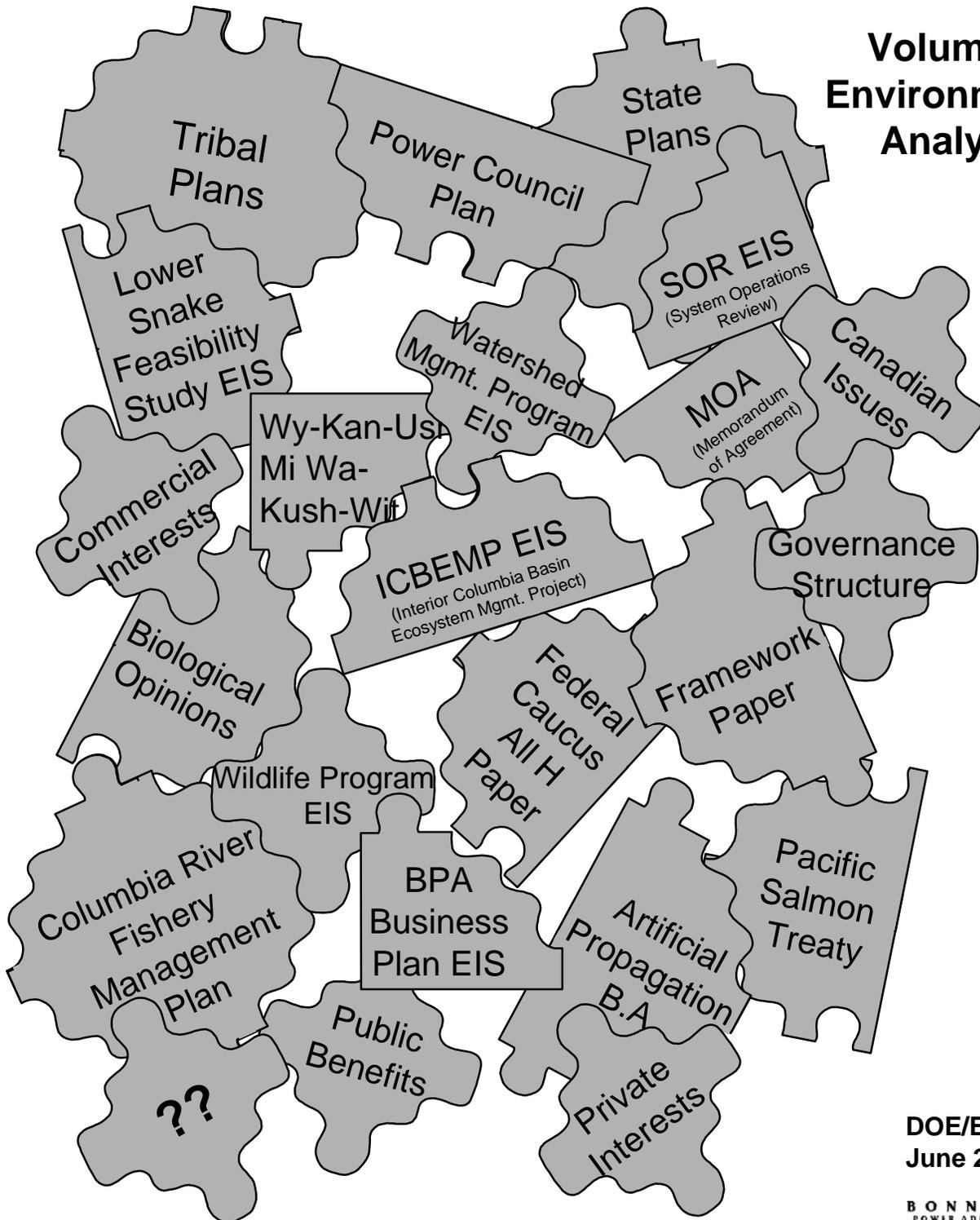


# Bonneville Power Administration Fish & Wildlife Implementation Plan Draft EIS

*"Piecing The Puzzle Together"*

**Volume 1:  
Environmental  
Analyses**



DOE/EIS-0312  
June 2001



**Fish & Wildlife Implementation Plan**  
**Draft Environmental Impact Statement (DOE/EIS-0312)**

**Responsible Agency:** U.S. Department of Energy, 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 species of fish and wildlife continue to decline. Reasons for the lack of success include: different groups have different values and priorities, there is no clear scientific answer, and there are conflicting directives and jurisdictions. The absence of a comprehensive and coordinated planning approach has caused inefficiencies in implementation of mitigation and recovery efforts, as well as their funding. On behalf of 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 existing initiatives in the region. BPA examined five alternative Policy Directions (Natural Focus, Weak Stock Focus, Sustainable Use, Strong Stock Focus, and Commerce Focus) in relationship to continuing the Status Quo, or “no action”, approach. The EIS evaluates the environmental consequences of BPA’s implementation and funding of sample actions that could emerge from any of the policy directions.

BPA does not intend to unilaterally select a Policy Direction for the region. Instead, this EIS provides an analysis of the full range of regional alternatives so that a timely funding and implementation strategy may proceed regardless of the alternative policy that ultimately is chosen—whether by design or by default. The BPA Administrator’s initial decision, as well as future tiered decisions, will rely on the environmental analysis and the 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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## **FOREWORD/UPDATE**

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 effort. This Fish and Wildlife Implementation Plan (FWIP) draft environmental impact statement (DEIS):

- 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 implementation decisions with respect to the natural, social, and economic environments; and
- allows the Administrator an opportunity to review and decide upon a comprehensive, consistent and unified BPA approach to its role in the fish and wildlife mitigation and recovery effort.

BPA expects it will not complete this EIS until late in 2001 because it takes time to prepare a thorough policy-level analysis, ensure opportunity for public review, produce a Final EIS, and make a decision on a Policy Direction. Meanwhile, the great rivers of the Pacific Northwest will continue to flow toward the ocean and through the Federal Columbia River Power System (FCRPS). And BPA must comply with the provisions of the Endangered Species Act (ESA) in managing the FCRPS or risk potentially severe legal consequences.

Therefore, BPA believes that, concurrent with preparation of this and other National Environmental Policy Act (NEPA) documents, we must proceed now toward implementation of certain actions under the Biological Opinions—including the issuance of the draft initial one- and five-year implementation plans. BPA anticipates issuance of a final one- and five-year implementation plan during the Fall 2001. Although BPA has made this decision, it does not mean that BPA has made its final determination on an over-arching Policy Direction for how to fulfill all of its fish and wildlife obligations for the next 10 years. Because the one- and five-year planning process allows BPA annual opportunities to exercise discretion in how to fulfill our ESA mandate, we believe we will meet all of our environmental mandates with these coordinated policy development and implementation planning processes.

A similar situation exists with the Northwest Power Planning Council's Year 2000 Columbia River Basin Fish and Wildlife Mitigation Program. The Council receives proposals for projects that will mitigate for impacts of the FCRPS; BPA uses ratepayer funds to support approved projects in the 11 ecological provinces of the region. BPA has many ongoing actions it funds to implement the Program, as well as an ongoing need to commit to funding additional actions. While BPA makes decisions this year based on current policy positions, at least every three years a rolling review takes place in which BPA is free to revisit its policy and funding decisions in each province. Consequently,

decisions this year may certainly affect, but not necessarily confine or in any way dictate, BPA's policy choices awaiting the conclusion of the FWIP EIS process.

These real-time actions, which take place in accordance with the National Marine Fisheries Service or U.S. Fish and Wildlife Service Biological Opinions (BiOps) BiOps and also as needed emergency measures, are anticipated and represented in the EIS as the *Status Quo* alternative. It is important to recognize that the present course of action (Status Quo) does not offer the efficiencies of regionwide coordinated actions. *BPA believes that the present course could be improved by following a comprehensive, coordinated, and consistent regional policy that would enhance the efficiencies for fish and wildlife mitigation and recovery.* Therefore, this EIS examines five alternative Policy Directions that possess the primary distinction of representing a formal, coordinated policy direction. Each of these is compared for effects against the Status Quo.

This EIS is not meant to replace, revisit or prejudice any of the other major fish and wildlife recovery processes in the Pacific Northwest. Such processes, which have already undergone substantial public scrutiny, include the Federal Caucus' Final Basin-wide Salmon Recovery Strategy, the NMFS and USFWS BiOps, the Northwest Public Power Council's 2000 Columbia River Basin Fish and Wildlife Program, and other federal, state, or tribal plans or programs. Instead, this EIS is intended to integrate and complement all of these efforts. Together, these many processes will coalesce to advance a single preferred alternative that BPA will adopt for fish and wildlife mitigation and recovery in the region. This EIS is designed to advance that goal.

It is customary but not mandatory for the agency preparing an EIS to declare a "preferred" alternative. To achieve greater efficiencies and allow for better predictability for BPA involvement in funding and implementing projects, BPA prefers an alternative that is comprehensive, coordinated, and consistent: in short, an alternative to Status Quo. At this time, the agency is choosing not to make a statement of preference among the five alternatives that offer such coordination and efficiency, in the interests of encouraging lively and thorough discussion throughout the region on the tradeoffs offered by these alternatives.

Finally, the EIS establishes a procedural "roadmap" for future site-specific actions within the scope of the broader policy decisions about BPA funding and implementation. 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 NEPA. The intended result is a BPA decisionmaking process that better aligns implementing actions with the broad policy direction.

BPA hopes that this DEIS, 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**  
**DRAFT ENVIRONMENTAL IMPACT STATEMENT**

***SUMMARY***

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

## **INTRODUCTION**

### **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. But human uses can compromise and severely deplete these resources, even eliminate them. The independent demands of human uses such as irrigation, municipal water supplies, fishing, electric power production, recreation, flood control, 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 species declines. 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 should be.**
- (2) There is no clear scientific answer to the problem.**
- (3) Conflicting directives and jurisdictions of regional authorities have meant that funds dedicated to the fish and wildlife recovery efforts have often been used less efficiently and effectively than they otherwise could have been.**

Recently, regional entities have taken more steps to try to work together to develop a comprehensive and coordinated planning approach for species recovery and mitigation efforts. Any such effort would 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. This effort is based upon the premise that all fish and

wildlife resources are interrelated parts of a singular ecosystem, and 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 in this effort.

### **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 Northwest. The marketed power comes primarily from 31 federal hydroelectric projects (known collectively as the Federal Columbia River Power System, or FCRPS), as well as from 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 use of renewable resources.

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

- The Pacific Northwest Electric Power Planning and Conservation Act of 1980 ("Regional Act") extended BPA's responsibilities to include development of energy conservation resources and enhancement of the Northwest's fish and wildlife that have been affected by the construction and operation of federal hydropower plants in the Columbia River Basin. 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, and
  - 2) to do so in a manner that provides equitable treatment for such fish and wildlife with the other purposes of the FCRPS.
- BPA also has specific duties regarding fish and wildlife under 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 DEIS section 2.3.2.1); and
  - 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:
    - 1) protecting tribal lifestyles, culture, religion, and economy; and
    - 2) striving toward mutually agreeable decisions reflecting a consensus.

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

The Regional Act created the Northwest Power Planning Council (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. Ratepayers, through BPA, are currently spending up to \$250 million annually for fish and wildlife. In addition, hydrosystem operation requirements for salmon recovery efforts have reduced power generation in the region by about 1,000 megawatts.

Although the Regional Act and ESA are those responsibilities perhaps most often mentioned in discussions involving BPA's fish and wildlife mitigation and recovery effort obligations, these statutes are but two of the statutes, regulations, and treaties that bear upon BPA's fish and wildlife mitigation and recovery efforts. Additionally, BPA is not the only Pacific Northwest entity with interests in, and activities affecting, fish and wildlife. Many other entities manage the Columbia River Basin's fish and wildlife resources, each with its own legal constraints, policy directives, and jurisdictional limitations. However, there is 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 is possible.

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 coordination and efficiency in fish and wildlife activities in the region.

Recently, the Council's Multi-Species Framework Process, 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' Basin-wide Salmon Recovery 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 path, the region is working to arrive at a unified planning approach to mitigation and recovery of fish and wildlife populations. BPA must be prepared to supply the funds to implement the ratepayers' share of fish and wildlife mitigation and recovery efforts (including the funding efforts) under whatever Policy Direction is chosen. BPA must be prepared to respond whether:

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

## **THE FISH AND WILDLIFE IMPLEMENTATION PLAN DRAFT ENVIRONMENTAL IMPACT STATEMENT**

*An **environmental impact statement** is a document that presents 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 public review and comment, the EIS is used by agency decisionmakers to select the best alternative for action to meet a defined need.*

BPA is preparing this draft environmental impact statement (DEIS) 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. These Policy Directions are reflected in the range of alternatives being considered in several key ongoing regional processes. BPA is preparing this DEIS now because (1) many species of fish and wildlife are already in serious condition (further delay must be minimized), and (2) BPA wants to be ready to respond promptly when a regional Policy Direction(s) is ripe for decision.

***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 BPA will select a Policy Direction, but any 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.*

## **Functions**

This DEIS has three main functions:

- (1) to evaluate the range of potential Policy Directions** and possible implementing and funding actions that the region could decide to take for fish and wildlife mitigation and recovery efforts,
- (2) to identify what specific path** the Pacific Northwest most likely will take as a unified planning approach or as a series of independent actions by involved parties for fish and wildlife mitigation and recovery efforts in the region, and
- (3) to determine the environmental consequences** of BPA's implementation and funding of the actions that could emerge from that policy.

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

- **BPA is not developing its own Policy Direction alternatives.** The alternative Policy Directions described and evaluated in this DEIS are based on *alternatives developed by the existing 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 developed five Policy Directions, plus Status Quo, that range across a wide spectrum of options.
- **BPA is not unilaterally selecting a Policy Direction.** Rather, this DEIS provides analysis of the full range of regional alternatives so that a funding and implementation strategy may proceed *regardless of the alternative policy chosen*. A Policy Direction will be an outgrowth of several regional processes, whether those processes harmonize around a specific approach or diverge through independent regional actions. However, if the region fails to agree upon a single Policy Direction, BPA must still implement and fund a fish and wildlife mitigation and recovery effort strategy.

BPA recognizes it must take action in response to a fish and wildlife policy, however it emerges. Successful implementation of the Policy Direction selected through various decisions will require quick and definitive actions if further declines in fish and wildlife are to be avoided. Although this DEIS is intended for BPA decisionmaking, the analysis may also make it valuable for other regional entities that may adopt it as part of their own decisionmaking.

## **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 DEIS to fulfill its National Environmental Policy Act (NEPA) requirements for understanding the environmental consequences of its actions (funding and implementing any Policy Direction) before decisions are made. This 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 more specific purposes BPA must consider. This DEIS must evaluate the alternative Policy Directions in terms of their consistency with federal and state laws, needs and responsibilities. BPA will use the purposes listed below as "yardsticks" to compare how well the alternative Policy Directions meet the agency's need:

- **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, and provide a reliable, adequate, efficient, and economical power supply.
- **Fulfill** the Administration's Fish 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;<sup>1</sup> 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** other obligations under other applicable laws, including federal treaty and trust responsibilities with regional tribes, the Endangered Species Act, the Clean Water Act (CWA), and the National Historic Preservation Act (NHPA).
- **Promote** predictable and stable fish and wildlife costs and competitive rates, enhancing BPA's ability to provide funding and remain competitive in the electric utility marketplace.

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<sup>1</sup> Treasury repayment is a payment BPA makes annually to repay 1) monies BPA has borrowed from the US Treasury and 2) appropriations to the Corps and Bureau for the share of capital construction allocated to the power purpose of the hydrosystem.

## **BACKGROUND**

### **Emergence of Fish and Wildlife Policy**

Public policy—principles that guide and shape decisionmaking by a controlling authority—is as old as civilization. Native American settlements occurred widely across the Pacific Northwest, shaped in many cases by the natural resources that supported their lives—fish and forest- or plains-dwelling animals; water for drinking, fishing, or transportation; forests and plant materials. Each tribe developed its own unique cultural adaptations and its own spoken traditions regarding the use of resources to support tribal life. Survival depended on use of the natural resources and on elaborate trade networks. For a number of Pacific Northwest tribes, salmon were at the heart of an entire way of life, not only as food source but also as spiritual center. 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. Consequently, 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.

Euro-American settlement and development of the West occurred in response to two factors: the presence of ample natural resources and the evolution of federal land policies. Non-Indian settlers obtained and marketed those resources that had previously been harvested for subsistence. The concepts of owning land and of harvesting to meet ever-expanding commercial needs significantly differed from the implicit policy followed by Native Americans: the shift in policy changed the environment, and profoundly diminished both tribal well-being and tribal access to natural resources they traditionally used. Conflicts over land ownership, exploitation of resources, and a host of related issues with particular significance for Native American peoples came to dominate relationships, as more immigrants were encouraged to settle land, and Native Americans were encouraged, or forced, to accept smaller and less desirable pieces of land as reservations. Although several tribes did successfully assert their fishing rights, those rights were less successfully exercised as development of the basin proceeded. In the meantime, both the landscape and resources changed dramatically.

In the nineteenth century, fish and wildlife policy came more under the control of the immigrants and their governing bodies. Focus shifted to control of the territory, displacement of Indian tribes, settlement (and later withdrawal) of lands, government ownership of lands, extraction of natural resources, harnessing of the rivers for irrigation and flood control, and, moving into the twentieth century, development of hydroelectric power. Over the decades, populations of animals and fish dropped dramatically—beavers, for instance, were hunted almost to extinction when beaver hats became the fashion. Salmon were harvested by the ton as technology made possible fish wheels and netting techniques that removed many salmon headed upstream for spawning from the population, thus sharply reducing, year by year, the numbers of returning salmon.

When the results of such commercial exploitation were added to the parallel extraction from mining, logging of timber, and agriculture, the federal government began to

recognize that the resources were finite. Near the end of the nineteenth century, federal interests began a shift in policy direction: from exploration and development to retention and management of these lands—keeping them under the wing of the government itself. However, regulations to curb excessive extraction were seldom or poorly enforced, and the government itself provided the muscle behind the development of hydroelectric power through a series of great irrigation and hydroelectric dams begun in the early 1900s and built into the 1970s. In the face of the deep and extensive Depression, a strong nation was the goal, and electric power and building programs were one way to support the country. Flood control reduced damage and danger to the growing human populations, and irrigation enabled poor lands to be farmed to supply more food for the nation.

But dams had (and continue to have) an enormous effect on downstream and upstream migrating fish as well as wildlife and their habitats. Miles and miles of salmon spawning habitat were blocked by the construction of dams in the Columbia River Basin. The swift cold flow of rivers that sped juvenile anadromous fish to the ocean was slowed; the great dams formed reservoirs (artificial lakes) that warmed and slowed the water, delaying the young fish and making them more vulnerable to predators. Returning adult fish struggled to reach their birth waters to spawn, an increasingly exhausting journey past some dams with fish ladders, and an impossible quest where all access was blocked. When the first great Federal hydroelectric dams were built on the Columbia River, legislators recognized that effects on fish would be negative, but chose to support the human population regardless of that resource impact. The native fish diminished. The raptors and terrestrial animals that fed on them diminished. Wetland habitat that supported some water-dependent animals disappeared.

Some attempts to mitigate for these losses began in the late 1940s, with the passage of the Mitchell Act, which was authorized by Congress to build hatcheries to offset fish losses. But not until the 1970s did the passage of environmental laws such as the Endangered Species Act, the Clean Water Act, and other environmental legislation signal a new approach to fish and wildlife policy. In addition, there was a legal affirmation of Indian treaty fishing rights. With these laws, the natural resources of the Pacific Northwest—and particularly the fish and wildlife—began to be viewed as equally important as the many human-centered uses (flood control, navigation, irrigation, electric power production) for which the river systems had primarily been managed throughout the previous century.

These acts, and others, plus the increasing interest of people of the Pacific Northwest and of governments at many levels, have assisted in lessening some of these impacts. But two basic problems remain. First, science does not have all the answers, and impacts continue—and are particularly worse, in years where natural conditions such as flood or drought add their weight to the human effects. And second, the number of interests, coalitions, and state, tribal, local, and federal government agencies with interests in and mandates for action has multiplied over the years. In following their mandates, however, their focuses and approaches often conflict. Here are a few examples:

<b>Current Policy Conflicts (Sample)</b>		
Policies that encouraged settlement and taking of tribal land		Tribal treaties to preserve certain land for tribes
Policies that allowed depletion of fish runs		Tribal rights to fish for salmon
Policies that encouraged resource extraction and production—mining, hydropower development, USFS multiple use, BLM grazing, and homesteading	<i>versus</i>	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 limit private property rights
Policies to reduce costs and increase market forces in the power industry		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 hatcheries that may compete with native fish
CWA dissolved gas standards		
Protection of endangered species (e.g., salmon)		Protection of marine mammals (e.g., sea lions or seals)

With the range of different interests and interest groups, their respective mandates, and the conflicts that arise among them, there is no efficient way to sort out priorities or to make good progress to support and sustain fish and wildlife. Fish and wildlife policy, over time, has evolved from use for sustenance, through exploitation, to a beginning of a more balanced view of the interrelationships of all living things that make up the human environment. The Pacific Northwest has reached a point in policy evolution where it needs a guiding framework to help all interests decide how best to spend the (limited) funds to support our natural resources. To arrive at a comprehensive and coordinated policy, we must first understand where we've been and next, define and decide on the choices as to where we want to go.

### **Major Participants**

It is important to understand the many interests in Pacific Northwest fish and wildlife: the participants and the processes now going on in the region. Major participants include the following:

- **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 efforts, as defined by various federal statutes and regulations)
- **the Columbia River Basin Forum** (which consists of the representatives of sovereign governments—federal, state, and tribal—involved in the region’s decisionmaking, seeking to develop an agreement for a fish and wildlife plan);
- **the Northwest Power Planning Council** (which develops and recommends fish and wildlife measures for BPA to fund as mitigation for the effects of the FCRPS);
- **individual states and local governments; and other regional interests** (including the many citizens and parties with a direct or indirect interest in the costs, strategies, and specific projects that may be involved in any plan to recover fish and wildlife populations).

Figure ES-1 shows the major participants in the regional Columbia River Political Forum.

### **Ongoing Processes and Key Issues**

These participants are involved in several different processes with differing scopes (policy directions, geographic areas, and particular species) that seek to address certain aspects of fish and wildlife recovery policy.

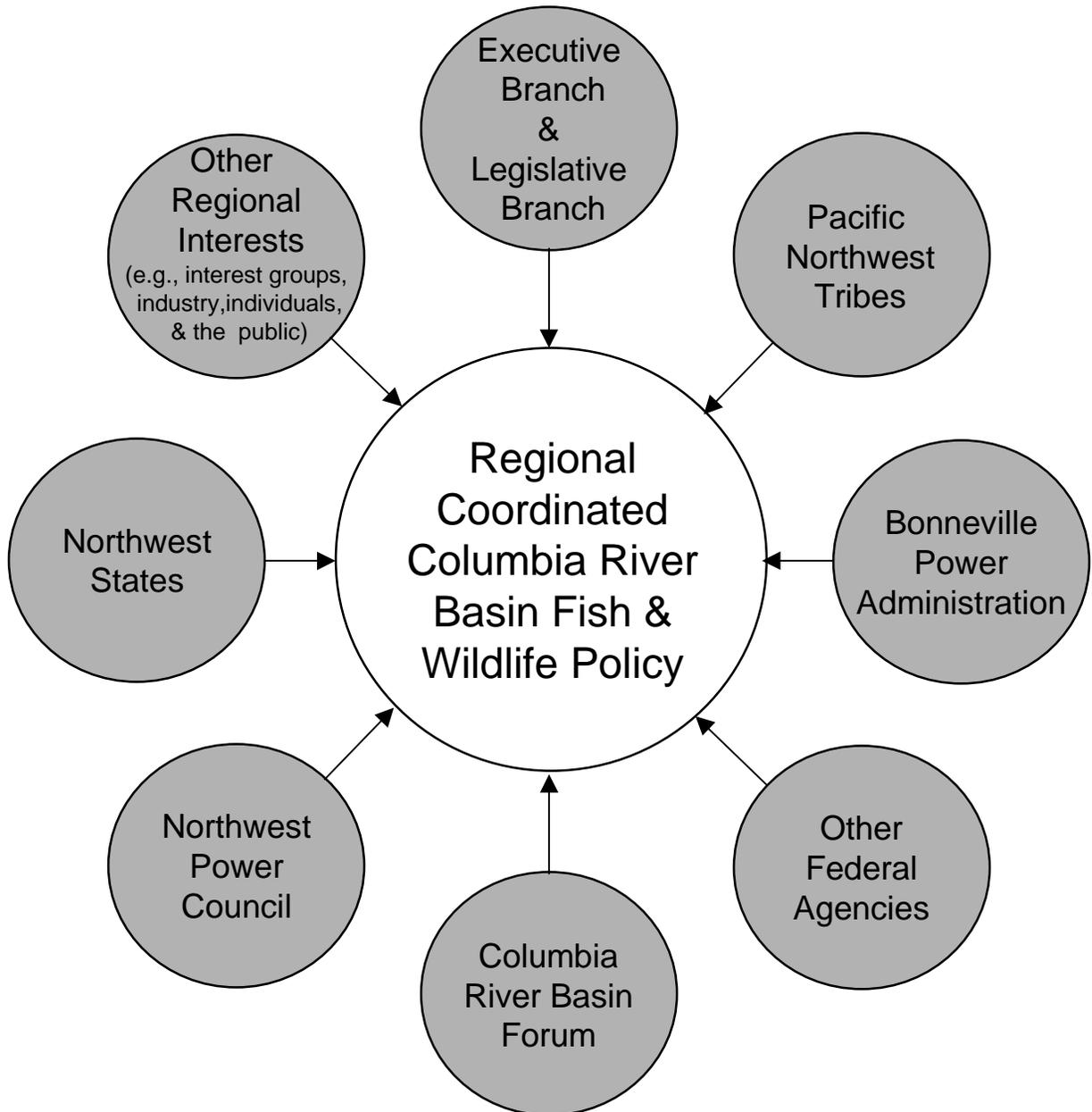
- **Individually focused processes** each addresses a narrow range of the fish and wildlife mitigation and recovery effort issues. Any one of these processes—such as hatchery propagation of fish, habitat restoration and improvement, manipulation of the flow in the rivers (hydro), management of federal lands, breaching dams, and harvest controls—may help a particular aspect of the overall policy need. None of these processes offers a coordinated, comprehensive effort to address the whole problem.

