss or reduction of a specific fish population.
Multi-Species Framework Project	A collaborative project of the Northwest Power Planning Council, the Columbia River Basin's Indian Tribes, and the United States to create several scientifically based, agreed-upon alternatives for determining how best to achieve fish and wildlife mitigation and recovery in the Columbia River Basin.
Native fish	Endemic to or limited to a specific region.
Naturally spawning fish/populations	Populations of fish that have completed their entire life cycle in the natural environment without human intervention.
NEPA	National Environmental Policy Act.
Non-native stocks	Not existing naturally, non-endemic.
Non-point source pollution (program)	Section 319 of the Clean Water Act establishes a Non-point Sources Management Program. States, territories and Indian tribes receive grant money that supports a variety of activities, including technical assistance, financial assistance, education, training, technology transfer, and monitoring to assess the success of specific non-point source implementation projects.
Off-site mitigation	Off-site mitigation is an action taken to address humanly caused mortality of listed species outside the action area (hydrosystem) that would mitigate, in part, for the effects of unavoidable mortality inside the action area. It is credited toward the action agencies because it would not otherwise occur without the direct involvement of the action agencies. This is not defined in statute.
Operating agencies	The Federal agencies that operate Federal dams in the Federal Columbia River Power System, namely, the Corps of Engineers and the Bureau of Reclamation.
Operating responses	Actions by entities specifically authorized to carry out directives.
Operations (FCRPS)	Management of the FCRPS projects as set forth in the 1995 FCRPS and 1998 Steelhead Supplemental Biological Opinions. Along with establishing certain hard constraints at storage reservoirs, the Biological Opinions established the Regional Forum, which as one of its responsibilities has some flexibility to recommend real-time (i.e., in season) management decision for flow augmentation, spill, and transportation decisions in order to best achieve passage strategies for migrating salmon.
Pacific Salmon Treaty (PST)	A long-term and comprehensive management plan negotiated between the United States and Canada that would govern salmon fisheries in Southeast Alaska, British Columbia, and the Pacific Northwest.
Particulates	Substances that consist of minute separate particles, such as dust or soot.
Passive Integrated Transponder (PIT) tagging	Passive Integrated Transponder tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an integrated microchip that is programmed to include specific fish information. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.
pH	The negative logarithm of the molar concentration of a hydrogen ion. More simply, the acidity of a solution.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Plan for Analyzing and Testing Hypotheses (PATH)	The PATH process is a multi-agency/multi-participant effort to allow a wide community of scientists and managers to analyze hypotheses for salmon decline and examine the outcome of different management options, including drawdown and transportation.
Point source discharges	Pollutants discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels, and containers of various types.
Policy Direction	The overarching theme—whether expressly stated or improvised—that guides and shapes the decisions made by governments, agencies, or other public bodies regarding fish and wildlife mitigation and recovery efforts. Also, a NEPA alternative for fish and wildlife policy in the Pacific Northwest Region.
Polluted	(1) An area that has been contaminated, especially by a waste material that contaminates air, soil, or water. (2) Any solute or cause of change in physical properties that renders water unfit for a given use.
Population(s)	A group of individuals of the same species occupying a defined locality during a given time that exhibit reproductive continuity from generation to generation.
Province	A large geographic area that has a similar set of biophysical characteristics and processes due to effects of climate and geology. Provinces are roughly equal to groups of 4 th - field USGS hydrologic unit codes (averages 1,000,000 hectares).
Reach	A section of stream between two defined points.
Rear	To feed and grow in a natural or artificial environment.
Reasonable and Prudent Alternative	Reasonable and prudent alternatives refer to alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.
Reclamation Project(s)	Projects constructed under the Reclamation Act and operated by the U.S. Bureau of Reclamation, which administers some parts of the Federal program for water resource development and use in western states. The Bureau of Reclamation owns and operates a number of dams in the Columbia River Basin, including Grand Coulee Dam.
Record of Decision, or ROD	The Record of Decision is prepared by the decision-maker to explain the basis for selection of a particular EIS alternative.
Recovery	The point at which population levels of a listed species have improved to an extent that the species no longer requires the protection of the ESA.
Redd	A nest of fish eggs covered with gravel.
Refugia	Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range.
Resident fish	Reside in fresh water throughout their life cycles.
Response Strategy	Corrective measures required to maintain the selected Policy Direction following economic, political, or environmental changes.
Riparian (zones)	Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and /or intermittent water, associated with high water tables, and soils that exhibit some wetness characteristics.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Run (fish)	A group of fish of the same species that migrate together up a stream to spawn, usually associated with the seasons, e.g., fall, spring, summer, and winter runs. Members of a run interbreed, and may be genetically distinguishable from other individuals of the same species.
Run-of-river dams	Hydroelectric generating plants that operate passing most if not all of their inflow because they lack more than a few feet of elevation for storage above their power head.
Runoff	Water that flows over the ground and reaches a stream as a result of rainfall or snowmelt.
Salmonids	Fish of the family <i>Salmonidae</i> , which includes salmon and steelhead.
Screens/ladders (fish)	Wire mesh screens placed at the point where water is diverted from a stream or river and through a turbine at a dam to help keep fish from entering the diversion or passageway. Fish ladders are devices made up of a series of stepped pools, similar to a staircase, that enable adult fish to migrate upstream past dams.
Seasonal flow patterns	Natural changes and fluctuations in stream flows occurring over the course of a year.
Sediment regime	The distribution of sediment input, transport, and storage in a river system over time.
Sedimentation	The settling of particles that are heavier than water and their deposition on the bottoms of streams and rivers.
Selective fishing gear	Fishing gear that, while targeting the intended species and size groups, allows non-target species to be released with little or no mortality.
Sensitive species	Those species that (1) have appeared in the <i>Federal Register</i> as proposed for classification and are under consideration for official listing as endangered or threatened species, or (2) are on an official state list, or (3) are recognized by the U.S. Forest Service or other management agency as needing special management to prevent their being placed on Federal or state lists.
Smolt	Refers to the salmonid or trout developmental life stage between parr and adult, when the juvenile is at least one year old and has adapted to the marine environment.
Smoltification	Refers to those physiological changes anadromous salmonids and trout undergo in freshwater while migrating toward saltwater that allow them to live in the ocean.
Spawn	The act of reproduction of fishes. The mixing of the sperm of a male fish and the eggs of a female fish.
Species of concern	An unofficial status for a species whose abundance is at low levels.
Spill	Releasing water over a dam's spillways rather than channeling it through the powerhouse.
Spillway flow deflectors (flip lips)	Structures that limit the plunge depth of water over the dam spillway, producing a less forceful, more horizontal spill. These structures reduce the amount of dissolved gas trapped in the spilled water.
Status Quo	A policy direction defined by policies that were current at the time the Fish and Wildlife Implementation Plan EIS was drafted (prior to 2002), used as the No Action Alternative in this EIS. The Status Quo is the baseline by which all alternatives in this EIS were compared and all future alternatives will be compared.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Stock	A specific population of fish. When referring to salmon, a specific population of fish spawning in a particular stream during a particular season.
Storage reservoir	Reservoirs that have space for saving inflow instead of passing it immediately. Retained water is released as necessary for multiple uses – power production, fish passage, irrigation and navigation.
Stranding	Causing fish to be trapped in stream reaches due to insufficient water, especially as a result of water withdrawal.
Straying	A natural phenomena of adult spawners not returning to their natal stream but entering and spawning in some other stream.
Strong Stock	Species, stocks, or populations of fish and wildlife that are currently healthy and are not in decline.
Subbasin	A watershed area defined by 4 th -field USGS hydrologic unit code; the size averages 200,000 hectares.
Supplementation	Releasing hatchery produced fish into the wild in an effort to try and reestablish or increase the size of a naturally spawning population.
Surface Bypass Collection (SBC)	System designed to divert fish at the surface before they have to dive and encounter the existing turbine intake screens. SBC directs the juvenile fish into the forebay, where they are passed downstream either through the dam spillway or via the juvenile fish transportation system of barges and trucks.
Surplus Power	Excess power (firm or non-firm) for which there is no market in the PNW.
Take (legal/illegal)	Under the Endangered Species Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an animal, or to attempt to engage in any such conduct.
Terminal area	The specific area (usually the mouth of a river or bay or near a hatchery release site) where a particular stock is returning to spawn.
Terminal fishery	A fishery that targets a specific stock of fish in a terminal area.
Threatened (ESA)	A genetic population that is at risk of becoming endangered in the foreseeable future.
TMDL	Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's source (Environmental Protection Agency).
Transport (juvenile)	Collection and transport via barge and truck of out-migrating juvenile salmonids from several FCRPS collection projects to a location downstream from Bonneville Dam, the lowermost dam on the Columbia River.
Tribal fishing rights	Generally understood to be the rights reserved by tribes in their treaties with the United States, although tribes may also have fishing rights based on Executive Orders, statutes, or aboriginal claims.
Trust obligations/responsibility	The obligation of the United States to all tribes, shared by Congress and all Federal agencies. . In <i>U.S. v. Mitchell</i> , the Supreme Court required the elements of a common law trust be present to make the trust responsibility enforceable. The elements of a trust are: (1) trust property (2) managed by a Federal agency under specific statutory guidance (3) on behalf of Indian beneficiaries. <i>United States v. Mitchell</i> , 463 U.S. 220-22 (1983).
Turbidity	The cloudiness of water caused by suspended matter that interferes with the passage of light through the water or in which visual depth is restricted.