**Federal Caucus and the Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (Conceptual Plan) and Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (Basin-wide Strategy)<sup>2</sup>:** This process and documentation, 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. The Basin-

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<sup>2</sup> These two documents were formerly known as the "All-H Plan"; they are the draft and final versions of the same study.

**ES- 1: The Major Participants in Regional Columbia River Political Forum**



wide 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 recovery planning for listed anadromous fish will likely proceed along the lines discussed in the Basin-wide Strategy Paper.

The strategy is incorporated into National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) recommendations through the Biological Opinions (BiOps) for actions that affect Columbia River Basin ESA-listed fish.

- **NMFS and USFWS Biological Opinions:** These agencies prepare Biological Opinions, as required by the ESA, for species under their respective authorities. BiOps describe the federal agency's determination of whether proposed actions will jeopardize listed species. BiOps prepared for the FCRPS provide performance standards for the action agencies—the Corps, the Bureau, and BPA. Biological Opinions are also prepared on other actions affecting Columbia Basin fish and wildlife.
- **Recovery Planning:** NMFS plans the recovery process for salmon and steelhead. The 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 sources to complete the information. Subbasin plans will be “aggregated” to ensure the recovery of the entire ESU is provided for.

- **The Council's 2000 Columbia River Basin Fish and Wildlife Program:** This program is the largest effort in the nation to recover, rebuild, and mitigate impacts on fish and wildlife. The 2000 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's Multi-Species Framework Report:** 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 recovery. 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 fish and wildlife recovery proposals (Concept Papers) were submitted by interested parties, and over 100 fish and wildlife recovery actions were proposed. The Council developed seven Framework alternatives, describing those alternative long-term visions. 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. Their report, which was completed in December 2000, was used to inform the Council's amendment of its Fish and Wildlife Program.

- **Fish Funding Principles:** In September 1998, former Vice-President Gore announced Fish Funding Principles. These Principles were intended to help shape how BPA set its power marketing rates, and to ensure that BPA would meet all of its mitigation and recovery effort responsibilities, while simultaneously meeting its marketing and Treasury repayment responsibilities.<sup>3</sup>
- **The Council's 2001 Report on Bonneville Fish and Wildlife Expenditures.** 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 *2001 Report on Bonneville Fish and Wildlife Expenditures* found that, since 1978, BPA's costs 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.** The *United States v. Oregon* is a case begun in 1968 by the Columbia River treaty tribes and the United States against Oregon, and later, against the states of Washington and Idaho. It continues today, with jurisdiction residing in the Federal District Court of Oregon. It is the landmark case in which Judge Robert Belloni ruled that state management practices failed to meet the tribes' treaty-secured fishing rights, and the tribes were entitled to take "a fair and

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<sup>3</sup> 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.

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 been renegotiated yet. Judge Garr King (U.S. District Court of Oregon) now oversees the case and has continuing jurisdiction over it.

Throughout the last decade, federal agencies in the region have developed and continue to prepare a number of fish and wildlife mitigation and recovery actions. They have also issued a series of EISs designed to evaluate and implement the selected actions. These documents include the Lower Snake River Juvenile Salmon Migration Feasibility Study Draft Environmental Impact Statement (U.S. Army Corps of Engineers, October 1999), 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 are used as resources in the preparation of this Fish and Wildlife Implementation Plan draft EIS (FWIP DEIS), and are incorporated here by reference. For a complete listing, please see pages 12 - 14 of Chapter 1 of the DEIS.

BPA's EIS team has expanded on the existing environmental documentation by incorporating information from the recent regional processes and by working with the public and the agencies to identify "Key Issues" that must be addressed in any comprehensive fish and wildlife recovery effort plan. The list of key issues compiled by the EIS team is provided below.

**Table ES-1: Key Issues Identified in the Regional Processes**

<b>Key Regional Issues</b>		
<b>1 Habitat</b>	<b>4 Hydro</b>	<b>7 Transportation</b>
1-1 Anadromous Fish	4-1 Dam Modifications and Facilities	7-1 Navigation
1-2 Resident Fish	4-2 Hydro Operations	7-2 Trucking, Railroads and Infrastructure
1-3 Introduced Species	4-3 Spill	<b>8 Agriculture</b>
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

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<b>Key Regional Issues</b>		
1-6 Watersheds	4-6 Water Quality	8-3 Grazing
1-7 Tributaries	4-7 Juvenile Fish Migration and Transport	8-4 Forestry
1-8 Mainstem Columbia	4-8 Adult Fish Passage	<b>9 Commercial Fishing</b>
1-9 Reservoirs	4-9 Flood Control	<b>10 Residential and Commercial Development</b>
1-10 Estuaries	<b>5 Power</b>	<b>11 Recreation</b>
1-11 Water Quality	5-1 Existing Generation	<b>12 Tribes</b>
<b>2 Harvest</b>	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	<b>6 Industry</b>	
2-3 Wildlife	6-1 Industrial Development	
<b>3 Hatcheries</b>	6-2 Aluminum and Chemical	
3-1 Anadromous Fish	6-3 Mining	
3-2 Resident Fish	6-4 Pulp and Paper	

**SCOPE AND DECISIONMAKING**

This DEIS is designed to be broad enough to encompass any potential Policy Directions under consideration. The associated environmental analysis and publication will offer the public an opportunity to assess, participate in, and influence the selection of a regional Policy Direction alternative(s) for fish and wildlife recovery efforts, along with the regional decisionmakers. By undertaking this DEIS as a complement to the other processes, BPA’s DEIS will also provide a springboard for the Agency 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 (see “tiering” discussion below).

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 animal activity away from a section of riverbank will help riparian vegetation to resprout, will slow erosion into the stream, and will improve the quality of the water in which the fish live. On the other hand, if the goal is to improve the lives 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 DEIS tries to emphasize factual matters, while revealing trade-offs among groups of people.

One constraint, however, is legal. There are certain laws that an alternative must meet to be viable. These laws include the ESA, the Regional Act, tribal trust and treaty responsibilities, and the CWA. But this is a forward looking policy-level DEIS. 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 to implement them. If scoping provided suggestions for an alternative that reflected a reasonable, focused, clearly articulated rationale, then we incorporated either that alternative or its actions into this DEIS. 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.

EIS alternatives sometimes change unexpectedly as the process is underway or as new information or ideas are presented. This EIS structure allows BPA to address the broadest possible range of alternatives so as to be able to assess the effects of such changes. Such an approach also anticipates changes over time and extends the usefulness of the EIS.

It also allows the decisionmaker to "tier" site-specific decisions from this EIS. First, this broadly scoped DEIS evaluates the different Policy Directions available to decisionmakers. The evaluation includes trade-offs among resources and options to modify the basic Policy Direction(s) as well as ways to mitigate for effects. Policy Directions are compared against the purposes. Publication of the DEIS then signals the beginning of a public comment process.

The draft EIS does not propose a preferred alternative because BPA wants to present all options equally at this time to promote creative public discourse on each of the Policy Directions. BPA is seeking suggestions for new alternatives or alternatives blended from the five Policy Directions that the reader thinks may better meet our needs. The Administrator will consider the blended options and reflect on these alternatives when conducting both the initial and any future decisionmaking process. Obviously, the need to avoid jeopardizing listed species is critical, as is mitigating for fish and wildlife losses in a manner consistent with the Council's program. This DEIS demonstrates, however, that there are many other highly important resources affected by any Policy Direction BPA might take. Choosing a preferred alternative at this time could dampen or skew the dialogue that BPA desires in order to make a fully informed decision at the conclusion of this NEPA process. Therefore, BPA will not identify a preferred alternative until it prepares the final EIS.

After a public review process and consideration of all analysis and comments, BPA will publish a Final EIS. BPA will then prepare a Record of Decision (ROD) that documents and explains the basis for the selected Policy Direction. BPA may then "tier" decisions about the implementation of actions consistent with the same Policy Direction. BPA will continue to involve the public as it decides on different categories of specific implementation actions. Other federal agencies, states, and/or tribes may find this EIS and associated RODs useful for related actions under their agencies' respective jurisdictions.

## **PROPOSED ACTION AND ALTERNATIVES**

This DEIS examines several Policy Directions. Each Policy Direction represents a shift toward a focus or theme. More actions and more intensive actions consistent with that theme would be taken, but existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated. The exact actions taken under each Policy Direction, and the intensity of the actions are generally not established at this time. Rather, actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate.

The Policy Directions are based completely on ideas set forth in the existing 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.

We have named the Policy Directions as follows:

<b><i>Status Quo</i></b>	<b>Weak Stock Focus</b>
<b>Natural Focus</b>	<b>Strong Stock Focus</b>
<b>Sustainable Use Focus</b>	<b>Commerce Focus</b>

Status Quo draws on the many regional processes, including the Framework. Each of the Policy Directions summarized below is based on a concept for fish and wildlife policy developed or proposed by some persons 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.

All of the Policy Directions have some common assumptions:

- Pressures for population growth and urbanization will continue;
- BPA's roles in marketing federal hydropower and funding fish and wildlife programs will continue; and
- All Policy Directions seek to attain their goals at least cost.

### **Status Quo Policy Direction (and current implementation actions)**

*The Status Quo Alternative (and the associated current implementing actions) represents the "no action" alternative—not changing the current ad-hoc approach. Analysis of a "Status Quo" alternative is required by NEPA. For this DEIS, the Status Quo serves as a baseline for comparison with the Policy Direction alternatives.*

*The Status Quo Alternative includes continued current actions and the future changes relative to existing environmental conditions that can be reasonably expected.*

*Increasing population, economic growth, and additional urbanization are assumed based on existing trends; these assumptions are also included in the other Policy Directions except as they may be affected by the implementation actions under each Policy Direction. (For example, a policy that discouraged new construction might reduce population growth.)*

**Emphasis:**

- Operation of hydrosystem primarily for authorized purposes: fish, power generation, recreation, navigation, irrigation, and flood control.
- Anadromous fish, especially ESA-listed species.
- Mitigation (e.g., flow augmentation, spill, juvenile transportation, predator control, and passage improvements, as well as off-site mitigation with hatcheries and replacement habitat) for the effects of hydro generation.
- Recognition of government's past trade-offs of fish, wildlife, and other resources for commodities and commercial activities.
- Increasing consideration of tribal viewpoint and co-management role.
- Hatcheries operated primarily in an effort to sustain anadromous and resident fish harvest.
- Mitigation efforts for terrestrial habitat consisting largely of purchases and preservation of land to replace habitat that was lost to hydro development.
- Boom and bust cycles of harvest, with recent trends away from maximizing fish harvest and toward weaker stock protection.
- Sustained commercial activity by preserving the hydrosystem and avoiding unbearably costly and restrictive mandates.

**Natural Focus**

*“A value for, and an emphasis on preserving ‘wildness’ and ‘wild areas’ from future human development.” (Cone, 1995:49-50)*

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 restore 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 and eliminating non-native species.<sup>4</sup>

**Differences from Current Implementation Actions:**

- Restores habitat emphasizing passive techniques.
- Decreases harvest.
- Discontinues hatcheries.
- Removes six dams: McNary, John Day, Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases some commercial activity.
- Allows tribal harvest of healthy fish and wildlife populations.

**Weak Stock Focus**

*"Extinction is not an option." (State of Washington, Statewide Strategy to Recover Salmon, September 1999)*

This alternative emphasizes an active posture to prevent the extinction of fish and wildlife populations, especially those listed as threatened or endangered under the Endangered Species Act or other legal protections. The focus would be on saving the weakest populations first. Reasons for preserving species may range from "existence value" to moral imperative to potential beneficial uses of species to humans.<sup>5</sup> The USFWS "ESA Basics" noted the connection between the passage of the ESA and American concern about the decline and possible extinction of many wildlife and plant species, not only around the world, but especially within the U.S. Congress attached aesthetic, ecological, educational, recreational, and scientific value to the diverse environments of the nation and so sought to conserve and recover both endangered and threatened species and the ecosystems on which they depend. The ultimate ESA 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 enforcement of this law, this Policy Direction is likely to entail more emphasis on continued regulation.<sup>6</sup>

**Differences from Current Implementation Actions:**

- Restores more habitat for weak stocks.
- Decreases harvest.
- Manages hatcheries for weak stocks.

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<sup>4</sup> Sources: Cone, 1995, pages 50-55; Kloor, 1999.

<sup>5</sup> Summarized from Daniel J. Rohlf, The Endangered Species Act: A Guide to Its Protections and Implementation (Stanford Environmental Law Society, Stanford, CA), 1989:12-17.

<sup>6</sup> Sources: US Fish and Wildlife Service "ESA Basics." June 1998; Rohlf, 1989.

- Removes four dams to assist weak stocks: Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases commercial activity that affects weak stocks.
- Uses selective techniques for tribal harvest to assist weak stocks.

### **Sustainable Use Focus**

*"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." (Gifford Pinchot, *The Fight for Conservation*: p. 81.)*

This Policy Direction emphasizes the expansion of opportunities to harvest fish and wildlife resources. The philosophy behind this Direction fundamentally emphasizes sustainable relationships between human beings and fish and wildlife. Humans and their technology are but one part of an integrated whole of nature and are responsible for maintaining appropriate, reciprocal relationships with fish and wildlife and a long-term connection to place. One of the tenets behind this Direction is that humans have rights to using natural resources to meet sustenance, spiritual, and economic needs. But humans also have an obligation to insure that those resources (e.g., fish populations) are self-sustaining, and therefore may intervene at all various stages in the life cycles of fish and wildlife species and their environments, to help those populations rebuild and maintain themselves in perpetuity.<sup>7</sup>

### **Differences from Current Implementation Actions:**

- Restores habitat to maximize production.
- Increases harvest of natural and hatchery stocks.
- Increases hatchery production and supplementation<sup>8</sup> (supplementing wild stocks).
- Improves hydro operations for fish and wildlife, including dam removal as a last resort if other measures fail to recover populations.
- Decreases commercial activity.
- Increases tribal harvest overall.

### **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" (Thomas: 2000, 5).*

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<sup>7</sup> Sources: Spirit of the Salmon (Wy-Kan-Ush-Mi Wa-Kish-Wit). Columbia River Inter-Tribal Fish Commission. 1999.

<sup>8</sup> **Supplementation** - Artificial propagation intended to reestablish a natural population or increase its abundance. (Conceptual Plan (Draft "All-H" Paper), 1999, Glossary, page 100).

The focus here is on maintaining viable stocks and ecosystems to avoid broader collapse of fish and wildlife populations. Program priorities would be based on effectiveness of stock maintenance (as opposed to recovery). Costly efforts to recover populations that are so depleted that they cannot or likely will not be recovered without substantial costs to other species should be abandoned. These costs, which would be avoided by this Direction, include "massive changes in the number and lifestyle of [humans], changes that society shows little willingness to seriously consider, much less implement" (Lackey, 2000:1). "Effective options to reverse the decline of wild salmon, and especially to restore *depleted* runs, would be socially disruptive, economically costly, and ecologically equivocal" (Michael, 1999 in Lackey, 2000:4). "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 fishes 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" (Thomas, 2000: 4).<sup>9</sup>

**Differences from Current Implementation Actions:**

- Maintains habitat for strong stocks.
- Increases harvesting while maintaining strong stocks.
- Maintains hatcheries that support strong stocks.
- Decreases restrictions on hydro operations not affecting strong stocks.
- Increases commercial activity while maintaining strong stocks.
- Increases tribal harvest while maintaining strong stocks.

**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" (Schaerer, 1996: 1).*

This Policy Direction emphasizes economic efficiency in choosing a recovery effort strategy. Money is a scarce resource and a major component in any recovery effort plan,

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<sup>9</sup> Sources: "The Future of Washington Salmon." John H. Michael. *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; Dr. Jack Ward Thomas, Columbia River Conference IV, March 16 & 17, 2000.

and should be spent only when costs are justified by benefits. The Direction represents a "libertarian" approach to conservation, in that it decreases government regulation and instead emphasizes voluntary actions, financial incentives and market mechanisms to bring about desired results. Private companies and citizens are given flexibility to determine how they can best meet the goals of conservation, while still fulfilling their economic needs. Decisionmaking is decentralized, and the "command and control" approach is abandoned. Managers of a unified recovery plan would "adopt cost-effective recovery effort measures that create accountability, clear goals, priority setting, and effective monitoring and continuous program improvements" (PNWA, 1996). Cost efficiency would consider hydrosystem benefits and benefits foregone, as well as program costs. Conservation in this ideology allows for "wise use" of resources, with the option for landowners to set aside and preserve land from certain human uses, while still retaining title to the land. This Policy Direction relies on voluntary actions and incentives rather than government regulation. "The Columbia and Snake Rivers support a tremendous diversity of life and bring a remarkable array of benefits to the region and the nation. The rivers support complex ecological systems and are the lifeblood of the regional economy" (PNWA, 2000). "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" (Smith, 1998:12).<sup>10</sup>

**Differences from Current Implementation Actions:**

- Emphasizes economically efficient restoration of habitat.
- Increases economically efficient harvesting.
- Increases economically efficient hatcheries.
- Operate hydrosystem for economic efficiency, including minimization of fish and wildlife mitigation costs.
- Increases other commercial activity.
- Targets fish farming and cost-effective production for tribal harvest.

**COMPARISON OF THE ALTERNATIVES AND SUMMARY OF EFFECTS**

This EIS is not intended to define the region's values or to determine what laws and regulations are applicable. It is designed to provide an understanding of how the many issues that affect the region's ability, and specifically BPA's ability, to reach a more

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<sup>10</sup> Sources: Pacific Northwest Waterways Association. "Columbia-Snake River Issues: Rebuilding Fish Runs and Maintaining the Northwest Way of Life"; "Incentives for Species." Brett Schaerer. The Thoreau Institute, April, 1996; <<http://www.ti.org/schaerer.html>>; Craig Smith, vice-president of environmental affairs for the Northwest Food Processors Association, quoted in *The Northwest Salmon Recovery Report*. August 31, 1998. Volume 2 Number 9:Issue 25; PNWA Policy Backgrounder: "Saving Salmon in the Pacific Northwest." Pacific Northwest Waterways Association. January 2000

comprehensive and consistent unified planning approach interact with the human environment and lead to certain environmental consequences.

There are many ways to characterize and compare alternative Policy Directions. The end goal is to be able to compare the environmental consequences associated with each, and to see how each alternative matches up with the purposes. Here is how we went through each step, from analyzing the regional ideas to generating the alternatives to comparing and evaluating them:

- First, we synthesized the Status Quo and five broad Policy Direction themes from the key issues and proposals in regional processes, such as the Multi-Species Framework Alternatives and the Federal Caucus Options.
- Then we developed a set of sample implementation actions from the many regional proposals that matched the theme for each Policy Direction.
- Next, we assessed these actions to determine the environmental consequences that might result from their implementation. We compared each Policy Direction to Status Quo (which includes the existing environmental conditions: the current state of the natural environment elements and the socioeconomic elements), and the likely circumstances of taking no action to change current actions.
- The tables following contain more concise summaries of environmental effects, consolidated to help decisionmakers readily compare effects and likely outcomes, in the form of a comparative analysis table. The information can also be used by those who want to develop and evaluate the effects of additional proposals for combining the Policy Directions.

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

Table ES-2, below, provides a summary of **Natural Environment**, and **Social and Economic Environment**,<sup>11</sup> consequences of Policy Directions. Results are summarized as being more or less favorable for fish and wildlife, as well as more or less favorable to economic and social well-being. The table illustrates the anticipated long-term environmental effects of possible implementation actions of alternatives compared to environmental conditions in the Status Quo Policy Direction. The summary highlights the areas where the effects are clearly different, but also shows where they may be similar. The shade of the boxes indicates the direction in which the effects are moving *relative to the Status Quo Policy Direction*, and shows the reader whether the five Policy

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<sup>11</sup> 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 3.3-1, please see Chapter 5.

Directions would result in worse, the same, or better conditions relative to the Status Quo. Effect categories are condensed from the expanded list of categories described in Section 5.3 of the DEIS. 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.

The resulting side-by-side comparisons offer the opportunity to see the "trade-offs" (pluses in one area balanced against minuses in another) in the two environmental effect areas. Public policy evolves as the region responds to these trade-offs.

In reading the tables, which are based on *relationship analysis*, it is useful to remember the following points:

- The Status Quo or the No Action Alternative is used as the baseline to gauge how the five policy directions (or combinations of policy directions) change relative to that baseline for the environmental consequences identified.
- The Status Quo is established by describing the types of actions being taken now and anticipated to continue without a unified Policy Direction.
- No judgment is made about whether the Status Quo 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. Making such a call is not appropriate for this EIS. This decision will be taken up during the preparation of the Record of Decision.
- The comparative tables that follow set the Status Quo as a "neutral" point for all of the environmental consequences. This is done to make it possible to determine whether working toward one of the five Policy Directions changes the condition of the environment. These changes are labeled as "better" and "worse." These terms are equivalent to the NEPA terms "beneficial" and "adverse." They describe environmental consequences in the conventional terms as defined by NEPA.

**Table ES-2: Comparison of the Alternatives Against Baseline Conditions\* and Summary of Effects**

<i>Effect Category</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
<b>NATURAL ENVIRONMENT</b>						
<b>Land Habitat</b>						
Upland						
Riparian/Wetland						
<b>Water Habitat:</b>						
Nitrogen Supersaturation						
Non-Thermal Pollution						
Sedimentation						
Temperature/Dissolved Gas						
In-Stream Water Quality						
Amount River Habitat						
Reservoir Habitat						
<b>Fish &amp; Wildlife</b>						
Anadromous Fish**						
Resident Fish**						
Wildlife						
<b>Air Quality</b>						
<b>SOCIAL and ECONOMIC</b>						
<b>Commerce</b>						
Commercial Interests						
Recreation (including fishing & hunting)						
Economic Development						
<b>Tribes</b>						
Fishing Harvest						
Health, Spirituality, & Tradition						
<b>Costs and Funding</b>						
<b>Cultural/Historical Resources</b>						
<b>Aesthetics</b>						

\* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.

\*\* Although anadromous fish for Natural Focus and Commerce Focus appear the same, there are sharp differences between numbers of hatchery and naturally produced fish. For resident fish, the two Policy Directions differ substantially in numbers of native and non-native fish. See DEIS Chapter 5, Section 5.3 for more detail.



**Mix and Match:** Combinations of the five alternatives (i.e., "hybrid" Policy Directions) are also possible and have been anticipated in the DEIS. Decisionmakers or individuals can "mix and match" elements to define a variant Policy Direction and identify what characteristics and effects will accompany the new combination.

The Policy Directions are compared in Chapter 5 and in summary form in Chapter 3. 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 "plus" for one factor may mean a "minus" for another important factor. (For example, a "plus" for anadromous fish might mean a "minus" for resident fish.) Many people are involved in developing recovery effort plans, and many different authorities govern the participants. This means that trade-offs will have to be considered.