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

Term	Meaning
Viability (population)	A population in a state that maintains its vigor and its potential for evolutionary change.
Water conveyances	Devices used to transfer water from one location to another, usually from a natural water body to the land surface for irrigation, or for an industrial use. Examples include pipes, lined or unlined ditches, and irrigation canals.
Water quality limited	A water body that does not meet the federally approved state water quality standard established under the provision of the Clean Water Act.
Watershed	A watershed area defined by 5 th -field USGS hydrologic unit code; the size ranges between 20 and 40,000 hectares.
Weak Stock	Species, stocks, or populations of fish and wildlife that are in decline and are protected under the Endangered Species Act.
Wetland(s)	Areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil condition for growth and reproduction (Executive Order 1990). Examples of wetlands include swamps, marshes, and bogs.
Wild fish	See " <i>naturally spawning fish/populations</i> " or " <i>native fish.</i> "

ACRONYMS

All H	The "All H" paper (referring to hydro, habitat, hatcheries, and harvest). Now titled the Basinwide Salmon Recovery Strategy.
BA	biological assessment
BIA	Bureau of Indian Affairs
BiOp	biological opinion
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
Bureau	Bureau of Reclamation
CEQ	Council on Environmental Quality
Corps	U.S. Army Corps of Engineers
Council	Northwest Power Planning Council
CREP	Conservation Reserve Enhancement Program
CRITFC	Columbia River Inter-Tribal Fish Commission
CVA	Columbia Valley Authority
CWA	Clean Water Act
DOE	Department of Energy
DOI	Department of Interior
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FBS	Federal Banking System
FCRPS	Federal Columbia River power system
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act of 1976
Forum	Columbia River Basin Forum
FPC	Federal Power Commission
FWIP EIS	Fish and Wildlife Implementation Plan EIS
H	see All H
HCP	habitat conservation plans
ICBEMP	Interior Columbia Basin Ecosystem Management Project

Fish and Wildlife Implementation Plan EIS
Glossary and Acronyms

IFDG	Idaho Department of Fish and Game
LRMP	land and resource management plans
MOA	memorandum of agreement
MSR	maximum sustainable revenue
MUSYA	Multiple-Use Sustained Yield Act of 1960
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service (now known as NOAA Fisheries)
NPS	National Park Service
NRCS	Natural Resource Conservation Service
PIT	"passive integrated transponder" tags
PMA	power marketing administration
PNCA	Pacific Northwest Coordination Agreement
Regional Act	Pacific Northwest Electric Power Planning and Conservation Act
ROD	record of decision
RTO	regional transmission organization
SAR	smolt to adult returns
SIA	sample implementation action
SOR	System Operation Review
TMDL	total maximum daily loads
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WNP	Washington Nuclear Projects

References

REFERENCES

- American Fisheries Society.** Fish Management Chemicals Subcommittee. 2002. Rotenone Use in Fisheries Management: Administrative and Technical Guidelines Manual. Available at <http://www.fisheries.org/rotenone> (last visited January, 2003).
- American Friends Service Committee.** 1970. Uncommon Controversy: Fishing Rights of the Muckleshoot, Puyallup and Nisqually Indians. University of Washington Press.
- Anderson, J.J.** 1998. "Decadal Scale Patterns in Climate and Salmon Survival: Indicators, Interactions and Implications." Conference on Estuarine and Ocean Survival of Northeastern Pacific Salmon. Hotel Newport, Newport, Oregon, March 20-22, 1996. Published in Sustainable Fisheries Conference Proceedings. National Marine Fisheries Service and OSU Hatfield Marine Science Center.
- Arkoosh, M.R., E. Casillas, E. Clemons, B.B. McCain, and U. Varanasi.** 1991. "Suppression of immunological memory in juvenile chinook salmon from an urban estuary." *Fish and Shellfish Immunol.* 1:261-277.
- Arkoosh, M.R., J.E. Stein, and E. Casillas.** 1994. "Immunotoxicology of an Anadromous Fish: Field and Laboratory Studies of B-Cell Mediated Immunity." Modulators for Fish Immune Responses, Volume 1. SOS publications, Fair Haven, NJ. Pp. 33-48.
- Armour, C.L., D.A. Duff, and W. Elmore.** 1991. "The effects of livestock grazing on riparian and stream ecosystems." *Fisheries* 16(1):7-11.
- Barry, J.P., C.H. Baxter, R.D. Sagarin, and S.E. Gilman.** 1995. "Climate-related Long Term Faunal Changes in a California Rocky Intertidal Community." *Science* 267:672-675.
- Beamish, R.J. and C. Neville.** 1998. "Climate-Ocean Changes and the Impacts on Young Salmon in the Strait of Georgia." Conference on Estuarine and Ocean Survival of Northeastern Pacific Salmon. Hotel Newport, Newport, Oregon, March 20-22, 1996. Published in Sustainable Fisheries Conference Proceedings. National Marine Fisheries Service and OSU Hatfield Marine Science Center.
- Berryman, A.A., X. Chen, and J. Firehammer.** n.d. Snake River Steelhead: An Endangered Fishery Threatened By Dynamic Instability (Washington State University). Available at <http://classes.entom.wsu.edu/Papers/> (last visited January, 2003).
- Bessey, R. F.** 1947. Department of the Interior Pacific N.W. Coordination Committee, Minutes of the Meeting of the Columbia Basin Inter-Agency Committee, Vol. 2 (June 25-26).
- Bigler, B.S.; D.W. Welch, and J.H. Helle.** 1996. "A review of size trends among north Pacific salmon (*Oncorhynchus spp.*). " *Can. J. Fish. Aquat. Sci.* 53, 455-465

- Brotten, Delores and Jay Ritchlin.** 1999. *The Pulp Pollution Primer*. Reach for Unbleached! Foundation. Vancouver, BC, Canada. October 5. *Available at* <http://www.rfu.org/PulpPrimer.htm> (last visited January, 2003).
- Brown, Bruce.** 1995. *Mountain in the Clouds A Search for the Wild Salmon*. University of Washington Press. Seattle.
- Brunelle, Andy.** Legislative Affairs, USFS, Boise, ID. 2002. Personal communication with Charles Alton, EIS Project Manager. Bonneville Power Administration, February.
- Buchal, J.** 1997. *The Great Salmon Hoax*. Iconoclast Publishing Co., Aurora, OR.
- Caraco, N.F., J.J. Cole, P.A. Raymond, D.L. Strayer, M.L. Pace, S.E.G. Findlay, and D.T. Fischer.** 1997. "Zebra mussel invasion in a large, turbid river: Phytoplankton response to increased grazing." *Ecology* 78: 588-602.
- Carter, Christopher.** 2002. Economist, State of Oregon Department of Fish and Wildlife. Personal communication with Charles Alton, EIS Project Manager. Bonneville Power Administration. May 8.
- CBFWA (Columbia Basin Fish and Wildlife Authority).** 1996. *Impacts of Artificial Salmon and Steelhead Production Strategies in the Columbia River Basin Draft Programmatic Environmental Impact Statement*. Prepared for: U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Bonneville Power Administration (BPA). December.
- CEQ (Council on Environmental Quality).** 1981. "Forty Most Asked Questions Concerning CEQ's NEPA Regulations." 46 Fed. Reg. 18026, 18027.
- CEQ.** 1987. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. 40 CFR Section 1508.20, Mitigation.
- Chamberlin, T.W., R.D. Harr, and F.H. Everest.** 1991. "Timber harvesting, silviculture and watershed processes." Pp. 181-205. *In*: W.R. Meehan (ed.). *Influences of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society, Bethesda, MD. Special Publication 19.
- Chaney, E., W. Elmore, and W.S. Platts.** 1990. *Livestock grazing on western riparian areas*. Produced for the U.S. Environmental Protection Agency by the Northwest Resource Information Center, Inc., Eagle, ID.
- Chapman, D.C., A. Giorgi, M. Hill, A. Maule, S. McCutcheon, D. Park, W. Platts, I. Pratt, J. Seeb, L. Seeb, and F. Utter.** 1991. *Status of Snake River Chinook Salmon*. Report to Pacific Northwest Utilities Conference Committee (PNUCC), Boise, ID.
- Chatters, James.** 1997. Quoted by Bill Rudolph in "Archaeologist Takes Long Look at Salmon Recovery." *Clearing Up*. P. 7. January 20.
- Coggins, G. and C. Wilkinson.** 1987. *Federal Public Land and Resource Law*. Second Ed. The Foundation Press. Mineola, NY.

- Cohen, Felix F.** 1945. Handbook of Federal Indian Law. United States Government Printing Office.
- Cone, Joseph.** 1995. A Common Fate. Oregon State University Press. Corvallis, OR.
- Corps (U.S. Army Corps of Engineers).** 1991. Review of flood control Columbia River Basin—Columbia River and tributaries study, CRT 63. U.S. Army Corps of Engineers, North Pacific Division. June.
- Corps.** 1992. Columbia River Salmon Flow Measures Options Analysis. January.
- Corps.** 1993. Final Supplemental EIS—Interim Columbia and Snake River Flow Improvement Measures for Salmon. March.
- Corps.** 1999a. Drawdown Regional Economic Workgroup: Hydropower Impact Team. Lower Snake River Juvenile Migration Feasibility Study, Technical Report on Hydropower Costs and Benefits. U.S. Army Corps of Engineers, Northwestern Division, and Bonneville Power Administration, co-chairs. March.
- Corps.** 1999b. "McNary Master Plan: Supporting Data Item 5 Pertinent Data McNary Lock and Dam." *Available at* <http://www.nww.usace.army.mil/planning/er/mcnary/sptdata/mcnspt5.htm> (last visited January, 2003).
- Corps.** 1999c. Lower Snake River Juvenile Salmon Migration Feasibility Study: Tribal Circumstances and Perspective Analysis of Impact of the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs, and Shoshone Bannock Tribes. Prepared by the Columbia River Inter-Tribal Fish Commission as part of the Army Corps of Engineers Lower Snake River Juvenile Salmon Migration Feasibility Study. U.S. Army Corps of Engineers, Walla Walla District. March.
- Corps.** 2000. Salmon Recovery through John Day Reservoir; John Day Drawdown Phase I Study. Corps, Portland District, Final Report, Portland, OR. September.
- Corps.** 2001a. Record of Consultation and Statement of Decision (ROCASOD). Addresses effects to listed species and reinitiates consultation on associated with operations of the Federal Columbia River Power System as covered by the USFWS and NMFS in December, 2000. Corps, Northwestern Division, Portland, OR. May.
- Corps.** 2001b. Zebra Mussel Information System. *Available at* <http://www.wes.army.mil/el/zebra/zmis/zmishelp.htm> (last visited January, 2003).
- Corps.** 2002a. Columbia River Channel Improvement Project: Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement. U.S. Army Corps of Engineers, Portland District; Port of Longview. July. *Available at* <http://www.nwp.usace.army.mil/issues/crcip/welcome.htm> (last visited January, 2003).
- Corps.** 2002b. Lower Snake River Juvenile Salmon Migration Feasibility Report/Final Environmental Impact Statement. Corps, Walla Walla District, Walla Walla, WA. February.