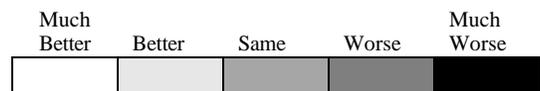
The reader can use the table to determine which one of the five alternative Policy Directions might best reflect her or his unique perspective:

1. **First, look down the column of boxes for each Policy Direction to find where the areas of greatest concern for environmental consequences will likely be for the different directions.** Here, mitigation will be needed, if available, 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 (light-colored boxes).**
3. **Then, determine how well the desired Policy Direction fulfills the purposes (Chapter 1). (See Tables S-3 and S-4.)**

**Table ES-3: Summary of Alternatives Compared against the BPA Purposes**

<i>Purpose</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
Facilitate <b>implementation of a regional unified planning approach</b>						
Fulfill obligations under <b>Regional Act</b>						
Fulfill the Administration's <b>Fish Funding Principles</b>						
Fulfill <b>BPA's other obligations</b> under law						
Promote predictable and stable <b>fish and wildlife costs and competitive rates.</b>						

\* Status Quo = Baseline conditions



The differences among the Policy Directions (including Status Quo) often turn on differences in people's opinions and perception. This DEIS has tried to condense the information from thousands of pages of key sources across the region. This information is presented in a user-friendly way and a reasonably objective discussion of the data is provided. However, the opinions of the public, interest groups, and other interested parties (including decisionmakers) regarding fish and wildlife recovery efforts will be the prime influence in determining the level of difficulty that BPA will experience in meeting 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 such factors as legal challenges, political interventions, and direct pressure on the Administrator from these outside influences have been factored into the Table above to give an indication of where each Policy Direction takes us from the Status Quo situation.

### **Tailoring a Policy Direction**

We recognize that no single Policy Direction described and compared above may be exactly the Direction that decisionmakers ultimately choose. However, it is expected that the Policy Direction will be encompassed within the range of Policy Directions analyzed. The region, as well as the decisionmakers, may wish to modify and adapt the Policy Directions to reflect an entirely new one. Individual readers may wish to "build their own alternatives." Or, in the future, conditions may change and the region may wish to make additional changes in Policy Direction or choose a new Policy. Please see the DEIS, Section 3.4 and Appendix I, for ways to accommodate such modifications.

### **AREAS OF CONTROVERSY**

Generally, there are many ethical, political, and scientific implications surrounding fish and wildlife management issues, making them difficult to discuss without becoming mired in the pro and con of various policy choices. Some of the choices facing the region now include: How expensive will our energy be? Where will we be able to live, recreate, farm and ranch? Who will have the right to fish? What will happen to our jobs? 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 in the region, and sometimes outside the region.

BPA must decide:

- 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 its Purposes.

This DEIS will support actions that BPA determines are necessary to comply with its responsibilities, including the following:

- Identification of a Policy Direction for funding and implementing fish and wildlife mitigation and recovery efforts.
- Short- or Long-term FCRPS recommendations in the NMFS and USFWS Biological Opinions.
- Funding of the Council's Fish and Wildlife Program, including hatchery programs, harvest measures, habitat programs, and hydrosystem programs and improvements.
- Capital improvements at FCRPS projects.
- Other fish and wildlife mitigation, recovery, and enhancement: research, monitoring and evaluation, education, and enforcement.
- Funding of cultural resources mitigation.

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## **READER'S GUIDE**

Welcome to the Fish and Wildlife Implementation Plan draft environmental impact statement (DEIS). Below are a few tips to help you make best use of the document.

### **WHAT THIS DOCUMENT DOES**

- This DEIS is designed to (1) evaluate the range of potential Policy Directions and to present possible implementing actions that the region could decide to take for fish and wildlife mitigation and recovery efforts, (2) identify the direction the Pacific Northwest is most likely to follow as a coordinated policy to recover fish and wildlife populations in the region, and (3) determine the environmental consequences of BPA's future decisions to implement and fund actions that could emerge from that policy and its associated alternatives. Ultimately, the BPA Administrator will decide how BPA will implement and fund its obligations under the identified policy path.
- BPA alone will *not* be responsible for deciding what the ultimate regional policy will be. State, federal, and local agencies; regional tribes; interest groups; and the people of the Pacific Northwest will decide what the policy itself will look like.

### **WHAT TO EXPECT IN THE DEIS**

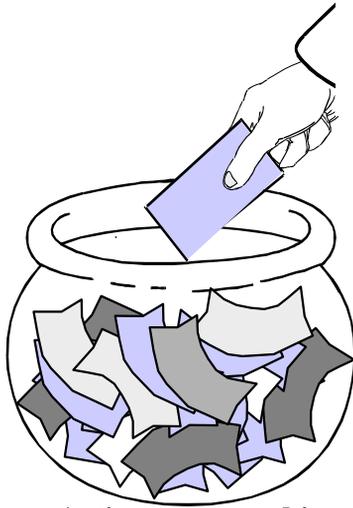
- Many EISs are written for specific actions: building or operating a transmission line or a hatchery. This EIS, however, is about *policy*: what kind of priorities to set for fish and wildlife policy and how to integrate those priorities with other needs for use of the river and land.
- This means that 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 or social resource. You will see the same topics covered that the Council on Environmental Quality specifies: Need, Background, Alternatives (including No Action or Status Quo—continuing to follow the same path), and Environmental Consequences.
- The DEIS has condensed thousands of pages of technical information produced by other regional processes and has identified key topics connected with fish and wildlife policy. The many proposed fish and wildlife actions have been sorted into five different Policy Directions that represent a wide range of themes. These Directions provide a basis for the region to organize the fish and wildlife processes and ideas. (See the attached Figure RG-1.)
- To focus on the problem and compare possible solutions, read Chapters 1 and 3. For the detailed analysis of the effects on the human environment, read Chapter 5. To understand what effects might occur as a Policy Direction is carried out, or what provisions have been made for change, read Chapter 4. Chapter 2 describes the history of fish and wildlife policy and existing conditions. Chapter 6 focuses on how a selected policy might be managed. (See attached Figure RG-2.)

### **HOW THE POLICY DIRECTIONS WERE DEVELOPED**

- There are many different ways to define and discuss alternatives. We developed a range of five Policy Directions (plus Status Quo) by reading proposals submitted by major participants in several regional planning forums, and identifying common themes or philosophies regarding priorities and values. Then, we grouped proposals together by their overall theme. We could have chosen other ways to organize the material. However, given the thousands of potential alternatives, we believe any policy analysis of this magnitude would require a comparison of broad policy choices, rather than individual options.
- To explore another approach and build your own alternative, please see Appendix I. For ways to comment on what we've done and offer suggestions, please see the cover sheet.

**Figure RG-1: Sorting Policy Alternatives**

This EIS takes the proposed actions from the key regional processes and sorts them into five primary Policy Directions

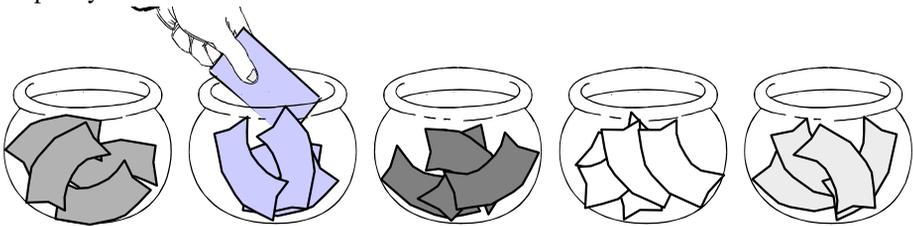


**Actions proposed in documents from the regional processes**

The proposed actions are matched with the theme of the closest policy direction.



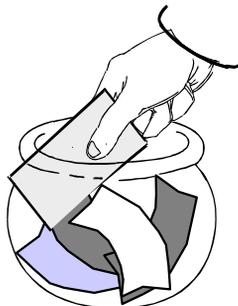
**Sorting process**



**Five broad based policy directions are used to sort the proposed actions and provide a structured method to evaluate *all* of the key processes integrated together, demonstrating where they are the same and where they are differer<sup>+</sup>**

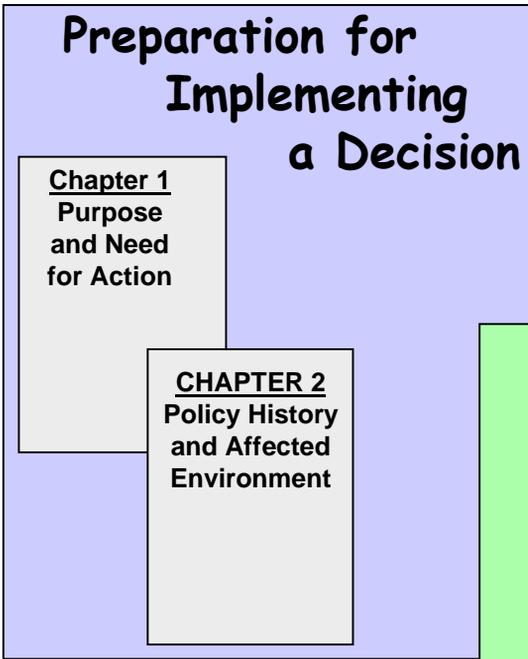
**Mixing process**

The reader picks their set of proposed actions.

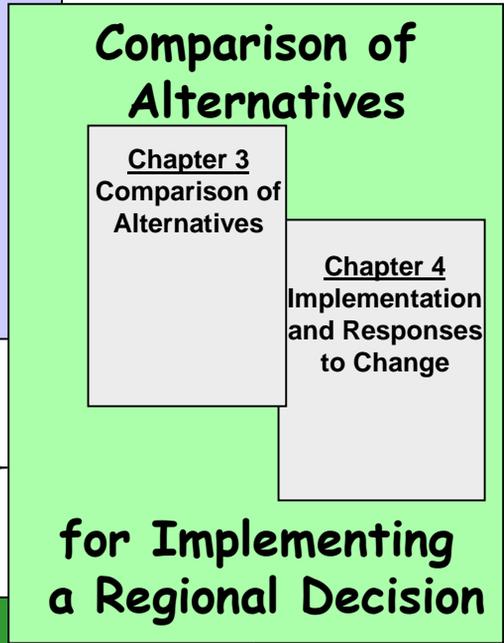


**The reader mixes and matches proposed actions into the theme that creates his or her preferred mix of policy directions.**

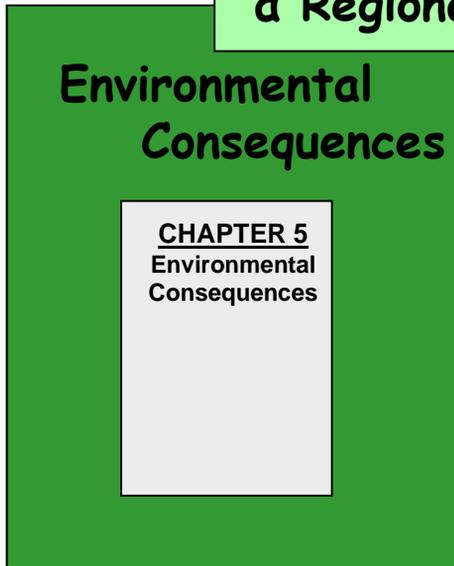
Figure RG-2: Structure of the Chapters



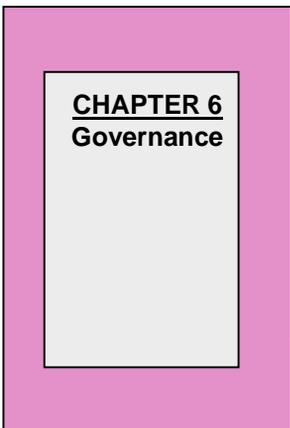
The background information explaining the need for a policy, the factors to judge the decision, how the overall tiered decisions process will work, and a brief history of public policy in the area of fish and wildlife recovery for the PNW.



All the necessary tools for making informed implementing decisions for a regional policy direction and the necessary action plan.  
*(The human environment effects information contained in Chapter 3 has been analyzed and simplified to aid the public and the decision makers.)*



Chapter 5 provides an understanding of generic environmental impacts and their relationship to different policy directions and implementing actions.



After policy direction decisions and implementing actions plans are made, some structure for governance will need to be used. Chapter 6 provides examples and a model for selecting a governance structure.

*“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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# Preparation for Implementing a Decision

## CHAPTER 1

**Purpose  
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CHAPTER 2  
**Policy History  
and Affected  
Environment**

**Comparison of  
Alternatives**

CHAPTER 3  
Comparison  
of  
Alternatives

CHAPTER 4  
Implementation  
and Responses  
to Change

**For Implementing  
a Regional Decision**

**Environmental  
Consequences**

CHAPTER 5  
Environmental  
Consequences

## Chapter 1

### ***Introduction***

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

***BPA's purposes for funding and implementing actions***

***Decisionmaking Process***

**Governance**

CHAPTER 6  
Governance

## **CHAPTER 1 – PURPOSE AND NEED FOR ACTION**

---

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

### **1.1 INTRODUCTION**

BPA is preparing this Fish and Wildlife Implementation Plan (FWIP) DEIS 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. These Policy Directions are reflected in the range of alternatives being considered in several key ongoing regional processes. The processes, described in Section 1.3.2, will shape and establish a regional fish and wildlife Policy Direction that BPA will use to guide its future mitigation and recovery efforts, including its funding for those efforts. BPA is preparing this DEIS now because (1) many species of fish and wildlife are already in serious condition (further delay must be minimized) and (b) BPA wants to be ready to respond promptly when a regional Policy Direction(s) is ripe for decision.

This DEIS is designed

- (1) to evaluate the range of potential Policy Directions** and possible implementing and funding actions that the region could decide to take for fish and wildlife mitigation and recovery efforts,
- (2) to identify what specific path** the Pacific Northwest most likely will take as a unified planning approach or as a series of independent actions by involved parties to try to recover fish and wildlife populations in the region, and
- (3) to determine the environmental consequences** of BPA's implementation and funding of the actions that could emerge from that policy.

*An environmental impact statement is a document that presents 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 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. But human uses can compromise and severely deplete these resources, even eliminate them. The independent demands of human uses such as irrigation, municipal water supplies, fishing, electric power production, recreation, flood control, 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.

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

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

Recognizing this trend, the people and public and private interests of the Pacific Northwest have begun to try to mitigate these stresses—to improve the status of fish and wildlife and their habitat, especially those that are 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.<sup>1</sup>

**Lack of Management Coordination.** For several decades, a variety of federal, state, and tribal entities within the Pacific Northwest have been managing the Columbia River Basin's fish and wildlife resources. Each entity has its own legal constraints, policy directives, and jurisdictional limitations. 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 a healthy self-sustaining fish and wildlife resource.

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<sup>1</sup> CEQ, 1987: Section 1508.20.

The Fish and Wildlife Activity Map (Figure 1-1) shows the number and overlapping tangle of authorities.<sup>2</sup>

***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 BPA will select a Policy Direction, but any 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.*

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

**Lack of Progress.** Unfortunately, after a decade of good intentions, there has been less progress than necessary to reverse species declines. 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.** 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 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 restore ecosystems and recover populations.
- (3) **Conflicting directives and jurisdictions of regional authorities have meant that funds dedicated to the 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 coordinated mitigation and recovery plan. There have been delayed, inconsistent, piecemeal, and

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<sup>2</sup> 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.

contradictory actions. Attempts to correct problems for one species have, in some cases, caused problems to increase 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 stopped, amended, or expanded. 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 try to work together to develop a **comprehensive and coordinated planning approach for species recovery and mitigation 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 singular ecosystem, and 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 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. 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.*

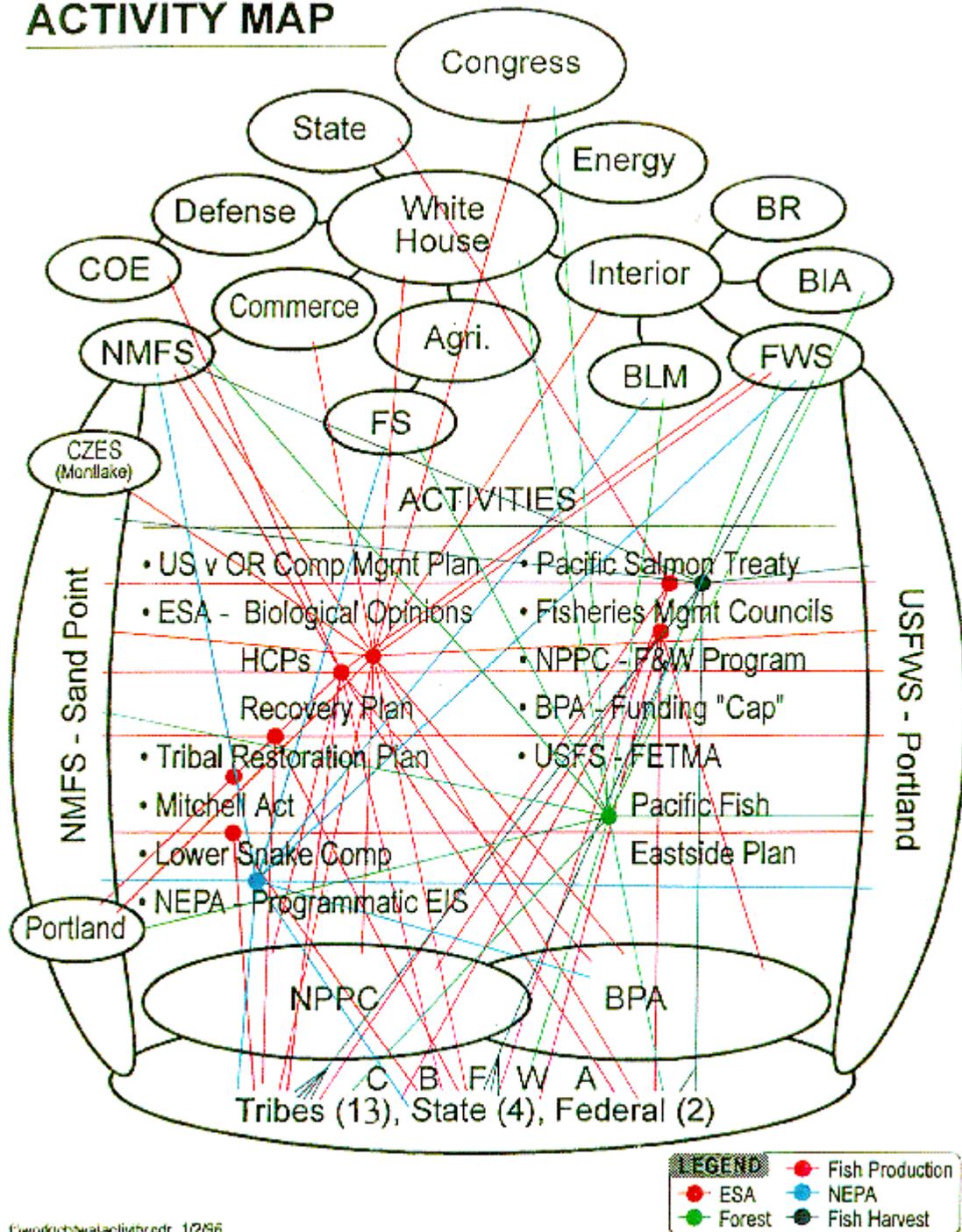
*Today, BPA sells about 46% of the electric power consumed in its service territory, which includes the states of Oregon, Washington, Idaho, and the portion of Montana west of the Continental Divide. BPA also directly serves small portions of California, Nevada, Utah, and Wyoming. In addition, it sells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

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

- BPA must use ratepayer money to fund and implement certain fish and wildlife mitigation and recovery effort actions in accordance with its obligations under statute and law (e.g., under the ESA and Regional Act; see Section 1.2.1).

Figure 1-1

# FISH & 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.

- 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).

Because environmental analysis and public process will be necessary to fully inform BPA and the public of the consequences of funding and implementation of various actions, BPA has prepared this DEIS. BPA has decided to analyze a range of alternative Policy Directions to determine their environmental consequences as well as their potential effects on BPA's implementation and funding responsibilities.

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

- **BPA is not developing its own Policy Direction alternatives.** The alternative Policy Directions described and evaluated in this DEIS are based on *alternatives developed within the existing 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 Directions (plus Status Quo—no change from the present approach), that encompass the wide range of options.
- **BPA is not unilaterally selecting a Regional Policy Direction.** Rather, this DEIS provides analysis of the full range of regional alternatives so that a funding and implementation strategy may proceed *regardless of the Policy Direction chosen*. A Policy Direction will be an outgrowth of several regional processes, whether those processes harmonize around a specific approach or diverge through independent regional actions. However, if the region fails to agree upon a Policy Direction, BPA still must implement and fund a fish and wildlife mitigation and recovery effort strategy (see Section 1.3.4).

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 understand 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 DEIS.

## **1.2 BPA'S PURPOSES AND NEED**

### **1.2.1 Need**

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

BPA's fish and wildlife responsibilities spring 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).<sup>3</sup> 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, and
  - (2) to do so in a manner that provides equitable treatment for such fish and wildlife with the other purposes of the FCRPS.
- 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); and
  - (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.  
(USDOE/BPA, 1996)

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

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<sup>3</sup> The FCRPS includes 31 federal hydro projects, on the combined Columbia and Snake rivers, that are operated to provide hydroelectric power transmitted throughout the Pacific Northwest and, where there is surplus power, other nearby areas. The projects are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation (not by BPA).

The Regional Act created the Northwest Power Planning Council (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. Ratepayers, through BPA, are currently spending up to \$250 million annually for fish and wildlife. In addition, hydrosystem operation requirements for salmon recovery efforts have reduced power generation in the region by about 1,000 megawatts.

Although the Regional Act and ESA are those responsibilities perhaps most often mentioned in discussions involving BPA's fish and wildlife mitigation and recovery effort obligations, these statutes are but two of the statutes, regulations, and treaties that bear upon BPA's fish and wildlife mitigation and recovery efforts. 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 the Columbia River Basin's fish and wildlife resources, each with its own legal constraints, policy directives, and jurisdictional limitations. 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 is possible.

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 the region. Accordingly, BPA is preparing this DEIS to examine the effects that may arise from implementing any of a range of fish and wildlife Policy Directions reflected in the alternatives generated by the key ongoing regional processes. Those processes will shape and establish a regional fish and wildlife Policy Direction that BPA will use to guide its future mitigation and recovery efforts, including its funding.

As noted earlier, BPA is *not* unilaterally formulating fish and wildlife policy. However, in the Final EIS, the Administrator will identify a preferred Policy Direction that supports the region's fish and wildlife mitigation and recovery efforts. Although this DEIS is intended for BPA decisionmaking, the analysis may also make it valuable for other regional entities that may adopt it as part of their own decisionmaking.

### **1.2.2 BPA's Purposes**

BPA has an initial obligation in this DEIS to fulfill its NEPA requirements for understanding the environmental consequences of its actions (funding and implementing any Policy Direction) before decisions are made and any actions are taken. This 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. This DEIS must evaluate the alternative Policy Directions in terms of their consistency with federal and state laws, needs and responsibilities. BPA will use the purposes listed below as "yardsticks" to compare how well the alternative Policy Directions meet the agency's need:

- **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 Power Act, especially BPA's obligations to:
  - protect, mitigate, and enhance fish and wildlife, and
  - provide a reliable, adequate, efficient, and economical power supply.
- **Fulfill** the Administration's Fish 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;<sup>4</sup>
  - 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** other 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).
- **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.

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<sup>4</sup>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.

## **1.3 BACKGROUND**

### **1.3.1 Major Participants**

BPA is just one of the many interests in the region seeking an effective and balanced means to halt species decline and extinction 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 and Policy Direction 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 national funding resources 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.
- **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 Columbia River Basin Forum** (Forum) does not have formal legal status but is a group consisting of the representatives of sovereign governments involved in the region's decisionmaking for fish and wildlife—the federal agencies, four states (Washington, Oregon, Idaho, and Montana; via the Northwest Power Planning Council: see below), and regional tribes. The Forum was designed to develop an agreement for a fish and wildlife plan for the Pacific Northwest.
- **The Northwest Power Planning Council** (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 aim 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 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."<sup>5</sup> 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.
- **Other regional interests** include the many citizens and groups with a direct or indirect interest in the costs, strategies, and specific projects that may be involved in any plan to recover fish and wildlife populations. Some are interested in

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<sup>5</sup> Governors, 2000.

maintaining a certain way of life. Others rely on the resources of the Columbia Basin for their livelihood or business.

### **1.3.2 Scope and Related Processes**

In response to the need for improved species survival and for a way to use limited funds most efficiently, the participants listed above (and others) have begun several related and wide-ranging processes with differing scopes (e.g., policy directions, geographic areas, and particular species) throughout the region.

These related processes and the associated documents are listed below. The listings include a description of the special mandates of each responsible agency; in some cases, they represent current policy regarding human effects on fish and wildlife. Figure 1-3 shows how the different scopes of the processes and documents relate.

- **Individual Processes:** At the top of the Figure are the many individual processes underway to address several of the fish and wildlife recovery effort issues. Any one of these processes—hatchery propagation of fish, habitat restoration and improvement, manipulation of the flow in the rivers (hydro), 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 the whole problem.

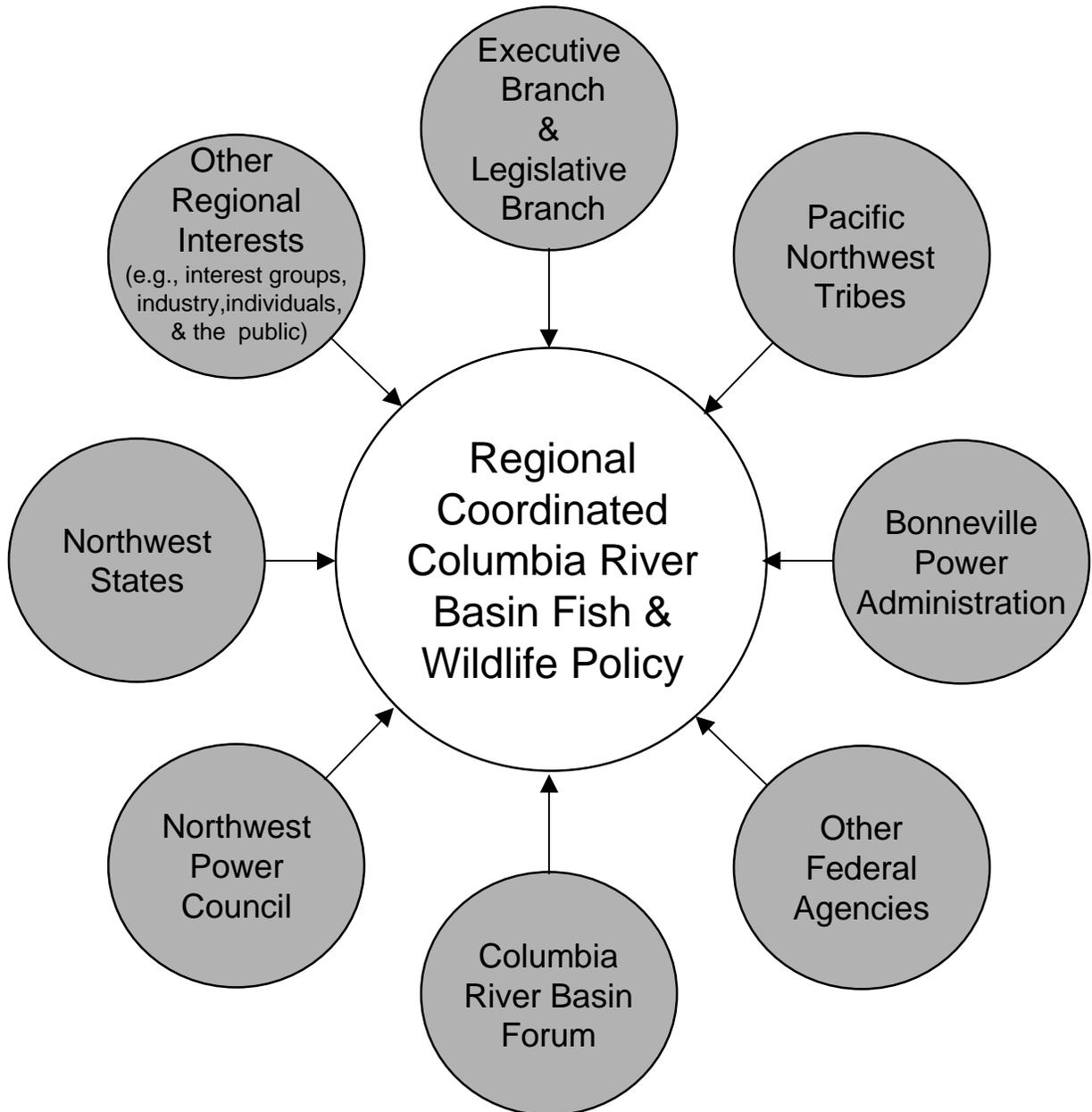
**Federal Caucus and the Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (Conceptual Plan) and Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (Basin-wide Strategy)<sup>6</sup>:** This process and documentation, a product of nine federal agencies known as the Federal Caucus, focuses on four areas affecting the life cycle of anadromous fish: hatcheries, harvest, habitat, and the hydrosystem. The Basin-wide 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 Basin-wide Strategy Paper.

The Basin-wide Strategy is incorporated into National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) recommendations through the Biological Opinions (BiOps) for actions that affect Columbia River Basin ESA-listed fish.

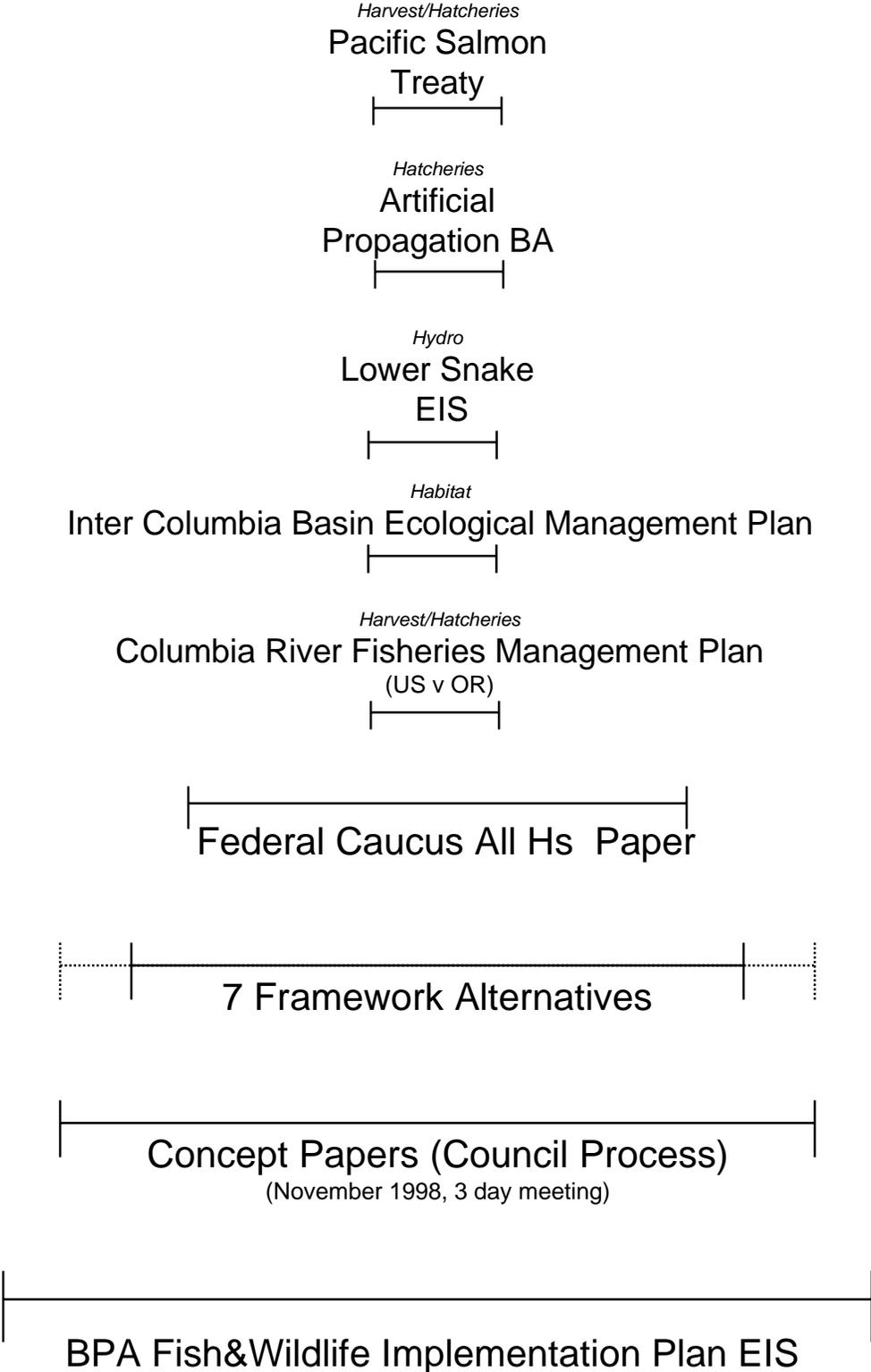
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<sup>6</sup> Federal Caucus 1999b, 2000b. These two documents were formerly known as the "All-H Plan"; they are the draft and final versions of the same study.

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



**Figure 1-3: Breadth Of Scope**



- **NMFS and USFWS Biological Opinions:** These agencies prepare Biological Opinions, as required by the ESA, for species under their respective authorities. BiOps describe the federal agency's determination as to whether proposed actions will jeopardize listed species. 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<sup>7</sup>:** NMFS plans the recovery process for salmon and steelhead. The 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 sources to complete the information. Subbasin plans will be “aggregated” to ensure the recovery of the entire ESU is provided for.

- **The Council's 2000 Columbia River Basin Fish and Wildlife Program:** 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's Multi-Species Framework Report:** 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 recovery. 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.

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<sup>7</sup> Source: Federal Caucus, 2000b.

Twenty-eight fish and wildlife recovery proposals (Concept Papers) were submitted by interested parties, and over 100 fish and wildlife recovery actions were proposed. The Council developed seven Framework alternatives, describing those alternative long-term visions. 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. Their report, which was completed in December 2000, was used to inform the Council's amendment of its Fish and Wildlife Program.

- **Fish Funding Principles:** In September 1998, former Vice-President Gore announced principles. These Principles were intended to help shape how BPA set its power marketing rates, and to ensure that BPA would meet all of its mitigation and recovery effort responsibilities, while simultaneously meeting its marketing and Treasury repayment responsibilities.<sup>8</sup>
- **The Council's 2001 Report on Bonneville Fish and Wildlife Expenditures.** 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 *Draft 2001 Report on Bonneville Fish and Wildlife Expenditures* found that, since 1978, BPA's costs 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. It is the landmark case in which 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

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<sup>8</sup> 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

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 resolved. Therefore, the scope for BPA's DEIS 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 the selected actions. The environmental documents described below have been produced either by the participants listed in Section 1.3.1 or in the processes discussed above. All of these documents are used as resources in the preparation of this Fish and Wildlife Implementation Plan Draft EIS (FWIP DEIS) 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).

**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).

**Wildlife Mitigation Program Final Environmental Impact Statement** (DOE/EIS-0246, March 1997). This EIS is used to standardize the planning and implementation of BPA-funded projects for mitigating loss of wildlife habitat caused by the FCRPS (USDOE/BPA, 1997b).

**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, 1997a).

**Lower Snake River Juvenile Salmon Migration Feasibility Study Draft Environmental Impact Statement** (U.S. Army Corps of Engineers, October 1999).

This EIS assesses the effects on juvenile salmon migration of alternative hydro system configurations and operations at the four Lower Snake dams (Corps, 1999a).

**Interior Columbia Basin Supplemental 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 more-than 83,000 comments received on those documents (USDA/USFS and USDO/BLM, 2000).

**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, 2000).

**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).

**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 (USDO/USFS and BLM, 1994).

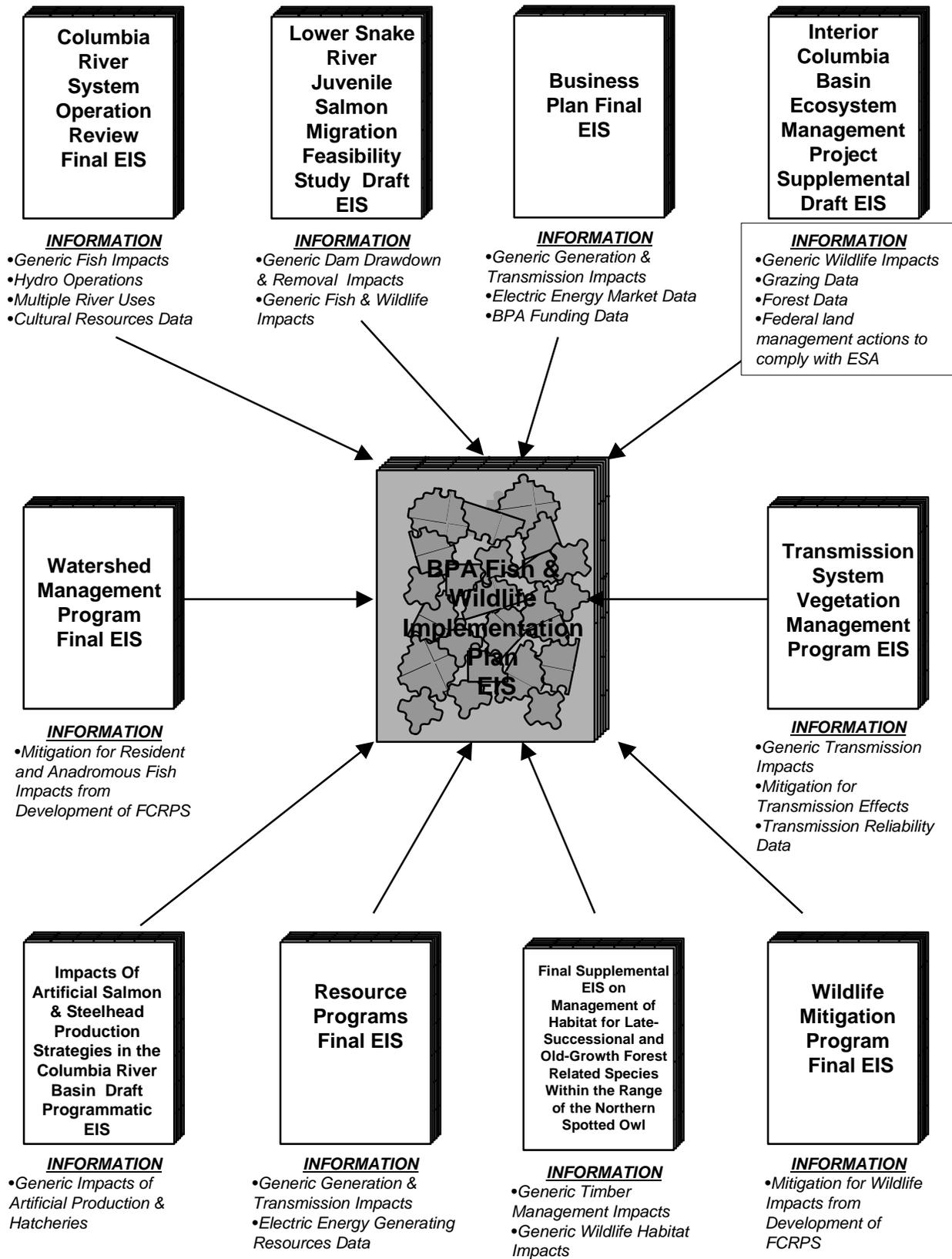
**Delivery of the Canadian Entitlement Final Environmental Impact Statement** (DOE/EIS-0197, January 1996). This EIS was prepared by the United States Entity (designated by the Columbia River Treaty between the United States and Canada as the BPA Administrator and the Corps' Division Engineer, North 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 (USDOE/BPA, 1996a).

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

### **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 recovery efforts has developed

**Figure 1-4: Incorporation By Reference**



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 (policy by inaction or uncoordinated action)
- 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 the fish and wildlife recovery effort actions.
- 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.
- 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.

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, too, needs to plan how to spend wisely those 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 and present approach.

## **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 alternative(s) for fish and wildlife mitigation and recovery effort plans, along with the regional decisionmakers.

### **1.4.1 Decision and Implementation through Tiering**

By undertaking this DEIS as a complement to the other processes, BPA completes a comprehensive look at those regionwide processes. This DEIS 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 recovery effort (whether by unified planning or by default), without further delay or reconsideration. 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, this broadly scoped DEIS will evaluate the different Policy Directions available to decisionmakers. The evaluation will include trade-offs among resources and options to modify the basic Policy Direction(s), as well as ways to mitigate for effects. Publication of this DEIS signals the beginning of a public comment process. After considering the potential environmental consequences and mitigation, as well as public and agency comment, a Final EIS (FEIS) will be published. In the FEIS, the BPA Administrator will identify a preferred Policy Direction that encompasses the Policy Direction that the region is most likely going to follow (or that has already been selected in other forums or processes, or by other decisionmakers) and reflects consideration of the BPA Purposes.
- **The Record of Decision (ROD) on Policy Direction.** BPA will then prepare a ROD that documents and explains the basis for the Administrator's Policy Direction selection.
- **Tiered RODs.** The BPA Administrator may then "tier" decisions about the implementation of actions consistent with the same Policy Direction. BPA will continue to involve the public as it decides on different categories of specific implementation actions.
- **Documentation.** Other federal agencies, states, and/or tribes may find this DEIS and associated RODs useful with respect to related actions under their agencies' respective jurisdictions.

#### **1.4.2 Potential Decisions to be Supported**

The final 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.
- Short or long-term FCRPS recommendations in the NMFS and USFWS BiOps.
- Funding of the Council's Fish and Wildlife Program, including
  - hatchery programs,
  - harvest measures funding,
  - habitat programs, and
  - hydrosystem programs.
- Capital improvements at FCRPS projects.
- Other fish and wildlife mitigation, recovery, and enhancement efforts:
  - research,

Figure 1-5: Policy Direction Process Cycle

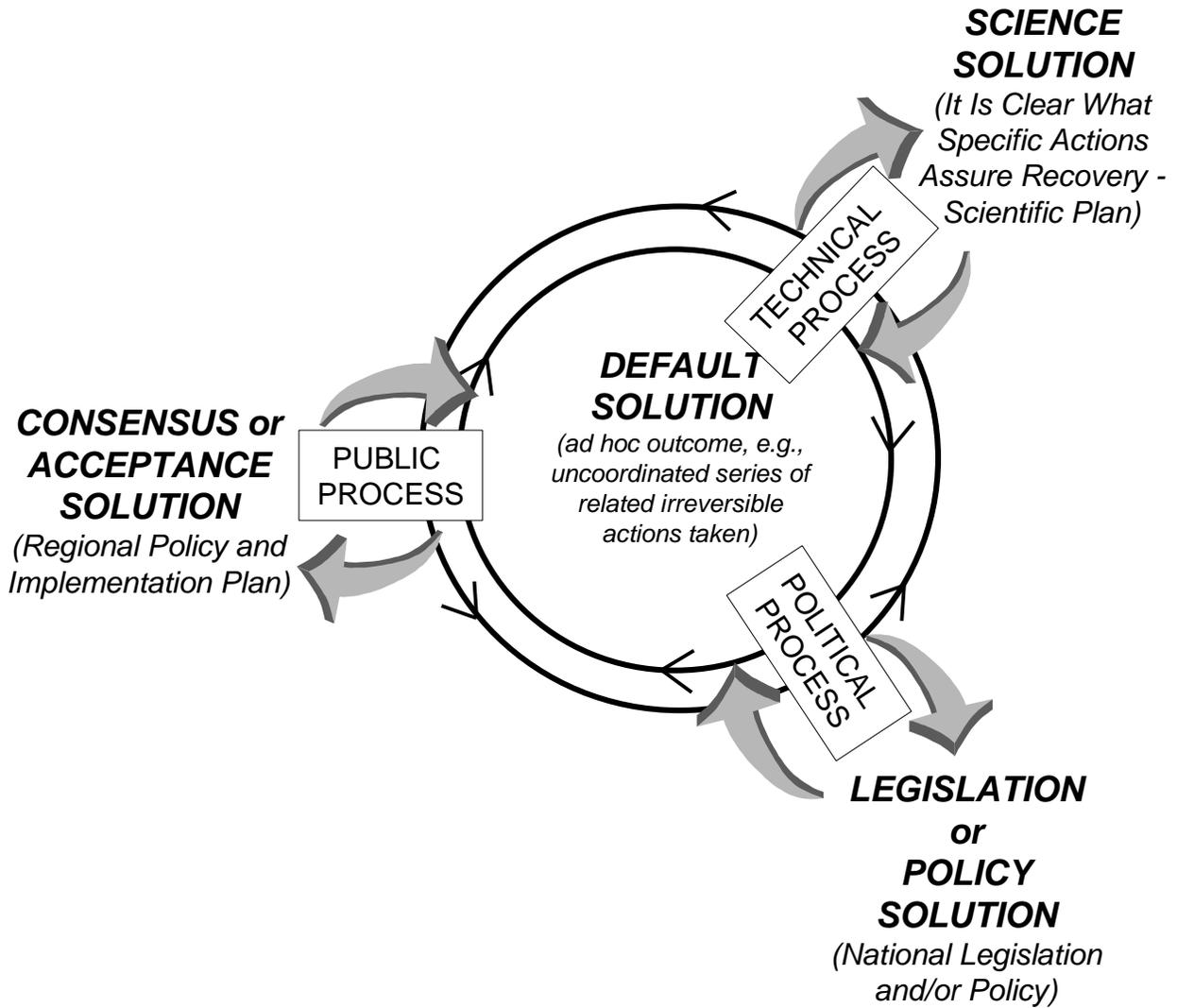
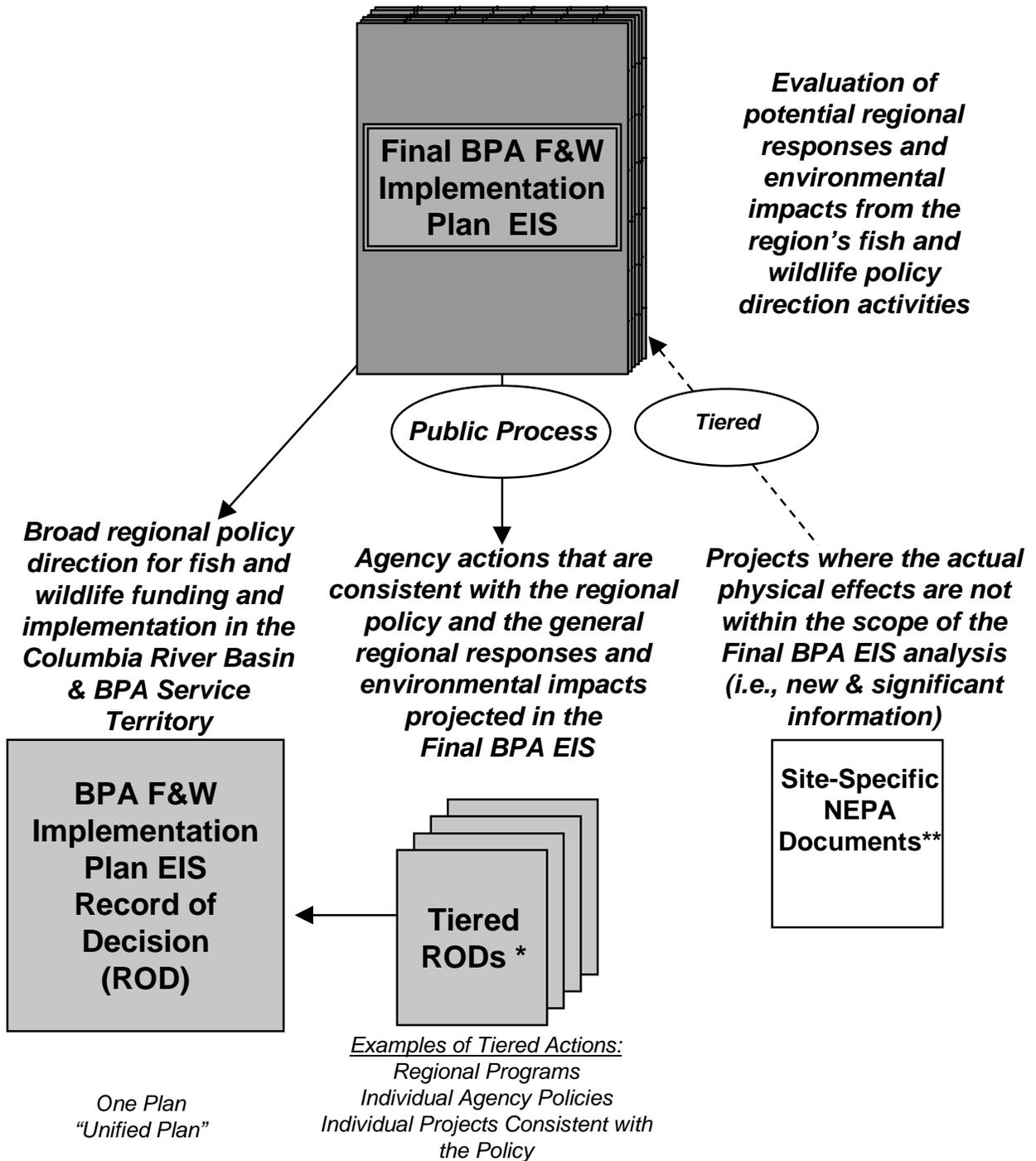


Figure 1-6: NEPA Decision Process Integration



\* 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 addition, if other agencies or entities find the Final 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.