Corps. 2002c. Record of Decision: Lower Snake River Juvenile Salmon Migration Feasibility Study. Corps, Walla Walla District, Walla Walla, WA. September.

Corps. 2002d. Upper Columbia Alternative Flood Control and Fish Operations Interim Implementation. Libby and Hungry Horse Dams. Montana, Idaho, and Washington. Final Environmental Assessment. Appendix G: Finding of No Significant Impact. December.

Council (Northwest Power Planning Council). 1986. Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin, Appendix D of the Columbia River Basin Fish and Wildlife Program. Portland, OR.

Council. 1992. Columbia River Basin Fish and Wildlife Program—Strategy for Salmon. Vol. I and II. 92-21 and 92-21A. Portland, OR. October.

Council. 2000a. Phase II Final Report: Human Effects Analysis of the Multi-species Framework Alternatives. Report No. 2000-5. February.

Council. 2000b. Return to the River. Portland, OR. Council Document 2000-12, p. 143.

Council. 2000c. The Year of the Decision. February.

Council. 2000d. 2000 Columbia River Basin Fish and Wildlife Program: A Multi-Species Approach for Decision Making. Council Document 2000-19.

Council. 2001. Inaugural Annual Report of The Columbia Basin Fish and Wildlife Program 1978-1999. Council Document 2001-2.

Council. 2002. Second Annual Report to Northwest Governors on Expenditures of Bonneville Power Administration. September. *Available at* <http://www.nwcouncil.org/library/2002/2002-13/Report.pdf> (last visited January, 2003).

Council. 2002a. Draft Mainstem Amendments to the Columbia River Basin Fish and Wildlife Program. Council Document 2002-16. October.

CRITFC (Columbia River Inter-Tribal Fish Commission). 1996. Spirit of the Salmon (Wy-Kan-Ush-Mi Wa-Kish-Wit), The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes. *Available at* <http://www.critfc.org/text/trp.html> (last visited January, 2003).

CRITFC. 1999. The Tribal Vision for the Future of the Columbia River Basin and How to Achieve It. Prepared by R. Heinith for CRITFC. July. *Available at* <http://www.critfc.org/legal/vision.htm> (last visited January, 2003).

Doerksen, H. 1997. Columbia River Interstate Compact. *Quoted in "A River in Common: Report to the Western Water Policy Review Advisory Commission" (see Volkman, John, 1997).*

- Dolbeer, R.A., N.R. Holler, and D.W. Hawthorne.** 1994. "Identification and Control of Wildlife Damage" in T.A. Bookhout (ed.). Research and Management Techniques for Wildlife and Habitats. The Wildlife Society, Bethesda, MD. 5th Ed.
- Eckbo, G.** 1969. The Landscape We See. New York: McGraw-Hill. 223 pp.
- Effler, S.W., and C. Siegfried.** 1994. "Zebra mussel (*Dreissena polymorpha*) populations in the Seneca River, New York: Impact on oxygen resources." *Environ. Sci. Technol.* 28, 2216-2221.
- Effler, S.W., S.R. Boone, C.A. Siegfried, L. Walrath, and S.L. Ashby.** 1997. "Mobilization of ammonia and phosphorus by zebra mussels (*Dreissena polymorpha*) in the Seneca River, New York." In F.M. D'Itri (ed.). Zebra Mussels and Aquatic Nuisance Species. Ann Arbor Press, Inc., Chelsea, MI. Pp. 187-207.
- Eisler, R.** 1986. Diazinon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Report. USDOI Fish and Wildlife Service, Washington, DC. Biological Report 85(1.8):1-38.
- Elmore, W. and R.L. Beschta.** 1987. "Riparian areas: perceptions in management." *Rangelands* 9(6):260-265.
- EPA (Environmental Protection Agency).** 1996. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, Section 3.4. Office of Air Quality Planning and Standards. Research Triangle Park, NC.
- EPA.** 1997. Deconstruction—Disassembly and Material Salvage: The Riverdale Case Study. Prepared by NAHB Research Center, Inc. for EPA, The Urban and Economic Division. June. Available at <http://www.smartgrowth.org/pdf/deconstruction.pdf> (last visited January, 2003)
- EPA.** 1998a. Idaho's 1998 303(d) List (Clean Water Act Listing of Streams). Available at www.deq.state.id.us/water/1998_303d/303dlist.pdf (last visited January, 2003).
- EPA.** 1998b. Reviewing for Environmental Justice. EIS and Permitting Resource Guide. EPA Region 10—Environmental Justice Office. August.
- EPA.** 2000. Clean Air Act, 42 U.S.C. §§ 7401–7410.
- EPA.** 2000a. Compilation of Air Pollutant Emission Factors, AP-42 Fifth Edition, Section 3.1. Office of Air Quality Planning and Standards. Research Triangle Park, NC.
- Everitt, R., P. Gearin, J. Skidmore, and R. DeLong.** 1981. "Prey Items of Harbor Seals and California Sea Lions in Puget Sound, Washington." *Murrellet* 62:83-86.
- Fagin, Dan.** 1999. "Serious Fun." Long Island Newsday. Available at <http://future.newsday.com/7/ftop0704.htm> (last visited January, 2003).
- Fahey, John.** 1986. The Inland Empire: Unfolding Years, 1879-1929. University of Washington Press. Seattle, WA.

Federal Caucus. 1999a. Citizen Update, Issue 1. Fall.

Federal Caucus. 1999b. Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (Conceptual Plan) [formerly known as Draft "All H" Paper]. December.

Federal Caucus. 2000a. Citizen Update Issue 3. Winter.

Federal Caucus. 2000b. Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy (Basinwide Strategy). Volume 1. December.

Fiber Futures. 2002. "Promoting Innovative Products from Nonwood and Recycled Sources." San Francisco, CA. Available at <http://www.fiberfutures.org/> (last visited January, 2003).

Fitzsimmons, Tom. 2001. Director, Washington Department of Ecology. Letter to Stephen J. Wright, Administrator, Bonneville Power Administration. December 3.

Ford, M.J. and J.J. Hard. 2000. "Does traditional hatchery production help conserve wild salmon—a comment on the Fall Creek coho hatchery controversy." Conservation Biology Division, Northwest Fisheries Science Center, Seattle, WA. Unpubl. manuscript, 9 p. Available at <http://www.nwfsc.noaa.gov/cbd/LannanResponse.pdf> (last visited January, 2003).

Forest Ecosystem Management Assessment Team (FEMAT). 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team. U.S. Department of Agriculture, Forest Service; U.S. Department of Commerce, National Oceanic and Atmospheric Administration; U.S. Department of Interior, Bureau of Land Management, U.S. Fish and Wildlife Service, and National Park Service; and Environmental Protection Agency. Washington, DC.

Friesen, Thomas A. and David L. Ward. 1999. Management of Northern Pikeminnow and Implications for Juvenile Salmonid Survival in the Lower Columbia and Snake Rivers. *North American Journal of Fisheries Management* 19:406-420.

GAO (General Accounting Office). 1998. Corps of Engineers Actions to Assist Salmon in the Columbia River Basin. April 27.

Garcia, Terry D. 1998. Assistant Secretary for Oceans and Atmosphere, Department of Commerce. Letter to Ted Strong, Executive Director, Columbia River Inter-Tribal Fish Commission. July 21.

Governors, Pacific Northwest States. 2000. Recommendation for the Protection and Restoration of Fish in the Columbia River Basin. July.

Harvey, B.C., T.E. Lisle, T. Vallier, and D.C. Fredley. 1995. Effects of suction dredging on streams: a review and evaluation strategy. U.S. Department of Agriculture, Forest Service.