- monitoring and evaluation,
  - education, and
  - enforcement.
  - Funding of cultural resource mitigation.
- 
- **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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# Preparation for Implementing a Decision

## CHAPTER 1

Purpose  
and Need  
for Action

## CHAPTER 2: Policy History and Affected Environment

## Comparison of Alternatives

CHAPTER 3  
Comparison  
of  
Alternatives

CHAPTER 4  
Implementation  
and Responses  
to Change

For Implementing  
a Regional Decision

## Environmental Consequences

CHAPTER 5  
Environmental  
Consequences

## Chapter 2

*BPA Service Territory &  
Columbia River Basin*

*Policy Evolution*

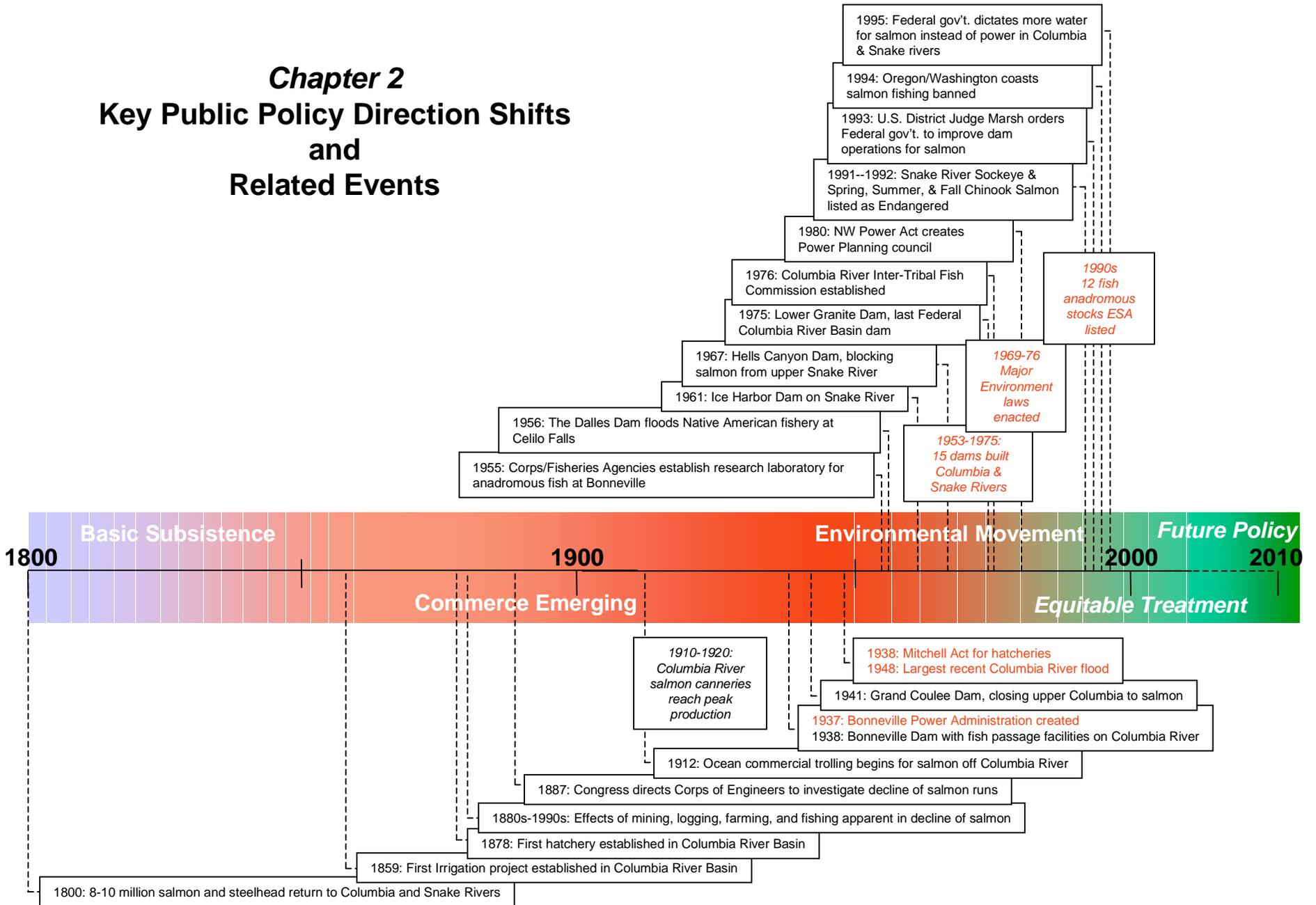
*Existing Environmental  
Conditions*

## Governance

CHAPTER 6  
Governance

# Chapter 2

## Key Public Policy Direction Shifts and Related Events



## **CHAPTER 2: POLICY HISTORY AND AFFECTED ENVIRONMENT**

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- **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 efforts.
- **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 where we are today (circa 2001)** in terms of the following:
  - state of the current policy(ies) to support fish and wildlife recovery efforts,
  - potential modifying policy initiatives, and
  - existing environmental conditions.

This chapter focuses on describing historical and recent policy-level decisions that have affected fish and wildlife populations throughout the region. Then, the consequences of these decisions are described in terms of their effects on the human environment.

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### **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 recovery and mitigation 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. However, we recognize that history, like so many issues, can be

a matter of interpretation. Therefore, the analytical focus of this chapter is on what's been done, *not* on who did it. In this way, 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 potentially affected human environment in the Columbia River Basin, including elements of land, water, air, fish, wildlife, vegetation, and peoples. Section 2.4 provides a more detailed description of existing conditions.*

### **2.2.1 Natural Environment**

The **Columbia River** watershed and BPA's service territory generally coincide with the boundaries of the Pacific Northwest states (see Figure 2-1). The river, which begins in Canada, 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. Other streams drain Central Idaho and a portion of Montana west of the Rockies.

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 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 predominate in 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.

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.

The Columbia River and its tributaries are home to a variety of native salmonid and non-salmonid fish. Rivers and streams support a large number of anadromous fish species (species that migrate down river to the ocean to mature, then return upstream to spawn), as well as varied populations of resident fish (fish that live their entire lives in fresh water). A number of fish and wildlife species are listed as threatened or endangered under the ESA or as sensitive (special designations by the U.S. Forest Service [USFS] or the Bureau of Land Management [BLM] for species in decline).<sup>1</sup> Listed fish species includes some runs of coho, chinook, chum sockeye, and steelhead salmonids, and sea-run cutthroat trout, the Kootenai River White Sturgeon, and bull trout. 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.<sup>2</sup>

## **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.

Euro-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 sea and land 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, finally, the Columbia River itself were targeted for development. Those goals—and the methods used to pursue them—significantly

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<sup>1</sup> Information from BPA Vegetation Management Program EIS (USDOE/BPA, 2000), p. 130. See **Appendix C** for a complete list of ESA-listed species.

<sup>2</sup> Information from USDOE/BPA (2000), p. 132.

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**Chapter 2: Policy History and Affected Environment**

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changed the environment, and profoundly diminished both tribal well-being and tribal access to traditional natural resources.

## 2.3 POLICY EVOLUTION

The evolution of fish and wildlife public policy in the region—state, federal, and tribal—has affected and been affected by the human environment over time. 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) summarizes 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 a sampling of major relevant milestones in Columbia River History.

**Table 2.3-1: A Timeline of Columbia River History**

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
1918-1937	Major beginning of wildlife protection laws such as 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 fishwheels prohibited
1937	BPA created to market the power from the federal hydroelectric projects
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	Mitchell Act hatcheries authorized by Congress to mitigate for the effects of declining fish populations on the fishing industry
1948	Vanport flood
1950	Commercial fishing seines, traps, set nets prohibited 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 research on anadromous fish
1956	Native American fishery at Celilo Falls flooded by The Dalles Dam

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Date(s)	Events
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
1965	Last summer chinook commercial fishing season
1967	Idaho Power Company completes Hells Canyon Dam, blocking salmon from Upper Snake River
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
1976	Columbia River Inter-Tribal Fish Commission (CRITFC) established
1977	Last major spring chinook commercial fishing season until 2000
1980	Congress creates Northwest Power Planning Council
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 species of anadromous fish stocks listed under ESA
1994	U.S. District Judge Malcolm F. Marsh orders federal government to improve dam operations, lessening their hazards to salmon
1994	Ocean salmon fishing banned for first time off northern Oregon and Washington coasts

### 2.3.1 Historical Perspective: Policy Evolution from Euro-American Settlement of the West 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. The vast majority of the changes, however, has resulted and continues to result from expressed or implied public policies. The state of the Pacific Northwest's human environment today is a direct or indirect consequence of policies followed over the last two hundred years. This section discusses how the human environment evolved from the era of almost exclusive Native American habitation to the near-present.

➤ *Note: This section is a brief summary. More complete discussions of the development of the Federal Columbia River Power System (FCRPS) and BPA are in BPA's Columbia River Power to the People: A History of Policies of the Bonneville Power Administration (Norwood, 1981), and Richard White's The Organic Machine*

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(1995). *The history of water policy and effects from water usage are 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: 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 Buchard (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 was populated almost exclusively by 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, 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 environmental 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.<sup>3</sup> 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.<sup>4</sup> Salmon was caught at various locations along the river by numerous tribes as the fish swam upstream to spawn. Other fish, marine mammals, waterfowl, game, and plant food sources were also plentiful.

The policies regarding fish and wildlife for the Columbia River basin at this time consisted of traditional cultural practices directed and preserved by elders of the many tribes and bands that inhabited the area. In general, these cultural practices were based on the belief that there is a close physical and spiritual interrelationship between humans and nature. This close bond of the Indian to the natural world was demonstrated by the seasonal cycle of subsistence that formed an integral part of the tribal cultural fabric. For example, some Columbia River tribes engaged in ceremonies to help ensure the return of

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<sup>3</sup> White, The Organic Machine (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."

<sup>4</sup> American Friends Service Committee, Uncommon Controversy (1970), p. 3.

the sacred salmon.<sup>5</sup> They waited for salmon with anxiety because there were times when natural events precluded or drastically reduced the salmon runs.<sup>6</sup> The tribes also placed special significance on certain places in the landscape, especially near the river. Tribal elders used traditional cultural practices to implement spoken policies requiring members to honor and respect the sacredness of the natural world. These policies allowed for 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 waters; 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, they found a river running with approximately 8-10 million adult salmon.<sup>7</sup> The environmental elements—air, land, and water—were clean and pristine, and the native ecosystems 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 Euro-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. Non-Indian 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.

Before the Pacific Northwest region became part of the United States, European nations competed to control its important seaports and resources. Beginning with the 1803 Lewis and Clark expedition to the Pacific Northwest, the United States government, motivated by what has become known as Manifest Destiny,<sup>8</sup> 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:

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<sup>5</sup> Lichatowich, Salmon without Rivers (1999), pp. 33-37.

<sup>6</sup> White (1995), pp. 18-19.

<sup>7</sup> NRC (1995), 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), Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin, Appendix D of the Columbia River Basin Fish and Wildlife Program. For an excellent account of Columbia River salmon issues generally, see C. Wilkinson, Crossing the Next Meridian: Land, Water, and the Future of the West 175 (Island Press, 1992).

<sup>8</sup> A U.S. policy during the 19<sup>th</sup> and early 20<sup>th</sup> century of imperialistic expansion defended as necessary or benevolent (1984, Webster's II New Riverside University Dictionary).

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- control of the territory,
- displacement of 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.<sup>9</sup> When, in the 1840s, the first major wave of Euro-American settlers arrived along the Oregon Trail, there was still no established national sovereignty. 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 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.<sup>10</sup>
- Non-Indian commercial harvest had occurred in the Lower Columbia River since the 1860's 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.
- 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.

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

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<sup>9</sup> Cone, Joseph, *A Common Fate* (1995). Corvallis, OR; Oregon State University Press, p. 108.

<sup>10</sup> Council (1986).

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, Columbia River salmon were typically harvested for commercial purposes in the river 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.

### ***Commercial Trapping<sup>11</sup>***

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.<sup>12</sup> Trappers, however, continued to trap and sell, without regulation, pelts from fur-bearing animals. 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 country.

### ***Changes to Forests and Streams***

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

Commercial lumber operations meant not only cutting of trees, but also construction of 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.

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<sup>11</sup> Information in this discussion is from USDOE/BPA, Corps, and BOR, Columbia River System Operation Review (SOR) Final Environmental Impact Statement, Appendix G - Section 2.1.2 (1995).

<sup>12</sup> Lichatowich (1999), p. 40.

### ***Mining***<sup>13</sup>

Although not currently a major industry in Oregon, mining for precious metals has continued here from the early days of settlement until the present. Finding gold and silver was the priority of the first miners in the 1800s and early 1900s. Mining, whether for gold or gravel, usually takes place in or near streams and creeks: salmon use the same waterways 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, then washed and screened the material to find precious metals, and finally discarded the processed material along stream banks. In some situations, mining may 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 deepens the channel of the stream. This may increase the speed of the water flow in the stream, disturbing or destroying salmon spawning grounds and removing streamside vegetation. Also, erosion from the tailings of hard-rock mining carries trace amounts of toxic chemicals, such as mercury, into streamflows or into sediments in streambeds and floodplains. Agencies such as the USFS are exploring ways to restore streams that were dredged by early miners.

The removal of sand and gravel below the water surface deepens streams, disturbing spawning grounds and possibly causing the rate of water flow in the stream to speed up. Juvenile salmon, however, need calm, slow-flowing water to live in as they develop. Further, removal of gravel from the floodplains has historically meant the loss of spawning habitat.

Today, however, sand and gravel mining account for most of the mining activity in Oregon, as urban development activity is brisk. That means high demand for concrete and asphalt, building products that require liberal amounts of gravel as a basic component.

Gravel mining activities can be divided into three categories. *Deep water dredging* for sand and gravel takes place in fairly deep water near the main channels of the rivers. Also, in some areas, sand and gravel companies conduct *gravel bar scalping* operations, which involves removing material that builds up on sandbars in the river. There are also *gravel pits excavated* by sand and gravel companies in floodplain areas near rivers.

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<sup>13</sup> The following material is from an article by Bob Rost in [A Snapshot of Salmon](#) by the Oregon State University Extension Service (1998).

Gravel pits are located in areas where flood activity of nearby rivers has caused huge amounts of sand and gravel to accumulate over time.

Regulations can help protect salmon that spawn in the shallow gravel of shaded, calm portions of streams and rivers.

### ***Relationships with Native Americans***

The Oregon Territory was established in 1848. This federal government recognition posed the difficulty of 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 Oregon Territory from their traditional use lands and allow the United States to claim title of 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.<sup>14</sup> 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.<sup>15</sup> 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.<sup>16</sup> During the same year, Joel Palmer, superintendent of Indian Affairs in Oregon, pursued similar treaties with several Oregon tribes. The desired effect would be to extinguish Indian land ownership in exchange for certain protections for the tribes and enticements for Indians to become agrarian.

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

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<sup>14</sup> American Friends Service Committee (1970), p. 16.

<sup>15</sup> American Friends Service Committee (1970), p. 16

<sup>16</sup> American Friends Service Committee, (1970), p. 19

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reserving of a portion of their homeland. The importance of the 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."<sup>17</sup>

Through treaties with the United States, several Columbia River tribes<sup>18</sup> reserved their right to fish inside and outside reservation boundaries. These rights would become, by the mid-20<sup>th</sup> century, an important point of contention and legal action, as well as an issue with biological and cultural significance.<sup>19</sup> In a treaty with the United States, the Shoshone-Bannock Tribes of the Fort Hall Reservation also 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 state 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 primary purpose of

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<sup>17</sup> American Friends Service Committee (1970), p. 21.

<sup>18</sup> 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)."

<sup>19</sup> See generally 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, 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 (CRITFC, 1999).

these 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. By the mid-twentieth century, 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 complexity of interests and approaches to the overall policy direction for enhancing commerce.

### ***Agricultural Development and Water Competition***

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.<sup>20</sup> 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.<sup>21</sup>

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.<sup>22</sup> 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 were escalated by new technology

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<sup>20</sup> Pacific Northwest River Basins Commission Columbia North-Pacific Region Comprehensive Framework Study (PNRBC, 1997). Appendix 9: Irrigation. Vancouver, WA, p. 4.

<sup>21</sup> PNRBC (1971), p. 3.

<sup>22</sup> Faltey, John, The Inland Empire: Unfolding Years, 1879-1929 (1986). Seattle: University of Washington Press, pp.88-90, 97-99; Lichatowich (1999), pp. 48 and 50.

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and rivers were harnessed by dams for irrigation and flood control, as well as for the coming push to produce hydroelectric power. Issues such as effects on fish, wildlife, vegetation, or even the regional population were considered only minimally, if at all.

***Early 20<sup>th</sup> 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 point in policy development, however, such issues were discounted or not considered at all.

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. Commerce on the river remained light until the current set of multi-purpose dams was constructed in the Columbia and Snake rivers (beginning 1938).

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 . . . ." <sup>23</sup>

Between 1803 and 1930, then, 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."<sup>24</sup> In most of the nineteenth century, the few basic state fish and wildlife statutes were ineffective for lack of funding for wardens,

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<sup>23</sup> Federal Power Act, 16 USC 891-928. Coggins and Wilkinson, 1987.

<sup>24</sup> G. Coggins and C. Wilkinson, *Federal Public Land and Resource Law* (1987), p. 779.

equipment, and programs. The 20th century, however, saw the evolution of wildlife law from a set of relatively narrow state hunting and fishing rules to a more comprehensive, frequently interjurisdictional schemes of broader dimensions and perspectives.

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

***Migratory Bird Treaty Act (1918)***

The original 1918 statute implemented the 1916 Convention between the U.S. 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 statute provides for establishment of a federal prohibition, unless permitted by regulations, 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...for the protection of migratory birds . . .or any part, nest, or egg of any such bird."

***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 and 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.

***Federal Aid in Wildlife Restoration 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 percent 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.

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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-1960's, 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 direction 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.

The federal government itself did not approach the Columbia River seriously 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 specifies 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,"<sup>25</sup> and recommended ten dams for navigation and electricity production. Construction soon began on two massive dams: the Grand Coulee Dam in 1937, and the Bonneville Dam in 1938.

A commerce-driven policy direction 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 population would increasingly be hampered in its attempt to travel from its 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. 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.

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<sup>25</sup> 308 Report (1932), Item #7, March 29, 1932.

### ***Flood Control***

Hydropower generation and marketing was only one aspect of dam building that supported human needs. Flood control was also important. 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 country. Significant flood events occurred throughout the Columbia River Basin, washing away vegetation, rearranging the river course, and renewing low-lying lands with rich deposits from upstream.

From 1953 - 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. These 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.

### ***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."<sup>26</sup>

The federal government was a prime mover for building dams in the 30s, 40s, and early 50s and beyond. Congress also 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. 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

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<sup>26</sup> Lichatowich (1999), p. 70.

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expire within the next decade and must be relicensed by FERC. The relicensing process provides an opportunity to set conditions for project operations to meet the needs of fish and wildlife.

In the early 50s, there was a move by the Eisenhower Administration 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, in 1955. When complete, the complex blocked 80% of the habitat for Snake River fall chinook and created water quality problems, such as elevated 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 of spawning habitat for chinook.<sup>27</sup> It eliminated the famed Kettle Falls fishery and all remnants of many upriver fish runs and inundated 56,000 acres<sup>28</sup> 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;<sup>29</sup> 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."<sup>30,31</sup>

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.<sup>32</sup> 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 upper 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

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<sup>27</sup> Lichatowich (1999), p. 222.

<sup>28</sup> Note: This figure represents land area inundated, and does not include former river area. Personal communication between Kathy Pierce, Bonneville Power Administration, and Craig Sprankle, Public Affairs Officer, Grand Coulee Power Office, Bureau of Reclamation. December 2000.

<sup>29</sup> Snake River Salmon Recovery Team: Final Recommendation to the National Marine Fisheries Service (1994), p. II-8; Council, Strategy for Salmon (1992), Vol. I, pp. 28, 33.

<sup>30</sup> NRC (1995), p. 53.

<sup>31</sup> T. Palmer, The Snake River (1997), p. 189.

<sup>32</sup> Berryman et al., "Snake River Steelhead: An Endangered Fishery Threatened By Dynamic Instability?" <<http://classes.entom.wsu.edu/Papers/>>

fisheries in the upper basin were particularly hard hit since 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 lands in the Pacific Northwest.

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 quality, fish, soils, or terrestrial animals.

### ***Mitigation/The Environmental Movement***

For more than 150 years, the European American settlers of the West and their descendents had treated the natural resources—the forests and rivers, the land and air, the fish and wildlife that live in them—like the farmer with the goose that laid the golden egg. (The farmer killed the goose to get all the eggs inside and so, of course, got no more eggs at all and lost the goose to boot.) 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, saw the game they hunted become more scarce, saw the streams plug up with silt when heavy rains washed dirt down eroded banks, and saw the numbers of salmon returning from the ocean steadily diminish.

In 1949, under the Mitchell Act, the first major federal funding for fish effects occurred (although hatcheries had existed since the turn of the century). It authorized funding for state and federal hatcheries on the Lower Columbia River. 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

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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.

In 1950, the Federal Aid in Sport Fish Restoration Act, commonly called the Dingell-Johnson Act or Wallop-Breaux Act, was enacted. 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.

In 1960, the Multiple Use Sustained Yield Act 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.

In 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. Over 100 million acres have been included in the National Wilderness Preservation System so far.

In response to noticeable environmental pressures from decades of population and commercial growth, the decade of the 1970s brought a surge of environmental legislation from the United States Congress. In 1964, the Wilderness Act was passed. Momentum increased with the National Environmental Policy Act in 1969. Then, from 1970 through 1976, Congress promulgated the following major environmental statutes:

- Resource Conservation and Recovery Act (1972);
- Marine Protection, Research, and Sanctuaries Act (1972);
- Clean Water Act (1972, 1977);
- Endangered Species Act (1973);

- Safe Drinking Water Act (1974);
- Toxic Substances Control Act (1975);
- Coastal Zone Management Act (1976); and
- Hazardous Materials Transportation Act (1977).

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 were established with which to protect and enhance fish and wildlife, including Columbia River anadromous fish.

### **2.3.2 Recent Developments: the Period of "Equitable Treatment" for Fish and Wildlife (1980 — 2000)**

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.

#### **2.3.2.1 Primary Federal Statutes**

Three environmental statutes—the Endangered Species Act, the Clean Water 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 very 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.

#### ***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 any 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 anadromous or marine species. Formal consultations typically conclude with the issuance of a Biological Opinion (BiOp) stating the opinion as to 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 conclusion of 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.

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If a jeopardy opinion containing 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.

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 listing of 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 planning 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 (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 Basin-wide Strategy Paper<sup>33</sup> 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 Basin-wide 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 Basin-wide Strategy Paper.

### ***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 the 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 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 improving temperature and dissolved gas levels in the Columbia and Snake rivers. But these improvements in water quality are sometimes beyond the ability of dam operators to achieve (because those improvement levels cannot be reached under natural settings), or sometimes in conflict with the needs of endangered species. Efforts to reduce temperature and gas levels for CWA purposes, for example, appear to conflict with the direction from NMFS for the Corps to spill more water 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 standards. Among the three states, there are over 2,500 water bodies that fail to meet CWA standards.

### ***The Regional Act and Its Influence***

The basis for starting this section of the FWIP DEIS with the year 1980 was the passage that year of the Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. §§ 839 to 839h; commonly referred to as the Regional Act). Concerns over adequate power supplies and fish and wildlife harmed by the hydroelectric system led to

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<sup>33</sup> Federal Caucus (2000b).

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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, and reliable power supply, and
- (2) protecting and enhancing fish and wildlife populations harmed by federal 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 fishery 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 (16 U.S.C. § 839b(h)(5)). 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.” (16 U.S.C. § 839b(h)(6)(C)). The Act requires BPA to act consistently with these plans. Other federal agencies must also take the plans into account to the fullest extent practicable (16 U.S.C. § 839b(h)(11)(A)(ii)). The Council, however, has no authority over the federal agencies that implement the program.

The 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. BPA provides equitable treatment 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.

The combination of the Regional Act and relevant environmental statutes caused a rapid increase in environmental analyses. For instance, in 1992, the Bureau, Corps and BPA prepared the *Columbia River Salmon Flow Measures EIS*. Next, the agencies prepared and issued the *Interim Columbia and Snake River Flow Improvement Measures for Salmon Supplemental EIS* to address operations 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 1999, the Corps issued its draft *Lower Snake River Juvenile Salmon Migration Feasibility Report EIS*.

The SOR, which contains detailed analyses of the effects associated with changes in river operations, is an important source document for this FWIP EIS. However, its scope and focus were defined to exclude certain important considerations. Its scope was limited to analyzing the effects of long-term river management of hydro operations. Studies beyond this scope were not considered in the SOR.<sup>34</sup> For instance, generally, alternatives

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<sup>34</sup> USDOE/BPA, Corps and BOR (1995) p. 10-1.

suggested but determined to be beyond the scope of the document included structural modifications at the projects and actions independent of project operations.

Structural modification measures dismissed from detailed study in the SOR included the following:

- 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.

Additionally, some alternatives were suggested that pertained to river uses but did not directly involve operations at the 14 federal projects within the SOR scope.

Non-project measures specifically dismissed from detailed study included the following:

- improving streams and watersheds to restore salmonid spawning and rearing habitat;
- preserving and enlarging wildlife habitat;
- expanding research on hatchery programs and preservation of native fish stocks, and improving hatchery operations;
- banning or further limiting sport and commercial fishing on the Columbia River or the ocean;
- review of logging and mining practices, agricultural runoff, and municipal and industrial pollution;
- modifying irrigation delivery systems; and
- energy and capacity marketing that would shift or adjust load shape.<sup>35</sup>

Further, 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/Basin-wide Strategy ("All H") process by the Federal Caucus (see section 2.3.2.4).

Finally, 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 DEIS delivers on the assurances provided in the SOR FEIS.

### **2.3.2.2 Other Federal Agencies and General Statutory Responsibilities**

The previous discussions describe BPA's responsibilities under the ESA, the CWA, and the Regional Act. Equally important, regionally, are the other federal agencies that also

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<sup>35</sup> USDOE/BPA (1995b), pp. 4-23 through 25.

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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.

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.<sup>36</sup> 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.<sup>37</sup> About 33 Maf (million acre feet) 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 affect fish species 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.<sup>38</sup>

Historically, the **Bureau of Land Management** (BLM) managed federal public lands to support mining, grazing, and timber harvesting activities. More recently, the Federal Land Policy and Management Act of 1976 (FLPMA)(43 U.S.C. § 1732 et. seq.), 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. Some timber harvest and grazing practices are important contributors to watershed deterioration.

The **U.S. Forest Service** (USFS), under the United States Department of Agriculture, has also been directed to shift from single-purpose commodity production to multiple-use

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<sup>36</sup> BOR (2000).

<sup>37</sup> Information about Reclamation project impacts comes from the NMFS Draft Biological Opinion on the Operation of the Federal Columbia River Power System at 6-27 (July 27, 2000).

<sup>38</sup> BPA, Corps, Bureau, Multi-Species Biological Assessment of the FCRPS at 3-13 (December 1999)

management of federal forest lands. The USFS has a mandate to “provide timber for the people” under the Organic Act of 1897 (16 U.S.C. §§ 473 to 482). This focus was shifted with the Multiple-Use Sustained Yield Act of 1960 (16 U.S.C. §§ 528 to 531) (MUSYA), 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 (16 U.S.C. §§ 1600 to 1614). 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 yield. However, neither act prioritizes the specified uses, leaving the Forest Service to balance these often-conflicting uses. The Forest Service, an agency historically focused on managing national forests for timber production purposes, 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 embarked on two recent efforts. First, in conjunction with the USFS, the BLM released “Rangeland Reform” in 1994, 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).<sup>39</sup>

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

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<sup>39</sup> USDA/USFS 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. Intermountain, Northern, and Pacific Northwest Regions (1995).

USDA/USFS and USDO/BLM. 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]. Washington, DC (1995).

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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) (see Figure 2-12). The Interior Columbia Basin Ecosystem Management Project (ICBEMP) Supplemental Draft EIS presents three management alternatives for managing these important ecosystems.

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. 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** has responsibilities under the Soil and Water Resources Conservation Act of 1977 (16 U.S.C. § 2001) and the Farm Bills of 1994 (7 U.S.C. § 6962) and 1996 (7 U.S.C. § 7201). 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 1986 (33 U.S.C. § 2263(a)) requires water resource managers to consider fish and wildlife conservation. The Water Resources Development Act of 1990 (33 U.S.C. § 2316(a)) places environmental protection as a “primary mission” of the Corps. However, Congress also stated that environmental protection should not interfere with the Corps’ preexisting duties of navigation improvements and flood control (33 U.S.C. § 2316(b)). Finally, in 1992, Congress passed the Reclamation Projects Reauthorization and Adjustment Act (43 U.S.C. § 371), 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 fishing and wildlife 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 the table below.

**Table 2.3-2: Conflicting Priorities**

<b>Policy Conflicts</b>		
Policies that encouraged settlement and taking of tribal land		Tribal treaties to preserve certain land for tribes
Policies that allowed depletion of fish runs		Tribal rights to fish for salmon
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	<i>versus</i>	The ESA, which prohibits take
Policies that recognize private property rights		ESA take and critical habitat provisions that limit private property rights
Policies to reduce costs and increase market forces in the power industry		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 hatcheries 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)

These conflicts are further complicated by judicial rulings and changes in policy regarding federal Indian tribes and Indian resources, water resources, state harvest and hatchery policies, and the ESU policy of identifying endangered salmon species of fish by stocks. Also part of the equation are international treaties and other agreements

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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.

### ***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*. At issue was the way in which the NMFS had prepared and issued its 1993 BiOp on FCRPS operations. In response, the Idaho Department of Fish and Game had brought suit claiming that NMFS BiOp was arbitrary and capricious. 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.”<sup>40</sup> 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 following: the Forum, the Council's Framework Process, the Council's Program amendment process, the Conceptual Plan/Basin-wide 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,”<sup>41</sup> 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:

- While maintaining all flood control requirements, the priority of FCRPS operations has shifted to fish protection. Power production is secondary.
- Significant investments have been made in structural modifications at the dams to improve fish passage and survival.
- NMFS Draft White Papers provide PIT tag survival data that illustrate an upward trend in juvenile fish hydro system survival.<sup>42</sup> Pit tag survival estimates for Snake River spring/summer chinook have increased from 32% in 1993 to the highest measured direct survival on record of 59% in 1998. During this period, NMFS'

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<sup>40</sup> 850 Supp. 886, 900 (D. Or. 1994).

<sup>41</sup> 850 Supp. 886, 900 (D. Or. 1994).

<sup>42</sup> "PIT" tags, or "Passive Integrated Transponder" tags, enable researchers to track individual fish. NMFS, Passage of Juvenile and Adult Salmonids Past Columbia and Snake River Dams (1999b), pp. 71-72; NMFS Salmonid Travel Time and Survival Related to Flow Management in the Columbia River Basin, (1999a), p. 41.

aggressive actions have been taken on the hydro system to improve juvenile passage survival.<sup>43</sup>

- 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-through-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, over \$342 million have been 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 could draw from the strategies outlined in the Basin-wide Strategy paper (Federal Caucus, 2000b). Performance standards leading to recovery should be used to guide these efforts.
- Predation Management
  - Predator control actions throughout the FCRPS and the estuary save approximately 7 to 12 million smolts per year. This equates to approximately a 5 to 10% increase in juvenile fish survival.<sup>44</sup>

### **Federal Indian and Indian Resource Policies**

The judiciary played an important role in shaping federal resource policy in the 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 20<sup>th</sup> century, courts found that the Columbia River treaty tribes had reserved rights, included 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

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<sup>43</sup> Source: NMFS (1999b), pp. 71-72; and NMFS (1999a) p. 41.

<sup>44</sup> Source: NMFS (1999b), pp. 71-72; and NMFS (1999a) p. 41

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- recognition and enforcement of tribal water rights to flows for preservation of tribal fisheries.

Buttressed with these holdings, the federal government has taken the short 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.<sup>45</sup>

The Administration clarified its current policy with regard to the treaty 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.<sup>46</sup>

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.<sup>47</sup> 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

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<sup>45</sup> The White House, "Memorandum for the Heads of Executive Departments and Agencies, Government-to-Government Relations with Native American Tribal Governments" (April 29, 1994).

<sup>46</sup> Terry D. Garcia, Assistant Secretary for Oceans and Atmosphere, Department of Commerce, to Ted Strong, Executive Director, Columbia River Inter-Tribal Fish Commission (July 21, 1998).

<sup>47</sup> USDO I (U.S. Department of the Interior), Secretarial Order No. 3026 (June 5, 1997).  
<http://endangered.fws.gov/tribal/Esatribe.htm>

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* series of cases, the conservation principles outline how, when, and why the government can limit tribal treaty fisheries. Appreciating that the Basin-wide 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 Basin-wide Strategy paper acknowledged that a conservation argument can be made for eliminating all harvest of this ESU. However, it does not recommend this action because the harvest rate is low and because it is important to maintain at least some tribal harvest pursuant to treaties and the federal trust obligation.<sup>48</sup>

When BPA adopted its first tribal policy in 1996,<sup>49</sup> it was the first for which tribal participation had occurred prior to such adoption. 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.

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<sup>48</sup> NMFS, Draft Analysis of Restrictions on Tribal Fishing (2000b), pp. 5-6.

<sup>49</sup> USDOE/BPA (1996).

### **State Harvest and Hatchery Policies**

Under production-focused fisheries management, many runs were purposefully harvested to extinction.<sup>50</sup> State and federal fisheries management agencies are now shifting from being production- and harvest oriented to being more conservation-minded. As noted in Washington's Draft Wildlife Fish Policy, "We know that in order to be successful, the resource must be our exclusive client."<sup>51</sup> 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, 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.<sup>52</sup>

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.<sup>53</sup>

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.<sup>54</sup> Similarly, minimum length requirements for troll and sport fishers resulted in the

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<sup>50</sup> "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, Wild Salmonid Policy, Draft Environmental Impact Statement, Recommended Alternative, p. 3 (April 2, 1997) .

<sup>51</sup> State of Washington (1997), p. 3.

<sup>52</sup> State of Washington (1997), p. 7. The Washington Fish and Wildlife Commission adopted a final policy on December 5, 1997.

<sup>53</sup> NMFS, Draft Biological Opinion on the Operation of the FCRPS, sections 9.6.3.1-9.6.3.4 (July 27, 2000).

<sup>54</sup> The average size of chinook salmon "has been declining since at least 1930, and continues to decline. Present average weights [in 1980] are half or less than half of those obtained 50 years ago." W.E. Ricker, "Causes of the Decrease in Age and Size of Chinook Salmon *Onchorhynchus tshawytscha*", Can. Tech. Rep. of Fish & Aquat. Sci. No. 944 (May 1980).

largest fish being kept, leaving the smaller fish to reproduce.<sup>55</sup> 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 up to an estimated 30%.<sup>56</sup>

### ***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 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 and 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 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.<sup>57</sup> BPA implements a number of conservation hatchery programs, some of which (e.g., the program for Snake River Sockeye Salmon) keep the genomes alive in stocks that are extinct in the wild.<sup>58</sup>

There are several clear movements in hatchery management: (1) a move to 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 between where and how to use hatcheries. Tribes, local governments, and industries want wider use of hatchery fish in order to boost spawning in the wild,<sup>59</sup> 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.<sup>60</sup>

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<sup>55</sup> State of Washington (1997), p. 6 .

<sup>56</sup> State of Washington (1997).

<sup>57</sup> **Supplementation** - Artificial propagation intended to reestablish a natural population or increase its abundance. (Federal Caucus, 1999b, 1999, Glossary, p. 100).

<sup>58</sup> A detailed history and current status of hatcheries, emphasizing their roles for mitigation and production, can be found in the Federal Caucus' Conservation of Columbia Basin Fish ( 2000b) (“All-H” Paper) at pp. 52-66 and in the associated Hatchery Appendix.

<sup>59</sup> "(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. NWF.105/Jun.28.2000.

<sup>60</sup> See, NW Fishletter No. 056 (1998): "Imnaha Hatchery v. Wild Steel Head Dispute Temporarily Settled."

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In the Council's Program process, tribes especially continue seeking BPA implementation of mitigation through supplementation projects. The Nez Perce Hatchery, for instance, just 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. 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 the 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 be reducing the reproductive success of ESA-listed fish. Technical and policy decisions are needed to resolve this inherent conflict between hatcheries and wild fish survival.

***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 hence a "species") 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.<sup>61</sup> Application of this concept is flexible, depending in part on the information available. Where detailed information is available on a run of salmon it may often be split into many stocks for management purposes; but 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.<sup>62</sup>

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.<sup>63</sup> In essence, Pacific Northwest fisheries managers have taken a biologically cautious approach to ESA listings. Small populations of fish within a species have been

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<sup>61</sup> Waples, R. "Definition of "Species" Under the Endangered Species Act: Application to Pacific Salmon" (March 1991), NOA Technical Memorandum NMFST/NWC-194 at 1.

<sup>62</sup> NRC (1995), pp. 70, 138-140.

<sup>63</sup> Lackey, R.T. "Salmon Policy: Science, Society, Restoration, and Reality," *Renewable Resources Journal* (1999a) 17(2):6-16 at 5.

listed for federal protection when, under a broader definition, the overall species itself is in no danger of extinction.

### ***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.<sup>64</sup>

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 rights law in Oregon, Washington, Idaho, and Montana, allows the first person that 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-19<sup>th</sup> 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 total maximum daily load 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 countered with litigation and claims of unlawful takings that must be compensated 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 concentrated 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

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<sup>64</sup> Volkman, J, *A River in Common: The Columbia River, the Salmon Ecosystem, and Water Policy* (1997), p. 1.

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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.<sup>65</sup>

**Managing the Money Resource**

**Current Provisions**

Under the provisions of the Council’s Columbia River Basin Fish and Wildlife Program or the BiOps for the FCRPS, BPA funds a substantial portion of the fish and wildlife recovery and mitigation 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 \$200 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 of over \$3 billion. During the period from fiscal year 1996-2001, BPA’s estimated costs are \$1.65 billion; for fiscal years 2001-2006 BPA estimates its costs in the neighborhood of \$2.4 billion.<sup>66</sup>

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 three categories:

<b>Program</b>	<b>Expenses</b>
1. Direct program	Direct expenses (not including capital debt service) of Council Fish and Wildlife Program measures.
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 interest and amortization on BPA’s capital budget investments, operations and maintenance (O&M) 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.

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*

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<sup>65</sup> Governance issues are discussed in more detail in Chapter 6.

<sup>66</sup> These estimates are found at BPA's Fish and Wildlife web site: : <http://www.efw.bpa.gov/>

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of Agreement (MOA). This interagency MOA allows BPA (i.e., ratepayers) to maintain funding for Columbia Basin fish and wildlife activities, at an average of \$252 million per year plus the cost of system operations for fish (such as spill and flow augmentation) for fiscal years 1996 through 2001. The \$252 million consists of \$100 million for the direct fish and wildlife program, \$40 million for reimbursable expenses paid to other agencies, and \$112 million for debt service on capital investments such as bypass facilities and hatcheries.

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 lasts only through 2001. Other obligations could be imposed on BPA during this period. 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 recovery. The agencies may enter into a new agreement for budget coordination beyond 2001. Table 2.3-3 shows BPA's estimate of costs under the MOA from 1996 through 2000.

**Table 2.3-3: MOA Fish and Wildlife Program Expenses, 1996 – 2000**

<b>MOA Fish and Wildlife Program Expenses, 1996 – 2000, Million \$</b>					
<b>Year</b>					
<b>Category</b>	1996	1997	1998	1999	2000
<b>Direct Program</b>	68.5	82.2	104.9	108.2	106.1
<b>Reimbursable</b>	35.4	35.9	36.4	38.9	37.6
<b>Expenses Assoc. with Capital Investments</b>	73.1	76.3	74.1	76.0	70.0**
<b>Hydro Operations</b>	85.7	111.8	125.9	Not reported, and not expected to be derived	Not reported and not expected to be derived
<b>Total</b>	262.7	306.2	341.3		

\*\* Estimated as of 11/2000. Source: Rollie Sivyer, BPA, 2000.

Costs of hydrosystem operations were not reported in 1999 and 2000. BPA incurs net costs from fish mitigation 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 aMW or 10% of the capability of the system.<sup>67</sup> Previous analyses estimated 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.<sup>68</sup> Prices are expected to be higher than the price

<sup>67</sup> Columbia Basin Bulletin (12/22/2000), NMFS, Caucus Release Salmon Recovery Strategy.

<sup>68</sup> USDOE/BPA, 2000b: Costs of Implementing the 2000 Biological Opinion (Draft: 12/20/00).

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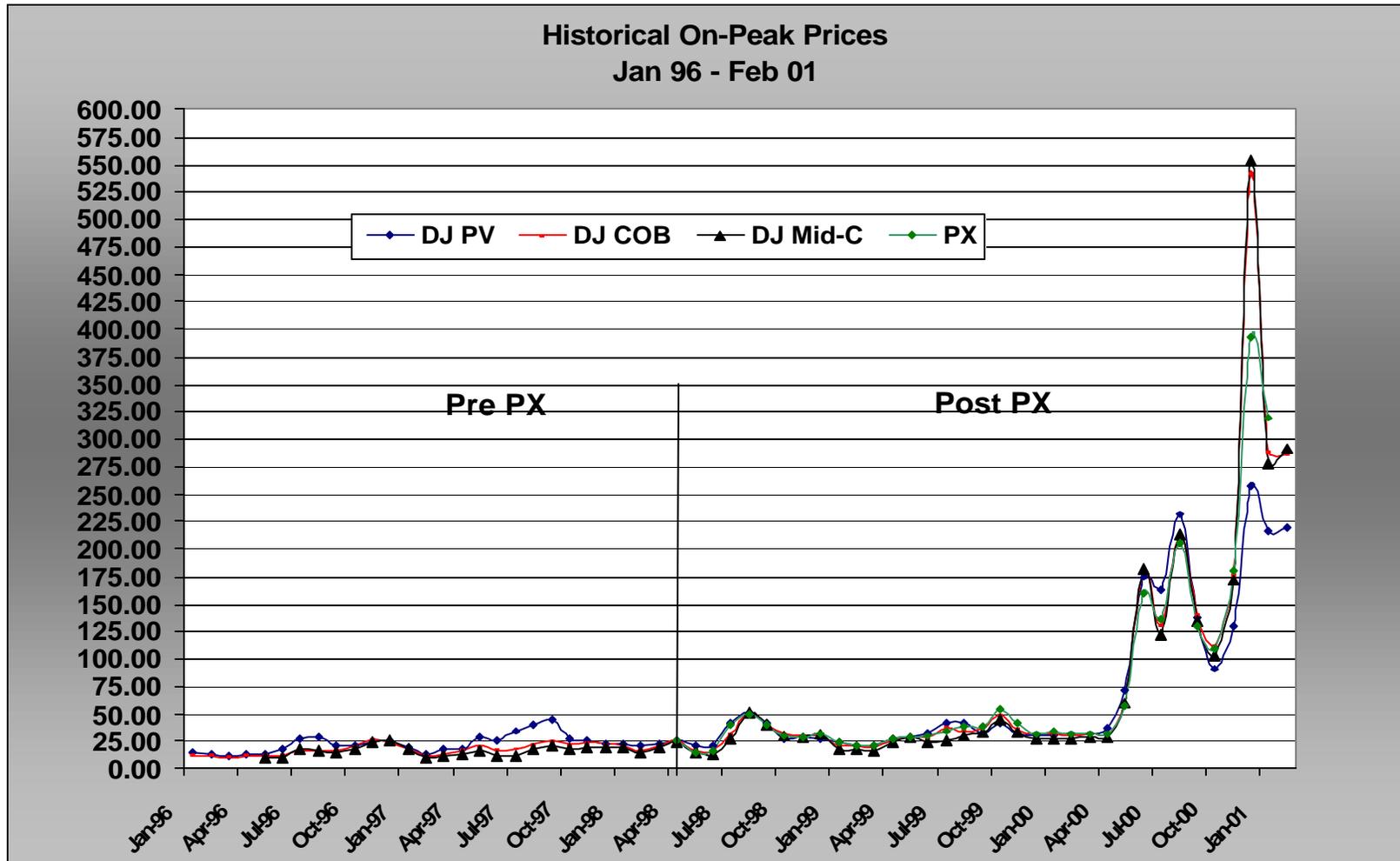
assumed in 1998. Figure 2-2 shows monthly average spot prices in regional power markets over the last 4 years. The price over the long-term is expected to be lower than recent highs but much higher than the 1998 price.

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.

The Regional Act calls for the tracking of the monetary cost of purchasing replacement power and electric power losses resulting from implementation of the Council's Fish and Wildlife Program. BPA interprets the Act to allow it to recoup the amounts in excess of the power share of mitigation costs. Nevertheless, foregone revenues as a result of reduced energy production represent an additional cost to ratepayers because their power must be acquired from some other, usually more expensive source. Also, BPA may need to raise its rates later to cover costs. Furthermore, reduced revenues reduce 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 because, as less energy is generated by the FCRPS, utilities obtain their energy from other sources that have environmental impacts such as depletion of non-renewable fuels and air pollution.

BPA is an unusual federal agency in that it receives no annual appropriations from Congress. Instead, Congress created the BPA Fund within the United States Treasury and gave BPA borrowing authority: 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, this means the money generated by BPA through its power marketing activities.

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



Where we refer to taxpayer dollars, we refer to 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 costs in the region. Other 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, use fees, and other sources.

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* definition, next page). More recently, however, a more competitive market has emerged for electric power, and non-BPA suppliers began 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)<sup>69</sup>, 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 increase revenues, reduce costs, or transfer costs—to continue meeting its obligations. Since BPA would already

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<sup>69</sup> USDOE/BPA (1995).

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.*

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 2-3 illustrates this condition.

In addition, BPA is concerned about its customers' *perceptions* of BPA's costs. In numerous forums, customers said that if BPA's responsibilities lead to unpredictable rates, they would 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 will exceed 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.

Currently, the risk of driving BPA customers to other sellers is much 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 adds another layer of uncertainty to BPA's revenues and ability to cover costs. Capacity shortages and increased volatility in West Coast electric power markets since June 2000 have resulted in unprecedented high prices throughout the western United States that have continued for months after seasonal peak loads. In California, high wholesale power prices, in conflict with statutory limits on retail prices, have left Independently Operated Utilities (IOUs) with billions of dollars in unrecovered costs. These deficits have led to defaults by those IOUs on payments due the California Power Exchange (PX) and the California Independent System Operator (ISO), which in turn have been unable to make full payments to power marketers.

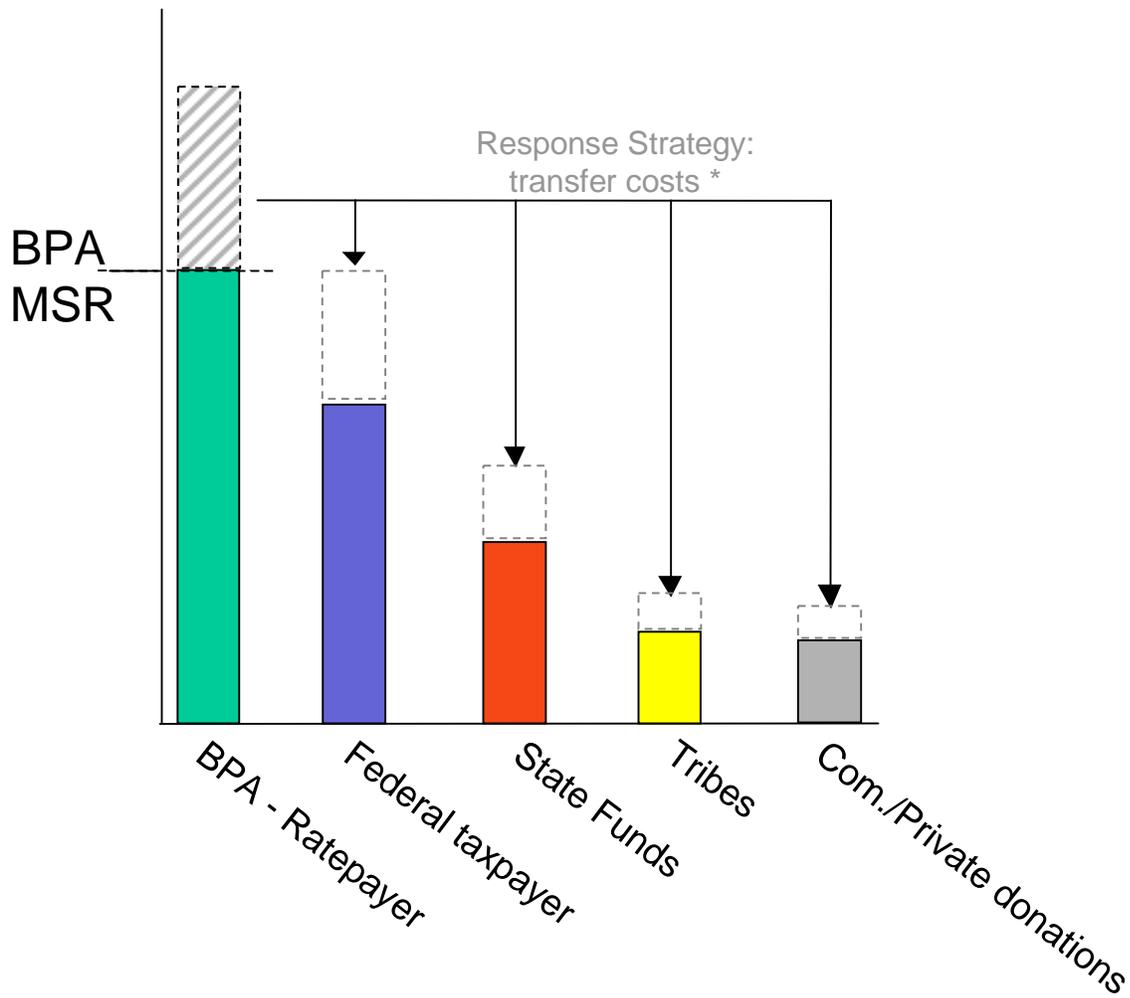
The lack of creditworthy buyers to purchase power for California loads has become a financial and operational crisis. Power generators and marketers are forced to choose between declining to provide power (out of legitimate concern that the buyer may be insolvent) and supplying power to avoid emergencies with little expectation of being paid. BPA has been called upon to provide power to California during one of the driest winter periods on record. As a result, when the weather has been coldest in the Pacific Northwest, under the terms of the Biological Opinion, requirements for Columbia River flows or elevations of FCRPS hydro projects have been modified. To the extent that these modifications get in the way of achieving the goals of fish and wildlife implementation, it is a consequence of market conditions arising from the breakdown of the California restructured electric power market.