- Harza Northwest, Inc., Northwest Economic Associates, John F. Palmisano Biological Consultants, Fisheries Consultants, and Pacific Northwest Project.** 1996. Salmon Decision Analysis: Lower Snake River Feasibility Study: Final Report. October 4. For U.S. Army Corps of Engineers, Walla Walla District, Walla Walla, WA.
- Hawken, Paul.** 1993. The Ecology of Commerce. HarperBusiness Publishers.
- Haynes, R.W., N.A. Bolon, and D.T. Hormaechea.** 1992. The economic impact on the forest sector of critical habitat delineation for salmon in the Columbia and Snake River Basin. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. Gen. Tech. Rep. PNW-GTR-307.
- Heath, Carolyn.** 2002. Financial Analyst, Licensing Division, State of Washington Department of Fish and Game. Personal communication with Charles Alton, EIS Project Manager, Bonneville Power Administration. May 8.
- Hebert, P.D.N., B.W. Muncaster, and G.L. Mackie.** 1989. "Ecological and genetic studies on *Dreissena polymorpha* (Pallas): A new mollusc in the Great Lakes." *Can. J. Fish. Aquat. Sci.* 46, 1587-1591.
- House Document No. 308**, Sixty-ninth Congress, first session, which was enacted into law with modifications, in section 1 of the River and Harbor Act approved January 21, 1927. Power Development Item 7, March 29, 1932. Available at <http://www.ccrh.org/comm/umatilla/primary/308rprt.htm> (last visited January, 2003).
- Idaho Department of Fish & Game v. National Marine Fisheries Service.** 850 F. Supp. 886 (D. Or. 1994), vacated as moot, 56 F.3d 1071 (9th Cir. 1995).
- IDFG (Idaho Department of Fish and Game).** 1998. "Idaho's Anadromous Fish Stocks: Their Status and Recovery Options Report to the Director." 600 S. Walnut, Boise, ID 83707. IDFG 98-13. May 1.
- IDFG.** 1999. "Idaho Game Fisheries." Compiled by Jacqueline Harvey. Available at <http://imnh.isu.edu/digitalatlas/geog/fishery/main/fshyinf.htm> (last visited January, 2003).
- IEAB (Independent Economic Analysis Board of the Northwest Power Planning Council).** 1999. River Economics: Evaluating Trade-offs in Columbia River Basin Fish and Wildlife Programs and Policies. IEAB 99-1. February 2. Available at <http://www.nwcouncil.org/library/ieab/ieab1999-1.htm> (last visited January, 2003).
- ISAB (Independent Science Advisory Board).** 2001. A Review of Salmon Recovery Strategies for the Columbia River Basin. 2001-7. August 22. Available at <http://www.nwcouncil.org/library/isab/isab2001-7.pdf> (last visited January, 2003).
- ISG (Independent Scientific Group).** 1996. Return to the River: Restoration of Salmonid Fishes in the Columbia River Ecosystem. Northwest Power Planning Council. Publication 96-6. Portland, OR.

Jones, J.A. and G.E. Grant. 1996. "Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon." *Water Resources Research* 32(4):959-974.

Kaczynski, V.W. and J.F. Palmisano. 1993. Oregon's Wild Salmon and Steelhead Trout: A Review of the Impact of Management and Environmental Factors. Oregon Forest Industries Council. Salem, OR.

Karatayev, A.Y., L.E. Burlakova, and D.K. Padilla. 1997. "The effects of *Dreissena polymorpha* (Pallas) invasion on aquatic communities in eastern Europe." *J. Shellfish Res.* 16, 187-203.

Kloor, Kieth. 1999. "Vanishing Act: Is the law that protects endangered species itself endangered?" *The Sciences* Sept-Oct.:14-17.

Koss, Patricia A. and Mike Katz, eds. 2001. "What we Don't Know about Pacific Northwest Fish Runs: An Inquiry into Decision Making under Uncertainty." Proceedings of the Portland State University Salmon Symposium, July 7-8, 2000.

Lackey, R.T. 1999a. "Salmon Policy: Science, Society, Restoration, and Reality," *Renewable Resources Journal* 17(2):6-16.

Lackey, R.T. 1999b. "The Savvy Salmon Technocrat: Life's Little Rules." *Environmental Practice* 1(3):156-161.

Lackey, R.T. 2000. "Restoring Wild Salmon to the Pacific Northwest: Chasing an Illusion?" Presented at the Portland State University Salmon Symposium, July 7-8.

Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, and J.E. Williams. 1997. "Broadscale assessment of aquatic species and habitats." Chapter 4 *In* T.M. Quigley and S.J. Arbelbide (tech. eds.) An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins: Volume III. General Technical Report PNW- GTR-405. Interior Columbia Basin Ecosystem Management Project, USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Leopold, Aldo. 1949. A Sand County Almanac. Oxford University Press, NY.

Lichatowich, J. 1999. Salmon without Rivers: A History of the Pacific Salmon Crisis. Island Press, Covelo, CA.

Lichatowich, J.A. and L.E. Mobrand. 1995. Analysis of chinook salmon in the Columbia River from an ecosystem perspective. Project number 92-18; Contract No. DE-AM79-92BP25105. Final Report. Bonneville Power Administration, Portland, OR.

Locke, Gary. Governor of the State of Washington. 2001. Letter to Columbia River Water Interests. Sept. 28.

- Lohn, D. Robert.** 2002. Regional Administrator, NMFS, National Oceanic and Atmospheric Administration. Letter to Co-managers. July 23. Available at <http://www.nwr.noaa.gov/HatcheryListingPolicy/CoverLetter.pdf> (last visited January, 2003).
- Lower Columbia River Estuary Program, Comprehensive Conservation and Management Plan.** 1999. Available at <http://www.lcrep.org/ccmp.htm> (last visited January, 2003).
- Marcin, T.C.** 1993. "Demographic change: Implications for forest management." *J. For.* 91(11):39-45.
- Marcot, B.G., W.E. McConnaha, P.H. Whitney, T.A. O'Neil, P.J. Paquet, L.E. Mobrand, G.R. Blair, L.C. Lestelle, K.M. Malone, and K.I. Jenkins.** 2002. A Multi-Species Framework Approach for the Columbia River Basin: Integrating Fish, Wildlife, and Ecological Functions. Version: February 2002. Northwest Power Planning Council, Portland, Oregon.
- McCain, B.B., D.C. Malins, M.M. Krahn, D.W. Brown, W.D. Gronlund, L.K. Moore, and S.L. Chan.** 1990. "Uptake of aromatic and chlorinated hydrocarbons by juvenile chinook salmon in an urban estuary." *Arch Environ. Contam. Toxicol.* 19:10-16.
- Meehan, W.R.** 1991. "Influences of forest and rangeland management on salmonid fishes and their habitats." American Fisheries Society, Bethesda, MD. Special Publication 19.
- Metro.** 2003. "History of the Urban Growth Boundary." Portland, OR. Available at <http://www.metro-region.org/article.cfm?ArticleID=277> (last visited December, 2002).
- Michael, John H.** 1999. "The Future of Washington Salmon." *Northwest Science.* 73(3): 235-239, quoted in: "Restoring Wild Salmon to the Pacific Northwest: Chasing an Illusion?" Robert T. Lackey. Presented at the Portland State University Salmon Symposium, July 7-8, 2000.
- Mighetto, L. and Ebel, W.J.** 1995. Saving the Salmon: A History of the U.S. Army Corps of Engineers' Efforts to Protect Anadromous Fish on the Columbia and Snake Rivers. Historical Research Associates, Inc., Seattle.
- MBTSG (Montana Bull Trout Scientific Group).** 1998. The relationship between land management activities and habitat requirements of bull trout. Report prepared for the Montana Bull Trout Restoration Team. Montana Fish, Wildlife and Parks, Helena, MT.
- Mlodinow, S.** 2002. *Greater Washington Birding Trail North by Northwest*, in Audubon, Vol. 104(4) p. 65. Available at http://www.audubon.org/bird_trails/great_washington.html (last visited January, 2003).

Morton, Pete. 1999. "The Economic Benefits of Wilderness." The Wilderness Society, Denver, Colorado. Available at www.wilderness.org/wild/network/economic_benefit.pdf (last visited January, 2003).

Moss-Adams LLP. 1997. Columbia River Basin Fish and Wildlife Program Management Review of Contracting Processes. Portland, OR. December.

Moulton, M.P. and J. Sanderson. 1997. Wildlife Issues in a Changing World. St. Lucie Press, Delray Beach Florida.

Murphy, M.H. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska--Requirements for protection and restoration. USDC NOAA Coastal Ocean Program, Silver Spring, MD. Decision Analysis Series No. 7.

Nash, Roderick. 2001. Wilderness and the American Mind. 4th Ed. Yale University Press, New Haven, CT.

NMFS (National Marine Fisheries Service). 1993. Interim Policy on Artificial Propagation of Pacific Salmon Under the Endangered Species Act, 58 Fed. Reg. 17,573.

NMFS. 1995. Biological Opinion: Reinitiation of Consultation on 1994-1998 Operations of the Columbia River Power System and Juvenile Transportation Program in 1994-1998. Endangered Species Act—Section 7 Consultation. NMFS. Portland, Oregon.

NMFS. 1997. Biological Opinion and Conference Opinion on the Implementation of Land and Resource Management Plans (FS) and Resource Management Plans (BLM). National Marine Fisheries Service, Portland, OR.

NMFS. 1998a. 1998 Steelhead Supplemental Biological Opinion: Operation of the Federal Columbia Power System, Including the Smolt Monitoring Program and the Juvenile Fish Transport Program: A Supplement to the Biological Opinion Signed on March 2, 1995, For the Same Projects. Endangered Species Act—Section 7 Consultation. NMFS. Portland, Oregon.

NMFS. 1998b. Biological Opinion: Land and Resource Management Plans for National Forests and Bureau of Land Management Resource Areas in the Upper Columbia River Basin and Snake River Basin Evolutionarily Significant Units. Endangered Species Act—Section 7 Consultation. National Marine Fisheries Service, Northwest Region, Portland, OR.

NMFS. 1999a. Summary of Research Related to Transportation of Juvenile Anadromous Salmonids around Snake and Columbia River Dams. White Paper. Northwest Fisheries Science Center, National Marine Fisheries Service. Seattle, Washington.

NMFS. 1999b. Biological opinion and incidental take statement on 1999 Treaty Indian and non-Indian fall season fisheries in the Columbia River basin. NMFS, Endangered Species Act Section 7 consultation. July 30.