In summary: high prices for power may impair BPA's ability to finance fish and wildlife implementation. Price volatility adds uncertainty about BPA's financial health. Extreme power demands or shortages may lead to modifications to fish and wildlife operations. Unprecedented conditions arising from generation shortages and high prices in California have created new risks and uncertainties for BPA and the FCRPS.

#### **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—despite the acts and statutes passed, 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. More are listed as threatened or endangered every year. 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.

**Figure 2-3: Illustration of a BPA Response Strategy When Reaching Maximum Sustainable Revenues (MSR)**



\* NOTE: For purposes of this illustration, the incremental differences are proportional to the pre-existing cost shares. In practice, the transfer costs increments may be affected by funding limitations, political considerations, and the Policy Direction ultimately selected.

On the plus side, in today's political environment, economic and environmental effects are considered together, and the public is actively engaged in government decisionmaking processes. Today's political environment contains all the elements that developed in the last 20 years: 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 dilemmas:

- There is no clear scientific proven answer regarding what single action or 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"<sup>70</sup>, the Federal Caucus' Basin-wide Strategy paper, the Council's Program, BiOps or Habitat Conservation Plans on the FCRPS, plus several formal plans from various regional entities. These different processes are not fully coordinated.

### ***Framework***

As we 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 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 formed the outline of the alternatives used in this DEIS. For more information, see, Northwest Power Planning Council, "The Year of The Decision"<sup>71</sup> and Chapter 4 and **Appendix D** of this DEIS.

### ***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

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<sup>70</sup> A process no longer active.

<sup>71</sup> Federal Caucus (2000b).

species. These agencies include BPA, NMFS, USFWS, the Bureau, the Corps, Bureau of Indian Affairs (BIA), USFS, BLM and EPA. The intent was to develop a response strategy that could 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 Basin-wide Strategy.<sup>72</sup>

### ***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.
- **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.

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<sup>72</sup> Federal Caucus (2000b).

### ***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.

### ***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 combinations 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 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 have entered into a Memorandum of Agreement (MOU) 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. A copy of a draft MOU is in Volume 2. 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.<sup>73</sup> The consultations considered 14 sets of 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 facilities were likely to jeopardize the continued existence of 12 species of fish listed under the ESA.

NMFS used a 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 concludes 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 Basin-wide Strategy, are likely to ensure a high likelihood of survival with a moderate-to-high likelihood of recovery.

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<sup>73</sup> NMFS (2000b).

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.<sup>74</sup> 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 Basin-wide 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. Third, it provides a tool for engaging the public. Fourth, it provides a forum for federal agencies to plan and coordinate their activities.

### ***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, 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. 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, communication, and other infrastructure. The impacts associated with these economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. The overall effect 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.

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<sup>74</sup> USDOJ/USFWS (2000).

The region has several other major plans related to fish and wildlife mitigation and recovery efforts that this DEIS incorporates by reference. These plans represent a formal set of actions reflecting more localized social values than the legal parameters. The effect on these plans can also inhibit or enhance implementation of any 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 USDOJ/BLM, 2000) and the Northwest Forest Plan (USDOJ/USFWS and BLM, 1994), and the Lower Snake River Juvenile Salmon Migration Feasibility Report EIS (Corps, 1999a).

### ***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,"<sup>75</sup> 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.

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<sup>75</sup> Governors (2000).

- d) Strengthen state law enforcement programs and coordinate them with habitat strategies to aid specific watersheds.
- 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."<sup>76</sup> This report examined the three recovery options being considered by NMFS 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."<sup>77</sup>

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<sup>76</sup> The report on Idaho's anadromous fish stocks was completed May 1, 1998. A second printing was released June 8, 1998. IDFG (Idaho Fish and Game), "Director's Letter," June 8, 1998, page 1.

<sup>77</sup> IDFG (1998). Idaho's Anadromous Fish Stocks: Their Status and Recovery Options. Conclusions, page 1.

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 issues. 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...[T]he 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."<sup>78</sup>

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 total maximum daily loads (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;
- Oregon Division of State Lands and Oregon Parks Department programs to improve habitat health on state-owned lands; and
- Department of Geology and Mineral Industries program to reduce sediment runoff from mine sites; and

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<sup>78</sup> "The Oregon Plan: Overview" <<http://www.oregon-plan.org/>>

- 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."<sup>79</sup> 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."<sup>80</sup> 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 actions in the harvest and hatchery areas, including comprehensive hatchery planning.

Washington State closed the mainstem Columbia River to new water rights appropriations in 1995. All applications for new water withdrawals are being denied, based on the need to address ESA issues. The state established and funds a program to lease or buy water rights for instream flow purposes. This program, begun in 2000, is in the preliminary stages of public information and identification of potential acquisitions.

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 State's Forest and Fish Plan may be promulgated as administrative rules. Those rules are designed to establish criteria for non-Federal and private forest activities that will improve environmental conditions for listed species. The Washington legislature may amend the Shoreline Management Act, giving options to local governments 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

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<sup>79</sup> State of Washington (1999).

<sup>80</sup> Extensive information on Washington's salmon recovery efforts is available at: <http://www.wa.gov/wdfw/recovery.htm>

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 tribes<sup>81</sup> 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 of the plan extends wherever these fish migrate and throughout the Columbia River Basin wherever activities occur that directly affect them.<sup>82</sup>

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.

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<sup>81</sup> These four tribes, which comprise the Columbia River Inter-Tribal Fish Commission, have Treaty rights to harvest Columbia Basin anadromous fish.

<sup>82</sup> CRTFC, "Spirit of the Salmon" (Wy-Kan-Ush-Mi Wa-Kish-Wit) Executive Summary (1999), p 3.

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.<sup>83</sup>

Tribal plans also rest in part on the ongoing results of *U.S. v. Oregon*, discussed in Chapter 1. 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 fisheries co-managers. 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 been renegotiated yet.

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."<sup>84</sup>

"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

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<sup>83</sup> CRTFC Spirit of the Salmon" (Wy-Kan-Ush-Mi Wa-Kish-Wit) Executive Summary (1999).

<sup>84</sup> CRTFC, The Tribal Vision for the Future of the Columbia River Basin and How to Achieve It (1999) pp. 2-3.

- 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.”<sup>85</sup>

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.<sup>86</sup>

#### **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 DEIS 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.”<sup>87</sup>

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

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<sup>85</sup> CRITFC (1999a), p. 3.

<sup>86</sup> CRITFC (1999a), p. 5.

<sup>87</sup> Lackey, R. T. " The Savvy Salmon Technocrat: Life's Little Rules." *Environmental Practice*. 1(3):156-161 (1999b).

**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 a through going 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.”<sup>88</sup>*

**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.”<sup>89</sup>*

Such examples serve as a reminder that policies are temporal and transient. An agency’s policy choice today may be the source of the problems future generations are trying 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 DEIS 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.

## **2.4 EXISTING ENVIRONMENTAL CONDITIONS**

*This section is intended to provide the reader with a basic understanding of existing environmental conditions. 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 Supplemental Draft EIS. Other sources include the Federal Caucus Conceptual Plan and Basin-wide Strategy papers, the Human Effects Analysis of the Multi-Species Framework Alternatives (2000), the U.S. Department of Commerce’s Statistical*

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<sup>88</sup> Bessey, R.F. Department of the Interior Pacific N.W. Coordination Committee at 22-23. “Minutes of the Meeting of the Columbia Basin Inter-Agency Committee Vol. 2” (June 25-26, 1947).

<sup>89</sup> USDO/USFWS, Draft Coordination Act Report on Snake River Feasibility Study (1999), at M ES-2.

*Abstract of the United States (1999), and the USDA's Agricultural Statistics (2000).*

## **2.4.1 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 categories:

- air quality;
- water use and water quality;
- aquatic biological resources, including aquatic and riparian ecosystems and all fish using the Columbia Basin for any part of their life cycle;
- land use and quality; and
- terrestrial biological resources, including upland forests, grasslands, and wildlife.

### **2.4.1.1 Air Quality**

Generally, the Pacific Northwest region is known for its excellent air quality. Areas close to the coast, where much of the population lives, normally have good air dispersion. Some interior areas are more subject to air quality problems in the summer and fall because of dry climates and proximity to large areas of exposed and highly erodible soils.

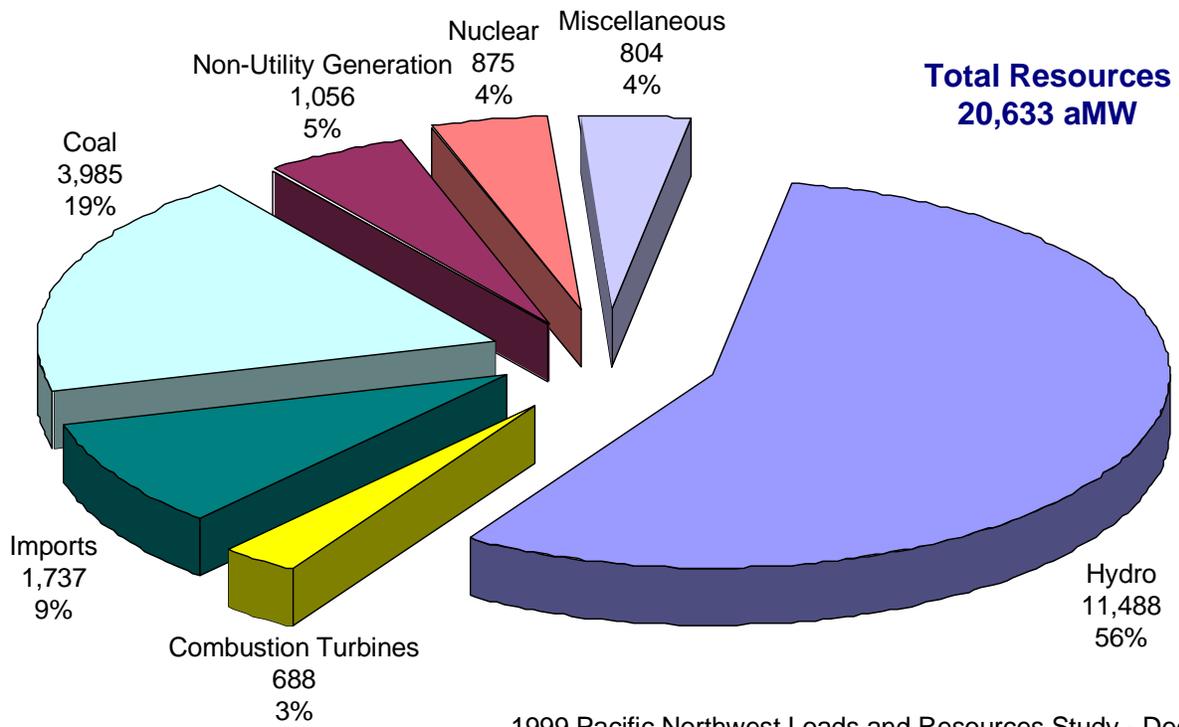
The Columbia River SOR identifies three major categories of pollutants 1) urban sources, 2) major single-point emitters, and 3) large areas of exposed soils. Important sources of urban air pollution include internal combustion engines used for transportation, industrial plants, burning of fuels for heating and other purposes, and burning of wastes. Single-point emitters include combustion turbines located in urban and rural areas. Most areas of exposed soils are agricultural and grazing lands and unpaved roads.

Important coal-fired plants are located near Centralia, Washington, and Boardman, Oregon. Sulfur dioxide is an important concern for coal-fired plants; nitrogen oxides are more of a concern for natural gas combustion turbines. Figure 2-4 shows the breakdown of the generation resources projected for operation in the 2000-2001 operating year. Figure 2-5 identifies Non-Hydro Generation sites in the region (see also **Appendix E: Energy Generation Facilities**). Figure 2-14 shows the location of major gas pipelines that which would help supply the fuel supply for any new gas combustion turbines.

Some areas in the basin do not fully meet federal, state and local Ambient Air Quality Standards. Some urban areas do not meet carbon monoxide standards, but the most

**Figure 2-4: Projected Regional Firm Resources  
Operating Year 2000-2001**

**(Based on 12-Month Average and 1936-37 Water Conditions)**



1999 Pacific Northwest Loads and Resources Study - Dec. '99

common types of non-attainment in the region involve small particulate matter and total suspended particulates. Non-attainment areas for particulates include Sandpoint, Clarkston, and Lewiston. See Figure 2-5 for a map showing Air Non-Attainment and Class I Areas.

#### **2.4.1.2 Water Use and Quality**

Water use is the diversion or instream application of water to human uses, including agricultural irrigation, other water supply, hydropower, navigation, and waste disposal.

“Large hydroelectric dams on the main-stem 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. . . . 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.”<sup>90</sup>

"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.”<sup>91</sup>

Water quality problems generally originate as intentional use of water for waste disposal, or as non-point sources. Non-point sources include irrigation return flows, forestry practices, malfunctioning septic systems, urban runoff and mining leachates. Some water quality problems are directly related to dewatering of streams for irrigation and other water supply purposes.

“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.”<sup>92</sup>

“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.”<sup>93</sup>

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<sup>90</sup> Federal Caucus (1999b), pp. 1-2.

<sup>91</sup> Federal Caucus (1999b), p. 28.

<sup>92</sup> Federal Caucus (1999b), pp. 28-29.

"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."<sup>94</sup>

Figure 2-6 shows rivers and streams with water quality concerns. Reservoir sediments can contain mercury and other hazardous substances. The effect of reservoir operations on sediment mobility and subsequent movements of hazardous substances has been a concern.

In addition to the human activities directly affecting the rivers, potential rapid increases in greenhouse gases and related ocean warming are issues of concern. Fish may be unable to adapt rapidly, which may in turn be contributing substantially to their drastically reduced ocean survival. One of the main biological impacts occurs because fish are cold-blooded, and their metabolism is a function of water temperature. If the water warms and food supply does not increase, their growth will decrease. This may be at least part of the reason that the growth of most of the salmon stocks studied has decreased over time<sup>95</sup>, a factor that directly affects the number of eggs and the viability of the eggs.

The 20th century is the warmest century in the past 1,000 years. The 1990s are the warmest decade, and 1998 was the warmest year (1997 was the second warmest).<sup>96</sup> 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. Global warming models indicate that each coming decade may successively add nearly as much warming as the entire 20th century. Because the events currently taking place are outside of the evolutionary experience of salmonid populations, they are going to be ill-adapted to climatic conditions that have not been experienced in over a thousand years. Thus, the effects of human-caused climate change

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<sup>93</sup> Federal Caucus (1999b), p. 2.

<sup>94</sup> Federal Caucus (1999b), p. 28.

<sup>95</sup> Bigler, BS; Welch, DW; Helle, JH, (1996): A review of size trends among north Pacific salmon (*Oncorhynchus spp.*). Can. J. Fish. Aquat. Sci. 53, 455-465

<sup>96</sup> Material in the next three paragraphs is drawn from the following sources: Welsh, D.W., Global Warming and Contemporary Fisheries Management, American Fisheries Society (in press), pp. 1 – 5; Welch, D.W., Whitney, F., Bertram, D., Harfenist, A., and Tucker, S., Ocean Climate Change and Growth and Survival of Pacific Salmon & Seabirds on the West Coast of North America, PICES VIII Conference, Russia (1999), p.2; Welch, D.W., Testimony to the Committee on Energy & Natural Resources, United States Senate, G. Smith hearing (1999), pp. 3-7; Welch, D.W., Unified Plan Working Paper on the Effects of the Ocean and Climate on Salmon Recovery and Their Importance to Planning and Decision Processes (in press), pp. 4, 15.

on salmonid populations, already clearly sensitive to climatic variation within our historical baseline, will be both unpredictable and large.

Changes in marine survival appear to be related to these sudden shifts in the climate of the ocean and atmosphere. Open ocean salmon research conducted from 1990-1995 indicates that salmon are headed for great difficulty in the long term because of global warming. On the West Coast, there have already been significant reductions in marine survival stretching from Oregon to Alaska, with the greatest losses occurring in southern regions. Oregon 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 coho salmon has decreased in the 1990s to one-tenth of the survival experienced 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.

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 our lifetimes, several species of Pacific salmon would no longer be able to forage 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. For more information on Global Warming and Ocean Conditions, please see **Appendix F**.

#### **2.4.1.3 Fish and Other Aquatic Resources**

Many aquatic species are substantially diminished in numbers relative to historical levels.

“Native salmon and steelhead, and many resident fish species 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).<sup>97</sup>

The problems extend to many of the region's resident fish:

"(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."

Figure 2-7 shows the areas where species have been listed as threatened or endangered.

Aquatic conditions in the mainstem have been substantially altered by reservoirs.

"These impoundments have inundated large amounts of spawning and rearing habitat...Current 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, with minor spawning in the mid-Columbia, below the lower Snake River dams, and below Bonneville Dam. Hanford Reach is the only known mainstem spawning area for steelhead. Chum salmon habitat in the Lower Columbia has also been inundated. The mainstem habitats of Columbia, Snake and Willamette rivers have been reduced, for the most part, to a single channel, floodplains have been reduced, 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."<sup>98</sup>

The presence of the dams can also cause increased dissolved nitrogen gas from voluntary and involuntary spills and alter natural temperature patterns that are important for fish habitat and migration.

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.<sup>99</sup>

Reservoirs are characterized by wider cross-sectional areas than free-flowing rivers, which result in lower water velocity for any given flow level when compared to the unimpounded river. This wider cross-section, coupled with the storage of water within a year, reduces water velocities, particularly during periods when most juvenile salmonids outmigrate.<sup>100</sup>

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<sup>97</sup> Federal Caucus (1999b), p. 1

<sup>98</sup> Federal Caucus (1999b), p. 29.

<sup>99</sup> Federal Caucus (1999b), p. 67.

<sup>100</sup> Federal Caucus (1999b), p. 67.

"These conditions increase the travel time of juveniles and adults. Increased travel time exposes juveniles to predators and alters the timing of their ocean entry. The reservoirs have also substantially modified the temperature of the river and provide ideal habitat for salmon predators."<sup>101</sup>

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.<sup>102</sup>

Riparian 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 degraded most riparian ecosystems in the Pacific Northwest. The following list is indicative of the decline in the health of riparian ecosystems:

- Forestry, agriculture, mining, and urbanization have altered or destroyed tributary habitat. Many riparian areas, flood plains and wetlands that once stored water during periods of high runoff have been developed.
- 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% of Washington State's waters that have been surveyed, 58.5% have been identified by the Washington Department of Ecology as impaired.<sup>103</sup>
- 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.<sup>104</sup>
- Agricultural development, channelization, and diking to control flooding along the Willamette River have drastically simplified the once braided system of

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<sup>101</sup> Federal Caucus (1999b), p. 67.

<sup>102</sup> Federal Caucus (1999b), Hydro Appendix, p. 11.

<sup>103</sup> WDOE (1998).

<sup>104</sup> EPA (1998).

oxbows, small side channels, ponds, and sloughs that supported extensive marshlands and riparian forests.

- 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.
- 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.
- 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.<sup>105</sup>

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.<sup>106</sup> 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.

In the main channel in the estuary, the Corps dredges and maintains the shipping channel and is proposing a navigation channel-deepening project. 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 the navigation channel dredging. The goal of consultation is to substantially reduce these effects immediately."<sup>107</sup>

The overall contribution of hatcheries to fish numbers in the basin has been positive, but the effect of hatcheries on wild stocks and genetic diversity is a concern.

Hatcheries have a long history of providing fish in an efficient manner for harvest and related social purposes. Artificial production represents 70-90% of the run for some species (coho, spring, fall chinook, steelhead). It is not yet clear, however, whether hatcheries are effective in rebuilding self-sustaining, naturally spawning

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<sup>105</sup> Federal Caucus (1999b).

<sup>106</sup> Lower Columbia River Estuary Program (1999).

<sup>107</sup> Federal Caucus (1999b), p. 30.

populations over the long term. A fundamental question is: how can artificial production be applied in a manner that not only avoids harm, but also assists in the conservation and rebuilding of wild runs?<sup>108</sup>

Hatcheries have introduced inbreeding and competition, may have been a source of disease for wild fish, and have in some cases induced fisheries to harvest at rates too high for natural stocks. Species of plant or animal [are] in danger of extinction.<sup>109</sup>

Figure 2-8 shows the hatcheries and the areas where they have been used to help to increase the number of fish. For more information on anadromous and resident fish hatchery facilities, please see **Appendix G**.

Fish harvest contributes directly to mortality of most stocks, and some fish are killed incidental to take of more common species or stocks.

“Fishing, or harvest, has reduced the number of adult fish that return to spawn.”<sup>110</sup>

In addition, introduced aquatic species have significantly and rapidly altered the population dynamics of native fish communities. In the Pacific Northwest, freshwater fish communities are relatively sparse in terms of the numbers of species and families, compared to other parts of the country. For example, Tennessee has about 400 native species of freshwater fishes, while 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 species richness of fishes in the Pacific Northwest by one-third, from what they were during the previous 10,000 – 12,000 years.<sup>111</sup>

#### **2.4.1.4 Land Use and Quality**

Land use in the region has changed dramatically in the last 150 years. Forests have been cut, grasslands, forestlands and wetlands converted to grazing and agriculture, and land has been converted to developed uses. Table 2.4-1 shows recent land use by ecological province as defined by the Multi-species Framework Process.<sup>112</sup>

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<sup>108</sup> Federal Caucus (1999b), p. 5.

<sup>109</sup> Federal Caucus (1999b), p. 1.

<sup>110</sup> Federal Caucus (1999b), p. 1.

<sup>111</sup> Palmisano, J.F, *Pacific Salmon: A More Thorough List of the Natural and Human-Induced Factors of Decline* (2000), July 27, 2000 memo.

<sup>112</sup> Ecological provinces are groupings of adjoining subbasins with similar climates and geology to account for distinct environments for fish and wildlife populations (Council, 2000, p. 46).

**Table 2.4-1: 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.<sup>113</sup> 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 alluvium, and upland soils tend to be rocky, coarse and permeable.

The ICBEMP Draft EIS identifies the current condition of BLM and FS lands east of the cascades:

“Soil productivity is generally stable to declining. . . sustainability of soil ecosystem function and process is at risk. . . in some areas.”<sup>114</sup>

Soil productivity decreases 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.

Urbanization of lands causes a loss of the native land characteristics. Urbanized and agricultural land, depending on its management, can provide habitat values for some native species.

“Urbanization paves over or compacts soil, and increases the amount of runoff reaching rivers and streams.”<sup>115</sup>

See Figure 2-9 for a map of the different types of vegetation across the region.

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<sup>113</sup> USDOE/BPA (1995b).

<sup>114</sup> USDA/USDI (1997), pp. 18-19.

<sup>115</sup> Federal Caucus (1999b), p. 29.

### **2.4.1.5 Wildlife and Other Terrestrial Resources**

The ICBEMP Draft and Supplemental Draft EIS identifies the current condition of forests, grazing lands, and wildlife east of the Cascades. Many of these statements are representative for other areas of the basin as well.