- NMFS.** 1999c. Biological Opinion On Artificial Propagation In The Columbia River Basin. Table 3. NMFS, Northwest Region. March 29.
- NMFS.** 2000a. Salmonid Travel Time and Survival Related to Flow in the Columbia River Basin. White Paper. Northwest Fisheries Science Center, National Marine Fisheries Service. March.
- NMFS.** 2000b. Endangered Species Act - Section 7 Consultation. Biological Opinion: Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin. NW Fish Science Center. Seattle, WA. December 21.
- NMFS.** 2000c. Passage of Juvenile and Adult Salmonids Past Columbia and Snake River Dams. White Paper. Northwest Fisheries Science Center, National Marine Fisheries Service and National Oceanic and Atmospheric Administration. Seattle, Washington. April.
- NMFS.** 2000d. Draft Analysis of Restrictions on Tribal Fishing.
- NMFS.** 2000e. Predation on Salmonids Relative to the Federal Columbia River Power System. White Paper. Northwest Fisheries Science Center, National Marine Fisheries Service and National Oceanic and Atmospheric Administration. Seattle, Washington. March.
- NMFS.** 2001. Administration Initiates New Salmon Restoration Efforts: Federal Agency to Review Hatchery Policy; Maintain Protections (Nov. 9).
- NMFS.** 2002. Updated Schedule for New Hatchery Listing Policy and Pacific Salmon & Steelhead Status Review Updates. Aug. 22. Available at <http://www.nwr.noaa.gov/occd/Update.pdf> (last visited January, 2003).
- NMFS.** 2002a. Endangered Species Act Status of West Coast Salmon and Steelhead. Aug. 8. Available at <http://www.nwr.noaa.gov/1salmon/salmesa/pubs/1pgr.pdf> (last visited January, 2003).
- NOAA (National Oceanic and Atmospheric Administration).** Northwest Fisheries Science Center. 2001a. Technical Memo NMFS NWFSC-8: Contaminant Exposure in Juvenile Salmon. Available at <http://www.nwfsc.noaa.gov/pubs/tm/tm8/disc.html> (last visited January, 2003).
- NOAA.** Northwest Fisheries Science Center. 2001b. Salmon Toxicology. Available at <http://www.nwfsc.noaa.gov/ec/Newport/SalTox.html> (last visited January, 2003).
- Nolan, Mary Lee.** 1993. "Recreation Resources and Tourism" in Jackson, P.L. and Kimerlin, A.J. (ed.) Atlas of the Pacific Northwest, 8th ed. OSU Press, Corvallis, OR. p. 140-147.

Norwood, Gus. 1981. Columbia River Power for the People: A History of Policies of the Bonneville Power Administration. U.S. Dept. of Energy, Bonneville Power Administration. Portland, OR.

NRC (National Research Council). 1996. Upstream: Salmon and Society in the Pacific Northwest. National Academy Press, Washington, DC.

NRCC (National Resource Council of Canada). 1981. Polychlorinated dibenzo-p-dioxins: Criteria for their effects on man and his environment. Ottawa, Canada: National Research Council of Canada, Associate Committee on Scientific Criteria for Environmental Quality. NRCC no. 18574.

Northwest Environmental Defense Center v. BPA. 117 F.3d 1520, 1533-34 (1997).

Northwest Fishletter. 1998. No. 056. "Oregon Hatchery v. Wild Steelhead, Dispute Temporarily Settled." April 7. Available at <http://www.newsdata.com/enernet/fishletter/fishltr56.html> (last visited January, 2003).

Northwest Fishletter. 2000a. No. 105. "(6) Briefs: Hydro System in Emergency Mode, and More," "Public outcry over a plan to kill surplus hatchery fish in the Methow Valley has state and federal officials scrambling to salvage their salmon recovery effort." June 28. Available at <http://www.newsdata.com/enernet/fishletter/fishltr105.html> (last visited January, 2003).

Northwest Fishletter. 2000b. No. 111. "WA Knocks Feds Over Fishery Planning, Recovery, Costs." October 10. Available at <http://www.newsdata.com/enernet/fishletter/fishltr111.html> (last visited January, 2003).

ODFW (Oregon Department of Fish and Wildlife). 2001. "Nonnative Wildlife in Oregon." Backgrounder. November 6.

Odum, E.P. 1981. "The effects of stress on the trajectory of ecological succession." In Barrett and Rosenberg (eds.) Stress Effects on Natural Ecosystems. John Wiley and Sons Ltd., New York, NY. 305 pp.

Olesiuk, P. and M. Bigg. 1988. Seals and sea lions on the British Columbia Coast. Pacific Biological Station, B.C. Department of Fisheries and Oceans, Nanaimo, B.C., Canada.

Olsen, D., and J. Richards. 1994. Inter-Basin Comparison Study, Columbia River Salmon Production Compared to Other West Coast Production Areas, Phase II Analysis. Study Sponsored by U.S. Army Corps of Engineers.

O'Neill, C.R., Jr. 1996. The zebra mussel: Impacts and control. Cornell Coop. Ext. Inf. Bull. 238, 62.

O'Neill, C.R., Jr. 1997. "Economic impact of zebra mussels – Results of the 1995 National Zebra Mussel Information Clearinghouse study." *Gt. Lakes Res. Rev.* 3, 35-44.

- O'Neill, C.R., Jr., and MacNeill, D.B.** 1991. The zebra mussel (*Dreissena polymorpha*): An unwelcome North American invader. New York Sea Grant Institute, Cornell Cooperative Extension, State University of New York.
- Oregon Chapter of the American Fisheries Society (ORAFS).** 2000. Statement to the Joint Committee on Water, Agriculture, and Natural Resources, January 19, 2000. Corvallis, OR. Available at <http://oregonstate.edu/groups/orafs/comment/fallcree.htm> (last visited January, 2003).
- Oregon Executive Order No. EO 99-01. 1999.** The Oregon Plan for Salmon and Watersheds. January 8. "The Oregon Plan: Overview."
- O'Toole, Randal. Thoreau Institute.** 1995. "Testimony of Randal O'Toole on Federal Forest Management and Ownership before the Forests and Public Land Management Subcommittee Senate Energy and Natural Resources Committee." November. Available at <http://www.ti.org/Testimony.html> (last visited January, 2003).
- Pacific Fishery Management Council.** 2001. Preseason Report III: Analysis of Council Adopted Management Measures for 2001 Ocean Salmon Fisheries. Salmon Technical Team and Council Staff. Available at <http://www.pcouncil.org/salmon/salother.html> (last visited January, 2003).
- Pacific Fishery Management Council.** 2002. Review of 2001 Ocean Salmon Fisheries, A-20&21. February. Portland, OR. Appendix A, Historical Record of Ocean Salmon Fishery Effort and Landings. Report.
- Pacific Northwest River Basins Commission (PNRBC).** 1971. Columbia North Pacific Region Comprehensive Framework Study. Vancouver, WA.
- Pacific Salmon Commission.** Pacific Salmon Treaty, June 30, 1999. U.S.-Canada. Available at <http://www.state.ak.us/local/akpages/FISH.GAME/geninfo/hot/pst.htm> (last visited February, 2003).
- Paine, Robert T., et al.** 2001. Salmon Recovery Science Review Panel, Report for the meeting held August 27-29, 2001. Northwest Fisheries Science Center, NMFS, Seattle, WA. Pp. 7-8.
- Palmer, T.** 1997. The Columbia: Sustaining a Modern Resource. The Mountaineers. Mountaineers Books; ISBN: 0898864747. Seattle, WA.
- Palmisano, J.F.** 1997. John Palmisano Biological Consultants, Beaverton, OR "Oregon's Umpqua Sea-Run Cutthroat Trout: Review of Natural and Human-Caused Factors of Decline." In *Sea-Run Cutthroat Trout: Biology, Management and Future Conservation*, Oregon Chapter, American Fisheries Society. Published 1997, proceedings from a 1995 symposium held in Pacific Auditorium, Reedsport High School Reedsport, OR, October 12-14, 1995.
- Palmisano, J.F.** 2000a. Pacific Salmon: A More Thorough List of the Natural and Human-Induced Factors of Decline. July 27 memo.

Palmisano, J.F. 2000b. "Millenium Move from Myth to Science: To Secure Salmon's Future." *California Forests* 4:1, January/March.

Pearcy, W.G. 1996a. Coastal Salmon Restoration Initiative, Peer Review. Oregon Department of Fish and Wildlife. December. Available at <http://www.oregon-plan.org/archives/ocsri1996peer/ocsri1996peer.pdf> (last visited January, 2003)

Pearcy, W.G. 1996b. "What have we learned in the last decade? What are the research priorities?" Paper presented at Conference on Estuarine and Ocean Survival of Northeastern Pacific Salmon. Hotel Newport, Newport, Oregon, March 20-22. National Marine Fisheries Service and OSU Hatfield Marine Science Center.

Pence, Carl F. Reality Specialist Bureau of Land Management- Idaho State Office, Boise, ID. 2002. Personal email communication with Charles Alton, EIS Project Manager, Bonneville Power Administration, February 22.

Pernin, C.G., M.A. Bernstein, A. Mejia, H. Shih, F. Rueter, W. Steger. 2002. Generating Electric Power in the Pacific Northwest – Implications of Alternative Technologies. This report was conducted by RAND Science and Technology for the Pew Charitable Trusts. Santa Monica, CA. September.

Pevar, Stephen L. 1992. The Rights of Indians and Tribes: The Basic ACLU Guide to Indian and Tribal Rights. Second ed. Southern Illinois University Press. Carbondale, IL.

Pinchot, Gifford. 1910. The Fight for Conservation. Doubleday, Page & Company, New York.

Platts, W.S. 1989. "Compatibility of livestock grazing strategies with fisheries." Pp. 103-110 *In Practical Approaches to Riparian Resource Management: an Educational Workshop*. USDOI Bureau of Land Management, Billings, MT.

Platts, W.S. 1991. Livestock Grazing. Pp. 389-424. *In* W.R. Meehan (ed.). Influences of Forest and Rangeland Management on Salmonid fishes and Their Habitats. American Fisheries Society, Bethesda, MD. Special Publication 19.

PNRBC (Pacific Northwest River Basins Commission). 1997. Columbia North-Pacific Region Comprehensive Framework Study. Vancouver, WA. February.

PNWA (Pacific Northwest Waterways Association). 1996. Columbia-Snake River Issues: Rebuilding Fish Runs and Maintaining the Northwest Way of Life.

PNWA. 2000. Policy Backgrounder: Saving Salmon in the Pacific Northwest, Volume 2 Number 9:Issue 25, January.

Quigley, T.M. and S.J. Arbelbide. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. 4 vol. Interior Columbia Basin Ecosystem Management Project, USDA Forest Service, Pacific Northwest Research Station, Portland, OR. Gen. Tech. Rep. PNW-GTR-405.

- Ricker, W.E.** 1980. "Causes of the Decrease in Age and Size of Chinook Salmon (*Oncorhynchus tshawytscha*)." *Can. Tech. Rep. of Fish & Aquat. Sci.* No. 944, May. 25 pp.
- Rieman, B.E. and J. Clayton.** 1997. "Wildfire and native fish: issues of forest health and conservation of sensitive species." *Fisheries* 22(11):6-15.
- Rohlf, D.J.** 1989. The Endangered Species Act: A Guide to Its Protections and Implementation. Stanford Environmental Law Society, Stanford, CA.
- Rost, Bob.** Oregon State University Extension Services. 1998. "A Snapshot of Salmon in Oregon: Mining." Available at <http://eesc.orst.edu/salmon/human/mining.html> (last visited January, 2003).
- Ryding, K.E.; and J.R. Skalski.** 1998. "Multivariate regression relationships between ocean conditions and early marine survival of coho salmon (*Oncorhynchus kisutch*)." Bonneville Power Administration, Project DE-BI79-87BP35885. Portland OR.
- Schaerer, Brett.** 1996. Incentives for Species. The Thoreau Institute, April. Available at <http://www.ti.org/schaerer.html> (last visited December, 2002).
- Sheley, R.L., J.S. Jacobs, and M.F. Capinelli.** 1998. "Distribution biology and management of diffused knapweed and spotted knapweed (*Centaurea*)." *Weed Technology* 12:353-62.
- Smith, Craig.** 1998. Vice-President of environmental affairs for the Northwest Food Processors Association, quoted in *The Northwest Salmon Recovery Report*, August 31. p. 12.
- Smith, Jeff P. et al.** USGS (United States Geological Survey). Status and Trends of the Nation's Biological Resources: Part II, Pacific Northwest. Available at <http://biology.usgs.gov/s+t/SNT/noframe/pn169.htm> (last visited January, 2003).
- Snake River Salmon Recovery Team.** 1994. Final Recommendation to the National Marine Fisheries Service. NMFS, Portland, Oregon.
- Spence, B.C., G.A. Lomincky, R.M. Hughes, and R.P. Novitzki.** 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.. December. Available at <http://www.nwr.noaa.gov/1habcon/habweb/ManTech/front.htm> (last visited January, 2003).
- Sprankle, Craig.** 2000. Public Affairs Officer, Grand Coulee Power Office, Bureau of Reclamation. Pers. comm. with Kathy Pierce, Senior Environmental Protection Specialist, Bonneville Power Administration, December.
- State of Oregon, Archives Division.** 2001. Oregon Blue Book. Available at http://www.bluebook.state.or.us/state/executive/Fish_Wildlife/fish_wildlife_budget.htm (last visited January, 2003).

State of Washington. 1997. Wild Salmonid Policy, Final Environmental Impact Statement. September. Available at <http://www.wa.gov/wdfw/fish/wsp/wsp.htm> (last visited January, 2003).

State of Washington. 1999. "Statewide Strategy to Recover Salmon." Washington State Joint Natural Resources Cabinet. September 21. Available at <http://www.governor.wa.gov/gdro/strategy/longversion.htm> (last visited January, 2003).

State of Washington. 2001. Convergence: Natural Gas and Electricity in Washington – A Survey of the Pacific Northwest Natural Gas Industry on the Eve of a New Era in Electric Generation. State of Washington, Energy Policy Division, Office of Trade & Economic Development. May. Available at <http://www.energy.cted.wa.gov/Papers/Convergence.htm> (last visited January, 2003).

State of Washington. 2002. Water 2002 Home. Available at <http://www.wa.gov/water2002/index.html> (last visited January, 2003).

State of Washington. 2002a. "Washington and Other Western States Hunting License Cost." George Tsukamoto, Staff Biologist. Fall. Available at http://www.wa.gov/wdfw/wlm/game/hunter/gametrails/license_cost.htm (last visited April, 2003).

Stein, J.E., T.Hom, T.K. Collier, D.W. Brown and U. Varanasi. 1995. "Contaminant exposure and biochemical effects in outmigrant juvenile chinook salmon from urban and non-urban estuaries of Puget Sound, WA." *Environ. Toxicol Chem.* 14:1019-1029.

Thoreau Institute. 1998. "State Lands and Resources: Conclusions and Recommendations." Different Drummer Magazine. January 21. Available at <http://www.ti.org/statelands.html> (last visited December, 2002).

Thoreau Institute. 2002. "Concept Paper—Redefining Range/Grassland Management on the Public Lands." Available at www.ti.org/rangereform.html (last visited December, 2002).

Thoreau Institute. Karyn Moskowitz. "The BLM Recreation Fee Demo Program: You Play, You Pay." From Inside the Bureau of Land Management. Available at <http://www.ti.org/blmrec.html> (last visited December, 2002).

Thomas, Jack Ward, Dr. 2000. Watching the Columbia River Salmon Dwindle Toward Extinction With Elephants In The Room. Paper and speech. Columbia River Conference IV, Stevenson, Washington, March 16 & 17.

Trivelpeice, W.Z. 1997. "Antarctic food web." *Nature* 387:897-900.

Troendle, C.A. and W.K. Olsen. 1993. "Potential effects of timber harvest and water management on streamflow dynamics and sediment transport." Pp. 34-41 in Covington, W., L.F. DeBano (tech. eds.). Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management. July 12-15, 1993, Flagstaff, AZ. Gen. Tech. Rep. RM-247. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experimental Station, Fort Collins, CO. 363 pp.

U.S. Census Bureau. 1999. Statistical Abstract of the United States.

US vs. OR, Technical Advisory Committee. 1997. 1996 All Species Review Columbia River Fish Management Plan. August 4.

USDA (U.S. Department of Agriculture). 2000. Agricultural Statistics. National Agriculture Statistics Service. Available at <http://www.usda.gov/nass/pubs/agr00/acro00.htm> (last visited January, 2003)

USDA (Forest Ecosystem Management Assessment Team). 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Land Management, Environmental Protection Agency. Washington D.C.

USDA/Forest Service (USFS). 1995. Inland Native Fish Strategy (INFISH). Environmental Assessment, Decision Notice, and Finding of No Significant Impact: Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada. USDA Forest Service Intermountain, Northern, and Pacific Northwest Regions, Coeur d'Alene, ID.

USDA/USFS and USDOI (U.S. Department of the Interior)/Bureau of Land Management (BLM). 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. USDA Forest Service and USDOI Bureau of Land Management, Washington, DC. April.

USDA/USFS and USDOI /BLM. 1995. Decision Notice/Decision Record, Finding of No Significant Impact, and Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California [PACFISH]. USDA Forest Service and USDOI Bureau of Land Management, Washington, DC.

USDA/USFS and USDOI/BLM. 1997. Eastside Draft Environmental Impact Statement. Volume 1. Interior Columbia Basin Ecosystem Management Project, USDA Forest Service and USDOI Bureau of Land Management, Walla Walla, WA.

USDA/USFS and USDO/BLM. 1998. Biological Assessment on the Effects to Bull Trout, Shortnose Sucker, Lost River Sucker, and Warner Sucker of Land and Resource Management Plans, and Associated Federal Actions on National Forests and Bureau of Land Management Resource Areas in the Columbia River, Klamath River, and Jarbidge River Basins. June 15. Available at http://www.fs.fed.us/r6/fish/biological_assessments/980615-bull-trout-BA_final.htm (last visited January, 2003).

USDA/USFS and USDO/BLM. 2000a. Interior Columbia Basin Supplemental Draft Environmental Impact Statement. Vol. 1. Interior Columbia Basin Ecosystem Management Project, US Government Printing Office, Washington, DC. March 2000.

USDA/USFS and USDO/BLM. 2000b. Interior Columbia Basin Final Environmental Impact Statement. Interior Columbia Basin Ecosystem Management Project, Boise, ID and Walla Walla, WA. December.

USDA/USFS and USDO/BLM. 2000c. Interior Columbia Basin Final Environmental Impact Statement Proposed Decision. BLM/OR/WA/PT-01/010+1792. Interior Columbia Basin Ecosystem Management Project, Boise, ID and Walla Walla, WA. December.

USDA/USFS and USDO/BLM. 2000d. Interior Columbia Basin Supplemental Draft Environmental Impact Statement: Summary. Interior Columbia Basin Ecosystem Management Project, Boise, ID.

USDA/USFS and USDO/BLM. 2003. Press Release and other supporting documents. "Federal Land Agencies Adopt Science Strategy for Interior Columbia River Basin." Interior Columbia Basin Ecosystem Management Project, USDA Forest Service and USDO/BLM Bureau of Land Management. February 19. Available at <http://www.icbemp.gov/> (last visited April, 2003).

USDOC (U.S. Department of Commerce)/US Census Bureau. 1996. Projections of the Total Population of States: 1995 to 2025. Available at <http://www.census.gov/population/projections/state/stpjpop.txt> (last visited January, 2003).

USDOE (U.S. Department of Energy)/BPA (Bonneville Power Administration). 1993. Resource Programs Final Environmental Impact Statement (DOE/EIS-0162, February 1993). Portland, OR.

USDOE/BPA. 1995a. Business Plan Final Environmental Impact Statement (DOE/EIS-0183, June 1995). Portland OR.

USDOE/BPA. 1995b. Business Plan Final Environmental Impact Statement Record of Decision. Portland OR.

USDOE/BPA. 1995c. Final Columbia River System Operation Review Environmental Impact Statement. (DOE/EIS-0170, November 1995).

USDOE/BPA. 1996a. Delivery of the Canadian Entitlement Final Environmental Impact Statement (DOE/EIS-0197, January 1996). Portland OR.

- USDOE/BPA.** 1996b. Tribal Policy. March 26. Portland OR.
- USDOE/BPA.** 1996c. Development of a Natural Rearing System to Improve Supplemental Fish Quality: Final Report. DOE/BP-20651-1. August. Portland OR.
- USDOE/BPA.** 1997a. Watershed Management Program Final Environmental Impact Statement (DOE/EIS-0265, July 1997). Portland OR.
- USDOE/BPA.** 1997b. Wildlife Mitigation Program Final Environmental Impact Statement (DOE/EIS-0246, March 1997). Portland OR.
- USDOE/BPA.** 2000a. Transmission System Vegetation Management Program Final Environmental Impact Statement (DOE/EIS-0285, May 2000). Portland, OR.
- USDOE/BPA.** 2000b. BPA Costs of Implementing the 2000 Biological Opinion. Portland OR. Draft: December 18.
- USDOE/BPA.** 2000c. Draft 2000 Pacific Northwest Loads and Resources Study ["White Book"]. Portland OR. December.
- USDOE/BPA.** 2000d. S. Cooper, Biological Opinion Implementation Lead, Bonneville Power Administration. "Rate Case and 2000 Biological Opinion Projection." Portland, OR. December 18.
- USDOE/BPA.** 2001a. Upgrading the Capacity and Reliability of the BPA Transmission System: Report of the Infrastructure Technical Review Committee. Portland, Oregon. August 30.
- USDOE/BPA.** 2001b. The Columbia River System Inside Story. 2nd Ed. Portland OR.
- USDOE/BPA.** 2001c. Bonneville Power Administration Draft Fish & Wildlife Policy Manual. November 7. Available at http://170.160.2.246/portal/Organizations/Government/Federal/Dept_of_Energy/BPA/Environment/Policies/PoliciesAndProcedures/20011107PolicyManual.doc (last visited January, 2003).
- USDOE/BPA.** 2001d. Phase I Results: Regional Air Quality Modeling Study. Portland OR. August 1. Pp. 1-7.
- USDOE/BPA.** 2001e. Avian Predation on Juvenile Salmonids in the Lower Columbia River Research Project Final Environmental Assessment. April. Portland OR.
- USDOE/BPA.** 2001f. Wright, Stephen J. Acting BPA Administrator. Letter to the Region. March 29.
- USDOE/BPA.** 2001g. Wright, Stephen J. Acting BPA Administrator. Letter to Frank L. Cassidy, Chairman, of the Northwest Power Planning Council, regarding BPA's fish and wildlife spending estimates for fiscal years 2002 through 2006. December 3.
- USDOE/BPA.** 2002a. 2002 Fast Facts. April. Portland OR.

USDOE/BPA. 2002b. Ruger, Alan, Fishery Biologist, Bonneville Power Administration. Personal communication with Charles Alton, EIS Project Manager, Bonneville Power Administration, February.

USDOE/BPA. 2002c. Sivyer, Rollie, Program Analyst. Bonneville Power Administration. Personal communication with Charles Alton, EIS Project Manager. Bonneville Power Administration. October.

USDOE/BPA. 2002d. Skidmore, John, Fish and Wildlife Project Manager. Bonneville Power Administration. Personal communication with Charles Alton, EIS Project Manager. Bonneville Power Administration. February.

USDOE/BPA. 2002e. BPA public release. "Bush Administration proposes 19 percent increase in spending for salmon recovery in the Northwest." Portland, OR. February 4.

USDOE/BPA. 2002f. Wallula Power Project and Wallula-McNary Transmission Line Project Draft Environmental Impact Statement. DOE/EIS-0330. Portland OR. February 22.

USDOE/BPA. 2002g. Wright, Stephen J., Administrator. Bonneville Power Administration. Letter to Larry Cassidy, Chairman, Northwest Power Planning Council. Regarding BPA's wildlife mitigation responsibilities. March 5.

USDOE/BPA, Corps, and Bureau. 1995. Final Columbia River System Operation Review Environmental Impact Statement. DOE/EIS-0170. November.

USDOE/BPA, Corps, and Bureau. 1999. Multi-Species Biological Assessment of the FCRPS. December.

USDO I (U.S. Department of Interior). 1994. Rangeland Reform '94 Draft Environmental Impact Statement. U.S. Government Printing Office, Washington, DC.

USDO I/BLM (Bureau of Land Management). 1992. Whitehorse Butte Allotment Biological Assessment. Bureau of Land Management, Vale, OR.

USDO I/Bureau (U.S. Bureau of Reclamation). 1999. Snake River Flow Augmentation Impact Analysis Appendix. Prepared for the U.S. Army Corps of Engineers Walla Walla District's Lower Snake River Juvenile Salmon Migration Feasibility Study and Environmental Impact Statement.

USDO I/Bureau. 2002. Voluntary Environmental Assessment, FONSI 02-02. Interim Operation of the VARQ Flood Control Plan at Hungry Horse Dam, MT. March.

USDO I/USFWS (U.S. Fish and Wildlife Service). 1994. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Kootenai River Population of the White Sturgeon. Federal Register/Vol. 59, No. 171, 45989. September 6. Available at <http://www.nwr.noaa.gov/HatcheryListingPolicy/59FR45989.pdf> (last visited January, 2003).

- USDOI/USFWS.** 1997. Secretarial Order # 3206: American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act. June 5. Available at <http://endangered.fws.gov/tribal/Esatribe.htm> (last visited August, 2002).
- USDOI/USFWS.** 1998a. ESA Basics. June.
- USDOI/USFWS.** 1998b. Biological Opinion for the effects to bull trout from continued implementation of land and resource management plans as amended by the interim strategy for managing fish-producing watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and portions of Nevada (INFISH), and the interim strategy for managing anadromous fish-producing watersheds in Eastern Oregon and Washington, Idaho, and portions of California (PACFISH), Status of the Species Within the Action Area: Columbia River Distinct Population Segment. Portland, OR.
- USDOI/USFWS.** 1998c. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. Federal Register/Vol. 63, No. 111, 31647, 31674. June 10. Available at <http://www.epa.gov/fedrgstr/EPA-SPECIES/1998/June/Day-10/e15319.htm> (last visited January, 2003).
- USDOI/USFWS.** 1999b. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Coterminous United States. Federal Register/ Vol. 64, No. 210, 58909,58933. November 1. Available at <http://endangered.fws.gov/frpubs/s991101a.htm> (last visited January, 2003).
- USDOI/USFWS.** 1999c. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Jarbidge River Population Segment of Bull Trout. Federal Register/ Vol. 64, No. 67, 17110,17125. April 8. Available at <http://endangered.fws.gov/frpubs/s990408.htm> (last visited January, 2003).
- USDOI/USFWS.** 2000. Effects to Listed Species from Operation of the Federal Columbia River Power System. Biological Opinion. December 20.
- USDOI/USFWS and BLM.** 1994. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. (Northwest Forest Plan). February.
- USDOI/Bureau, Corps, and BPA.** 2001a. Draft Endangered Species Act Implementation Plan for the Federal Columbia River Power System [known as 5-Year Implementation Plan]. Summer. BPA actually produced this document (printing, editing, etc.). Available at http://www.salmonrecovery.gov/biops_5-year_ip_documents.shtml (last visited January, 2003).
- USDOI/ Bureau, Corps, and BPA.** 2001b. Endangered Species Act 2002 Implementation Plan for the Federal Columbia River Power System. [known as the 1-Year Implementation Plan]. November. Available at http://www.salmonrecovery.gov/biops_2002_ip.shtml (last visited January, 2003)

USDOI/Bureau, Corps, and BPA. 2002. Final Endangered Species Act 2003/2003-2007 Implementation Plan for the Federal Columbia River Power System. October.

USDOI/Bureau, Corps, and BPA. 2002b. Endangered Species Act 2001 Progress Report for the Federal Columbia River Power System. May. Available at http://www.salmonrecovery.gov/biops_2001_progress.shtml (last visited January, 2003).

US FERC (U.S. Federal Energy Regulatory Commission). 1999. Regional Transmission Organizations. Docket No. RM 99-2-000; Order No. 2000. December 20. Available at <http://www.ferc.gov/news/rules/pages/RM99-2A.pdf> (last visited January, 2003).

Volkman, John M. 1997. A River in Common: The Columbia River, the Salmon Ecosystem, and Water Policy: Report to the Western Water Policy Review Advisory Commission. The Commission. 206 p. Published by the Western Water Policy Review Advisory Commission. Springfield, VA.

Waples, R. 1991. "Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon." NOAA Technical Memorandum NMFST/NWC-194. March.

Washington Farm Bureau Service Company Inc., Common Sense Salmon Recovery. 1999. CSSR Lawsuit vs. National Marine Fisheries Service. Available at <http://www.salmonjustice.com/CSSR/NMFSLawsuit.htm> (last visited August, 2002).

WDNR (Washington Department of Natural Resources). 1999. Forests and Fish Report. Available at <http://www.wa.gov/dnr/htdocs/forestpractices/rules/forestsandfish.pdf> (last visited August, 2002).

WDOE (Washington Department of Ecology). 1998. The 303(d) List of Impaired and Threatened Waterbodies: List for 1998. Available at <http://www.ecy.wa.gov/programs/wq/303d/1998/1998-index.html#background> (last visited January, 2003).

Welch, D.W. 1996. Growth and Energetics of Salmon in the Sea. National Marine Fisheries Service and OSU Hatfield Marine Science Center. Proceedings of the Workshop March 20-22, 1996. Newport, Oregon. Published April 1997. Paper NOAA Technical Memorandum NMFS-NWFSC-29

Welch, D.W. 1999. "Testimony to the Committee on Energy & Natural Resources, United States Senate," G. Smith hearing. (This document is Appendix F of this FWIP EIS.)

Welch, D.W. 2002. Personal communication with Alan Ruger, BPA Fishery Biologist. Global Warming and Contemporary Fisheries Management, Draft Perspective Piece for American Fisheries Society.

Welch, D.W., F. Whitney, D. Bertram, A. Harfenist, and S. Tucker. 1999. Ocean Climate Change and Growth and Survival of Pacific Salmon & Seabirds on the West Coast of North America, Paper and presentation given at the PICES VIII Conference, Russia.

Western Governors' Association, USDOJ, USDA. 2002. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.* May. Available at http://www.westgov.org/wga/initiatives/fire/implement_plan.pdf (last visited January, 2003).

White, Richard. 1995. *The Organic Machine.* Hill and Wang. New York, NY.

The White House. 1994. "Memorandum for the Heads of Executive Departments and Agencies, Government-to-Government Relations with Native American Tribal Governments." April 29.

Whitney, R.R., L.D. Calvin, C.C. Coutant, J. Lichatowich, W.J. Liss, J.A. Stanford, and R.N. Williams. 1993. *Critical Uncertainties in the Fish and Wildlife Program.* Report to the Policy Review Group by the Scientific Review Group. SRG Report Number 93-3. Bonneville Power Administration. Portland, OR.

Whittaker, Martin. (ACSH) 2001. "Climate Policies Present Investment Risks, Opportunities: ACSH." Innovest Strategic Value Advisors, Inc., Toronto, Ontario. January 16. Available at <http://www.thecarbontrader.com/news37.009.htm> (last visited January, 2003).

Wilkinson, C. 1992. *Crossing the Next Meridian: Land, Water, and the Future of the West.* Island Press. Washington, D.C.

Wissmar, R.C., J.E. Smith, B.A. McInstosh, H.W. Li, G.H. Reeves, and J.R. Sedell. 1994. "A History of Resource Use and Disturbance in Riverine Basins of Eastern Oregon and Washington (Early 1800s-1900s)." *Northwest Science* 68:1-35.

World Business Council for Sustainable Development: South Africa.

"Eco-efficiency." Available at http://www.ief.co.za/downloads/SA_Executive_Guides/eco-efficiency.pdf (last visited December, 2002).

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Fish and Wildlife Implementation Plan EIS
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*USDOJ Bureau of Indian Affairs, Portland, OR
USDOJ Bureau of Indian Affairs, Washington, DC
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USDOJ Bureau of Land Management, Oregon State Office, Portland, OR
USDOJ Bureau of Land Management, Washington, DC
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- *David Wu, OR

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- *Yakama Indian Nation, Toppenish, WA

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- *Columbia River Inter-Tribal Fish Commission, Portland, OR
- *Columbia Snake-River Irrigators Association, Kennewick, WA
- Northwest Indian Fisheries Commission, Olympia, WA
- *Northwest Power Planning Council, Boise, ID
- *Northwest Power Planning Council, Helena, MT
- *Northwest Power Planning Council, Milton-Freewater, OR
- *Northwest Power Planning Council, Portland OR
- *Northwest Power Planning Council, Spokane, WA
- *Northwest Power Planning Council, Vancouver, WA
- Pacific Fishery Management Council, Portland, OR
- Pacific States Marine Fisheries Commission, Gladstone, OR
- Western Governors' Association, Denver, CO

STATE NEPA POINTS OF CONTACT

- *Arizona Department of Environmental Quality, Phoenix, AZ
- *California State Clearinghouse, Governor's Office, Sacramento, CA
- *Idaho: INEEL Oversight Program, Boise, ID and
INEEL Oversight Program, Idaho Falls, ID
- *Montana Legislative Environmental Quality Council, Helena, MT
- *Nevada State Clearinghouse, Carson City, NM

- *New Mexico Environment Department, Santa Fe, NM
- *Oregon Governor's Office, Salem, OR
- *Utah Governor's Office of Planning and Budget, Salt Lake City, UT
- *Washington Department of Ecology, Olympia, WA

STATE HISTORIC PRESERVATION OFFICERS

- Idaho State Historical Society, Boise, ID
- Montana State Historic Preservation Office, Helena, MT
- Oregon State Parks and Recreation Department, Salem, OR
- *Washington Office of Archaeology and Historic Preservation, Olympia, WA

STATE GOVERNMENTS

- *Governor of Idaho, Dirk Kempthorne, Boise, ID
- *Governor of Montana, Judy Martz, Helena, MT
- *Governor of Oregon, Ted Kulongoski, Salem, OR
- *Governor of Washington, Gary Locke, Olympia, WA
- Alaska Department of Fish and Game, Juneau, AK
- *Idaho Fish and Game Department, Bayview, ID
- *Idaho State Department of Water Resources, Idaho Falls, ID
- *Idaho State Office of Species Conservation, Boise, ID
- Montana Department of Fish, Wildlife, and Parks, Helena, MT
- Montana Department of Natural Resources and Conservation, Helena, MT
- *Oregon Department of Fish and Wildlife, Portland, OR
- *Oregon Water Resources Department, Salem, OR
- Washington Department of Fish and Wildlife, Olympia, WA
- *Washington Department of Natural Resources, Olympia, WA
- *Washington State, Farm Bureau, Olympia, WA

LOCAL GOVERNMENTS

- Association of Oregon Counties, Salem, OR
- City of Portland, Bureau of Environmental Services, Portland, OR
- *County of Lincoln, Board of Commissioners, Libby, MT
- Idaho Association of Counties, Boise, ID
- Montana Association of Counties, Helena, MT
- *Port of Pasco, Pasco, WA
- Port of Vancouver, Vancouver, WA
- Washington State Association of Counties, Olympia, WA

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- *Boise Public Library, Boise, ID
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- *Brigham Young University – Idaho, Library, Rexburg, ID
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- *Linfield College, Northup Library, McMinnville, OR
- *Montana State Library, Helena, MT
- *Montana State University - Billings, Library, Billings, MT
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- *Montana State University - Northern, Vande Bogart Library, Havre, MT
- *Montana Tech of The University of Montana Library, Butte, MT
- *Multnomah County Library, Portland, OR
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- *North Olympic Library System, Port Angeles Library, Port Angeles, WA
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- *Northwestern School of Law, Paul L. Boley Law Library, Portland, OR
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- *Western Oregon University, Hamersly Library, Monmouth, OR
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OTHER LIBRARIES AND UNIVERSITIES

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- *Northwestern University, Evanston, IL
- *Portland State University, Executive Leadership Institute, Portland, OR
- *University of Washington, School of Fisheries, Seattle, WA
- *Washington State Library, Joel M. Pritchard Library, Olympia, WA

INTEREST GROUPS

- American Lands Alliance, Portland, OR
- *American Rivers, Seattle, WA
- Association of Northwest Steelheaders, Portland, OR
- Columbia River Alliance, Portland, OR
- Columbia River Fisheries Program Office, Vancouver, WA
- Columbia River Pilots Association, Portland, OR
- Common Sense Salmon Recovery, Olympia, WA
- Defenders of Wildlife, Portland, OR
- Ducks Unlimited, Inc., Rancho Cordova, CA
- *Environmental Defense Fund, Bend, OR
- For the Sake of Salmon, Portland, OR
- Friends of the Earth, Northwest Rivers Project, Seattle, WA

Fish and Wildlife Implementation Plan EIS
List of Those to Whom the EIS Was Sent

Idaho Fish and Wildlife Foundation, Boise, ID
*Idaho Rivers United, Boise, ID
Idaho Steelhead and Salmon Unlimited, Boise, ID
*Idaho Water Users Association, Boise, ID
Idaho Wildlife Federation, Boise, ID
Industrial Forestry Association, Portland, OR
Kokanee Recovery Task Force, Bayview, ID
*Mountaineers, Seattle, WA
*National Wildlife Federation, Seattle, WA
*Native Fish Society, Portland, OR
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*Northwest Energy Coalition, Seattle, WA
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Northwest Mining Association, Spokane, WA
Northwest Pulp and Paper Association, Salem, OR
*Northwest Sportfishing Industry Association, Oregon City, OR
*Northwest Steelheaders Association, Inc., Portland, OR
*Oregon State University Seafood Laboratory, Astoria, OR
*Oregon Trout, Portland, OR
Oregon Water Trust, Portland, OR
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Pacific Northwest Waterways Association, Vancouver, WA
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Sun Mountain Reflections, Portland, OR
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National Rural Electric Cooperative Association, Arlington, VA
Northern Wasco County Public Utility District, The Dalles, OR
*Northwest Irrigation Utilities, Portland, OR
*Pacific Northwest Generating Cooperative, Portland, OR
*Public Power Council, Portland, OR

MEDIA

Associated Press, Portland, OR
*Chronicle, Omak, WA
*Daily Astorian, Astoria, OR
The Oregonian, Portland, OR

BUSINESSES

*Alcoa, Inc., Malaga, WA
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Wiser, Ralph; Yamhill, OR

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