- “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 and animal terrestrial 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.”

In coniferous forests, logging has greatly reduced late-successional forest structures. Populations of associated wildlife species have correspondingly declined. Both late-successional and younger forests provide habitat for large animals such as mule deer, cougar, bear, and elk.<sup>116</sup> See Figure 2-10 for a map of sightings for the listed threatened and endangered wildlife.

### **2.4.2 Socioeconomic Environment**

*This section describes the existing socioeconomic environment, including cultural, social, aesthetic, historical and health-related factors.*

The Columbia River Basin includes most of the states of Washington, Oregon, and Idaho and parts of Montana, Wyoming, Nevada and Utah. Approximately 8 million people lived in the region in 1980; by 2015, this figure is expected to grow to about 12 million. The region has recently experienced rapid population growth in comparison to the nation as a whole, and this is expected to continue. The recession during the 1980s contributed to outward migration; however, enhanced economic prospects for the region have reversed this trend and more people are moving into the region. As of 1999, the Basin was continuing to experience rapid growth, with many small rural communities (including Native American communities) undergoing significant social and economic changes. Please see Chapter 7 for a discussion of a related socioeconomic issue, Environmental Justice.

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<sup>116</sup> USDOE/BPA (1997b), p. 43.

This immigration is expected to continue as comparatively strong economic growth, increases in retirement, and recreation development help foster population growth above United States averages. The growth at the regional and basin levels is not shared equally among all communities and industries. See Figure 2-11 for a map showing the population distribution across the different counties within the region.

Only a few decades ago, economic growth was fueled by natural resources industries such as agriculture, fishing, mining and forestry, and inexpensive hydropower was important in attracting energy-intensive industries. Now, economic growth is spurred primarily by growth in services, government, and technology. 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.<sup>117</sup>

The region's economic base is strengthened by the advantage of low-cost energy. The availability of natural gas from Canada and the region's hydro base for electricity gives the Pacific Northwest a long-term energy advantage. However, even this advantage means less to most people, as the economy becomes more service-oriented.

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 have lost economic base because of resource depletion, environmental laws, and changes in international markets and technology. 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.

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.

These changes have reduced the relative economic and political power of the natural resource industries. In general, the regional economy has evolved a more diverse base, with notable growth in technology, transportation, trade, and service sectors. This, plus improved efficiency in regional industries, has made the region more resistant to the severe economic fluctuations experienced in the past, and fewer persons need to rely on natural resources for their livelihood. Overall, growth for major sectors of the regional economy is expected to be moderate.<sup>118</sup>

An increasingly urban population is increasing demands for recreation and environmental quality. California, with over 30 million people, represents an important market for the

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<sup>117</sup> This paragraph paraphrased from USDOE/BPA (1995b), Appendix O - Sec. 2.1.1.

<sup>118</sup> USDOE/BPA (1995b), Appendix O, p. 2-8.

Pacific Northwest. The tourism industry, fueled by outdoor recreation and scenic opportunities, provides economic stimulus in less populated regions and creates economic activity in the service and trade sectors. All of these factors increase the relative importance of recreational use, quality of life and preservation relative to resource extraction. At the same time, development is threatening the qualities that make rural places attractive for recreation, retirement, and new businesses.

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 environment and managing the effects of a quickly growing population have become important to many.

Table 2.4-2 (following page) 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.

The following discussion for this section of the existing socioeconomic environment is described by these categories:

- Tribal Conditions,
- Commerce,
- Social and Cultural, and
- BPA Projects and Funding.

#### **2.4.2.1 Tribal Conditions**

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, we focus on the 13<sup>119</sup> in the Basin where we are required to take mitigation and recovery actions for the FCRPS. The Columbia River tribes that have adjudicated fishing rights include the Confederated Tribes of the Warm Springs Reservation, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Reservation, and the Nez Perce Tribe. Other federally recognized tribes in the region also have fishing and hunting rights. These tribes include the Burns Paiute, Coeur d'Alene, Duck Valley, Flathead, Shoshone-Bannock, Shoshone-Paiute, Kalispell, Kootenai of Idaho, and Spokane. The two newly federally recognized tribes are the Chinook Indian Tribe/Chinook Nation and the Cowlitz Indian Tribe. Figure 2-12 shows a map of the Indian Reservation lands and other land ownership in the region today. Table 2.4-3 provides data on the federally recognized tribes in the region.

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<sup>119</sup> Now a total of 15 tribes: the Chinook Indian Tribe/Chinook Nation and the Cowlitz Tribe have recently been federally recognized, but are not yet active in mitigation efforts. The 50 tribes are named in **Appendix B: Mission Statements and Statutory Tables**.

The tribes exercise sovereign governmental authority over tribal members and land on their respective reservations. 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. Some of the tribes have recently exerted strong leadership roles in natural resource preservation and management, as well as in the protection of cultural resources.

Despite some differences in language and cultural practices, many of the regional tribes share the history of a subsistence economy based on salmon. However, due to the demise of salmon, there has been a dramatic decline in the amount of salmon harvested and consumed by tribal peoples over the last century. 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 somewhat different priorities. Some “upriver” tribes today have less of an interest in salmon than they once did, perhaps because of the loss of fish and wildlife brought about by a number of contributing factors, including those such as population growth, urbanization, and the construction of the dams. Some tribes also have re-directed their interests to other economic enterprises such as irrigation or recreation development in the reservoirs behind dams. An issue faced by the tribes concerns downriver operations for salmon that can be harmful to upriver resident fish species, recreation or irrigation and, therefore, the interests of the upriver tribes.

Socioeconomic conditions for tribal members are not on par with their non-Indian neighbors. Table 2.4-3 (following Table 2.4-2) shows poverty rates, unemployment rates, per capita income and mortality rates for the four states and selected tribes in the Columbia Basin.

**Table 2.4-2: 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

<b>Full-time and Part-time Employment Shares by Industry: 1996</b>						
	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.

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**Table 2.4-3: Poverty Rates, Unemployment Rates, Per Capita Income and Mortality Rates for All Citizens and Tribal Citizens of the Columbia Basin**

States/Tribes	Poverty (Percent)	Unemployment <sup>1</sup> (Percent)	Per Capita Income <sup>2</sup>	Rate of Death (per 100,000 population)	Ratio of Tribal Death Rate to State Death Rate
<b>Washington</b>	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		
<b>Oregon</b>	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	*	*
<b>Idaho</b>	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 <sup>3</sup>	44.2	25.2	\$5,200	***	***
<b>Montana</b>	16.1	--	\$11,200		
Flathead Salish and Kootenai	27.4	16.4	\$8,800		

<sup>1</sup> In winter, tribal unemployment can reach 80%.

<sup>2</sup> Includes Duck Valley Sho-pai in Nevada.

<sup>3</sup> . 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”

### **2.4.2.2 Commerce**

*This section describes existing conditions in the regional economy for industries that might be affected by the Policy Directions. The term “industry” is meant to include many groups of people having a close relationship to the industry such as owners, workers, consumers, people who sell to the industry, and associated regional economies and communities.*

#### **Power**

Hydroelectric power accounts for about 75% of the region's electricity supply. The system of 30 federal projects in the basin has an installed capacity of about 19,600 MW. Fourteen federal projects account for 18,900 MW, or two-third of the region's hydroelectric capacity in 1995.<sup>120</sup> Figure 2-13 and **Appendix E** shows the major hydro sites in the region.

BPA markets and distributes power generated by the Corps and Reclamation at federal projects in the basin. Customers include public and private utilities, industrial customers, and users outside the region. The regional transmission system, which includes about 15,000 circuit miles, is interconnected to Canada, California and Utah. These interties take advantage of differences in power costs and timing of demand between regions. Figure 2-14 shows BPA's major high-voltage electrical transmission system.

BPA sells firm power contracts to deliver power over a future defined period. As of 1995, BPA had long-term firm power sales contracts with over 120 utilities, including municipalities, public utility districts, and rural cooperatives. The region's publicly owned utilities have a first call, or “preference” for federal power. Firm power contracts are also held by federal agencies and industries. Nonfirm energy is generally sold with no guarantee of availability and deliveries can be curtailed on short notice.

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, as of winter 2000 – 2001, natural gas prices reached record levels. These events have increased the value of hydropower generation significantly. Electricity spot prices have reached unprecedented levels, and California's electricity market deregulation faces close scrutiny by federal and state regulators. Electricity prices are likely to remain high, and shortages more frequent, until new generation capacity is

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<sup>120</sup> USDOE/BPA (1995b), p. 3-23.

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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.<sup>121</sup>

This situation has continued to deteriorate. The winter of 2000-2001 has been one of the driest on record since 1929. A lack of water supply has forced federal agencies to transport up to 90% of Snake River migrants, and the agencies may be unable to provide normal system benefits for users at least through 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.

Available transmission capability allows exchange of power between areas that have surpluses. If this transmission capability is reduced, less power can be transferred between the areas and the areas cannot take advantage of these surpluses. This will tend to increase the cost of power throughout the region.

If new generation were built to replace dams that are breached, additional transmission facilities would be needed to connect the generation to the system. Depending upon the location of the new generation, new transmission reinforcements are often needed to move this new generation to the load areas. With careful placement of these new generators, transmission reinforcements can be deferred.

Transmission system maintenance is a critical component of maintaining capacity and reliability of the power grid. Changes in environmental policies can affect the way in which maintenance activities are performed and can increase the cost of providing transmission services.

### ***Recreation***

Outdoor recreation has become an important use of the federal hydroelectric system. The range of potentially affected activities includes sport fishing for anadromous and resident fish; flatwater recreation activities such as boating, waterskiing, and windsurfing; river recreation such as rafting, kayaking and canoeing; and land-based activities with ties to water such as touring, camping, sightseeing and hiking.

Recreation use is authorized at all of the federal projects. The Corps and Bureau are responsible for providing recreation facilities at their projects. Often, these agencies cooperate with state or local governments to provide recreation facilities such as swimming beaches, boat ramps, marinas, and campgrounds.

Reservoir recreation is generally concentrated in the summer months. 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

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<sup>121</sup> Energy Policy Division, State of Washington, Office of Trade & Economic Development, Natural Gas and Power in Washington: A survey of the Pacific Northwest natural gas industry on the eve of a new era in electric generation (April 2001), p. 14.

annually. Annual use at the four lower Snake dams is about 2 million days. Most visitors to the lower Snake reservoirs live close by.

Recreational fishing for salmon and other anadromous fish is an important economic activity in parts of the Pacific Northwest. Ocean sport fishing is a significant activity. 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. 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 value of sport harvest fluctuates according to the allowable catch, which is dictated by the abundance of fish runs and associated local harvest regulations.

National Forest lands in Idaho, Oregon, and Washington received, respectively, 15, 37 and 25 million visitor days in 1997.<sup>122</sup> Outdoor recreation data for private lands are not available.

### ***Commercial Fisheries***

Potentially affected commercial fisheries are primarily salmon fisheries. Columbia River salmon are caught by ocean commercial net and troll fisheries from California to Alaska. The ocean fisheries catch salmon from many non-Columbia River stocks. The freshwater Columbia River commercial fishery is comprised of a non-Indian commercial gillnet fishery in the lower Columbia River (from the estuary to Bonneville Dam) and a treaty Indian fishery in the Columbia River above Bonneville Dam. The tribal fishery primarily uses set gillnets and dip nets to take salmon. As with the sport fishery, 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. Total economic consequences (personal income including multiplier effects) of the Columbia River commercial fishery under early 1990s conditions has been estimated to be about \$33 million.<sup>123</sup> This amount is a small share of the personal income generated by all commercial fishing. Decreased fish abundance in recent years (and therefore declines in harvest) has reduced the present value of the commercial fishing industry.

### ***Transportation***

The Columbia-Snake Inland Waterway extends 465 miles through eight dams and locks from the Pacific Ocean to Lewiston, Idaho. 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. 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

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<sup>122</sup> USDA, Agricultural Statistics 2000 (2000), Table 12-38, Page XII-28

<sup>123</sup> Derived from information in Corps (1999a).

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weighed about 4 million tons. Upriver tonnage is about one-tenth the downriver amount. About three-quarters of the cargo is 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 - \$35 million annually.<sup>124</sup> Figure 2-15 shows the major barging routes, railroad tracks, and interstate and state highways in the region.

**Agriculture and Forestry**

Agriculture and forestry are important industries for the Columbia River region, but especially for many rural communities. Table 2.4-4 summarizes data on agricultural and forestry land use and agricultural income by state for the region.

**Table 2.4-4: Data on Land Use and Agricultural Income by State**

	<b>Idaho</b>	<b>Montana</b>	<b>Oregon</b>	<b>Washington</b>
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

See also Figure 2-9 for a map of the general different general land uses across the region.

There are 7 to 9 million acres irrigated in the Columbia River basin in the United States, including irrigated land in non-agricultural uses. Important agricultural uses include alfalfa and other hay, wheat, corn, potatoes, peas, apples, grapes, a number of other crops, and irrigated pasture. 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 or groundwater levels, especially near Ice Harbor, John Day and McNary reservoirs. About 37,000 acres are irrigated using surface water diverted from Ice Harbor. About

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<sup>124</sup> Source: Corps (1999), Appendix I Economics, Table 8-1.

167,000 and 125,000 acres are irrigated from John Day and McNary reservoirs, respectively.

There are about 16 million acres of dry (non-irrigated) agricultural land in the basin.<sup>125</sup> Probably less than 10 million acres is normally planted to dryland crops at any point in 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.

The Human Effects Analysis reported that there are almost 45 million acres of rangelands in the basin, of which about 25 million acres are federal lands. Additional grazing occurs on forestlands. 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 important products. 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.<sup>126</sup>

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 significant lands are 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 Supplemental Draft EIS (2000). Timber harvest on federal forestlands has declined in recent years. Currently, most timber harvest is occurring on private forest lands. See Figure 2-12 for the different land ownership across the region.

***Residential and Commercial Development***

Residential and commercial development are important economic activities in the basin. Table 2.4-5 summarizes some data on value of construction, and home construction and sales in the region.

**Table 2.4-5: Data on Value of Construction, Housing Units and Existing Home Sales by State**

	<b>Idaho</b>	<b>Montana</b>	<b>Oregon</b>	<b>Washington</b>
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

<sup>125</sup> Land use information is from Council (2000a): Human Effects Analysis of the Multi-species Framework Alternatives (March 2000).

<sup>126</sup> USDA/USFS and USDO/BLM (2000).

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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 region. See Figure 2-11, which shows the counties by distribution of population.

**2.4.2.3 Social and Cultural**

Social resources are the established patterns of human relations that could be affected by the Policy Directions. These patterns include formal and informal institutions, communities, and families. Social resources are described in the environmental documents incorporated by reference.

Among the many changes occurring around the region regarding fish and wildlife, perhaps none is more deeply or emotionally expressed than the pressure on cultural values. The cultural values most likely to be affected by the Policy Directions are tribal values, rural values in communities dependent on salmon fisheries, agriculture or forestry, and environmental values. Physical cultural resources include archeological and historical sites throughout the basin. These sites are best described in the environmental documentation incorporated by reference.

***Aesthetics***

Aesthetics, the quality of a sensual experience, is a value judgment: an attribute that someone finds aesthetically pleasing may be displeasing to someone else. Many people value undisturbed land, air, and water as an aesthetic value. Others prefer developed land. In environmental documents, effects on aesthetics are commonly described for value judgments (such as clean air and water and healthy ecosystems) that are held in common by many or most persons.

The Pacific Northwest Region is world-renowned for its aesthetic resources. Potentially affected aesthetic resources include all of the land, water, and biological resources previously discussed, but with reference to their impression on aesthetic values rather than their economic or ecological functions. Effects of reservoir drawdown on exposed reservoir bottoms and the appearance of reservoir bottoms are an issue.

**2.4.2.4 BPA Projects and Funding**

BPA funds fish and wildlife projects with funds provided by ratepayers. Currently, BPA's revenues make up a substantial portion of one of the largest and most expensive fish and wildlife mitigation and recovery efforts in the United States. Since the enactment of the Regional Act in 1980, BPA has spent billions of dollars on this effort and continues that spending today. For fiscal years 1996 through 2000, BPA spent over \$200 million on average for direct fish and wildlife program costs, reimbursable expenses paid to the Treasury for other federal agencies' operation and maintenance of fish hatchery and passage facilities, and debt service on capital investments such as bypass facilities and hatcheries.<sup>127</sup> From 2001 through 2006, BPA projects spending on average over \$300 million, with the integration of the 2000 Biological Opinions to address the

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<sup>127</sup> BPA (1998).

ESA compliance requirements increasing the amount to over \$350 million.<sup>128</sup> Even as large as this amount seems, it does not include any costs for changes in operations.

**While it is difficult to measure the results scientifically, BPA has achieved a considerable progress through its mitigation and recovery effort 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.*
- *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.*

To date, BPA has funded over 1,500 fish and wildlife mitigation and recovery effort projects.

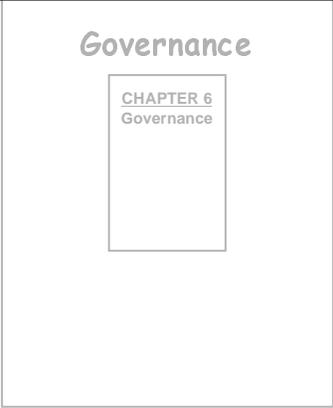
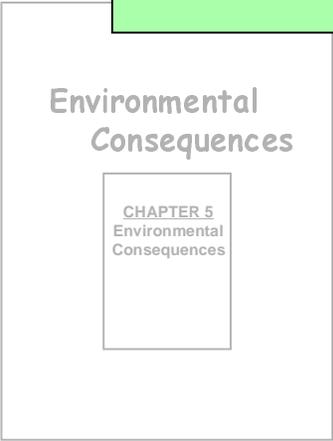
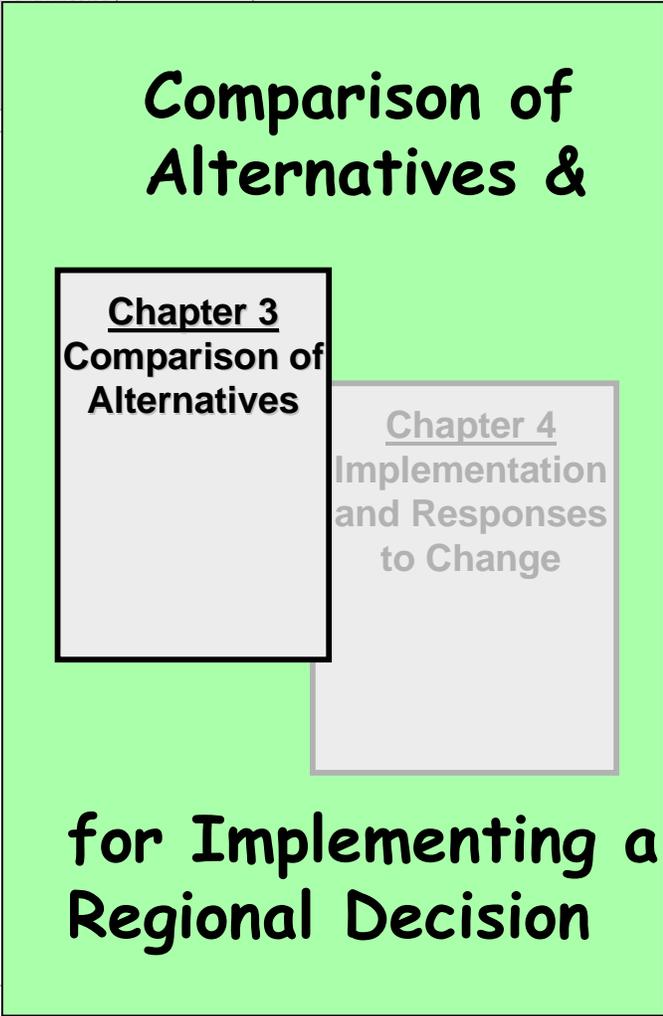
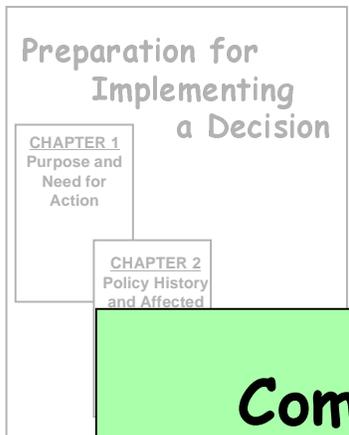
Figure 2-13 shows where BPA has done or is doing fish and wildlife projects for the recovery effort in the region. Please see **Appendix H** for a detailed list of BPA fish and wildlife projects.

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

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<sup>128</sup> BPA, Rate Case and 2000 Biological Opinion Projection, S. Cooper (Dec. 18, 2000).

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## **Chapter 3**

***Defining and Deciding on the Alternatives***

***Description of the Policy Direction Alternatives***

***Comparing the Policy Directions***

***Tailoring a Policy Direction***

***Sample Implementation Actions***

## **CHAPTER 3 — COMPARISON OF ALTERNATIVES**

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- **Explains how the five alternative Policy Directions 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**, which are based on the many options being discussed and processes underway in the Columbia River Basin. The Policy Directions are compared against the Status Quo (No Action). The comparison is based on the more detailed discussion and analysis in Chapter 5 (Environmental Consequences). **Provides ways for the public and the decisionmaker to tailor Policy Directions** to meet particular needs or desired ends, and to determine potential consequences of those changes.
  - **Provides tables of sample implementation actions** for each Policy Direction.
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**Refresher:** *The items below are summarized from Chapters 1 and 2 to provide an instant 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 to protect the environment 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 recovery in the region. The resulting mitigation and recovery policy has not been as coordinated and consistent as BPA needs.*
3. *A unified planning approach appears to be needed, but it is not yet clear what it should or will look like. Many different approaches (including the work on the NMFS and USFWS BiOps) are possible. The resolution lies in the broad acceptance of a comprehensive, consistent, and workable plan more likely to be implemented than other plans at this time.*
4. *Several regional plans and processes are under development to address fish and wildlife mitigation and recovery efforts. These include the following:*
  - *the Council's Multi-Species Framework and Fish and Wildlife Program Amendment Process, which focuses on long-term river management options and conservation of multiple species;*

- *the Federal Caucus and the Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (Basin-wide Strategy), which will guide those federal actions and interactions with state and local governments and tribes that relate to anadromous fish;*
- *NMFS and USFWS Biological Opinions for fish and wildlife issued under the ESA that will be guided by the Strategy;*
- *salmon (and other species) plans that contribute to these two major processes and that were crafted by the four Northwest states and several of the region's Native American tribes;*
- *the “Recommendations for the Protection and Restoration of Fish in the Columbia River Basin”<sup>1</sup> from the Governors of Idaho, Montana, Oregon, and Washington, which advocates a healthy, functioning ecosystem while preserving a sound economy in the Pacific Northwest.*

*The scope of each of these plans and processes as they relate to each other and to this DEIS is shown in Figure 1-3.*

5. *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 DEIS now because (a) many stocks of fish and wildlife are already in serious condition and (b) BPA wants to be ready to implement future fish and wildlife mitigation and recovery efforts without delay when a Policy Direction is chosen or changed. This document will provide the necessary NEPA documentation to inform policy-makers and the public of the potential consequences of their 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.*
8. *The Federal Caucus, Council, tribal and state plans, and other related processes will help BPA to make a decision. However, these processes did not provide NEPA environmental documentation or process for the full range of alternatives as required by law. Selection of a Policy Direction to begin implementing actions will lead to environmental consequences that must be documented and to potential mitigation for adverse effects that must be discussed. This document intends to provide NEPA coverage for a broad range of possible Policy Directions.*

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<sup>1</sup> Governors (2000).

### **3.1 DEFINING AND DECIDING ON THE ALTERNATIVES**

- **This section tells you how we studied the many regional processes and ideas on fish and wildlife recovery efforts, how we defined a range of alternatives as a result, and how we used a qualitative or “relationship” analysis (not specific numbers) to help us compare the alternatives in terms of environmental consequences.**

The action alternatives in this DEIS 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. (One of the alternatives, which represents the existing policy approach [No Action, or Status Quo], does not operate as a unified planning approach).

***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 more intensive actions taken consistent with that theme, but fewer and less intensive actions not 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 are shown in Section 3A.

There are ethical, political, environmental, legal, and scientific implications to and trade-offs in selecting a particular regional unified planning approach (i.e., Policy Direction) for fish and wildlife 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 animal activity away from a section of riverbank will help riparian vegetation to resprout, will slow erosion into the stream, and will improve the quality of the water in which the fish live. On the other hand, if the goal is to improve the lives 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 DEIS tries to emphasize factual matters, while revealing trade-offs between different resource users.

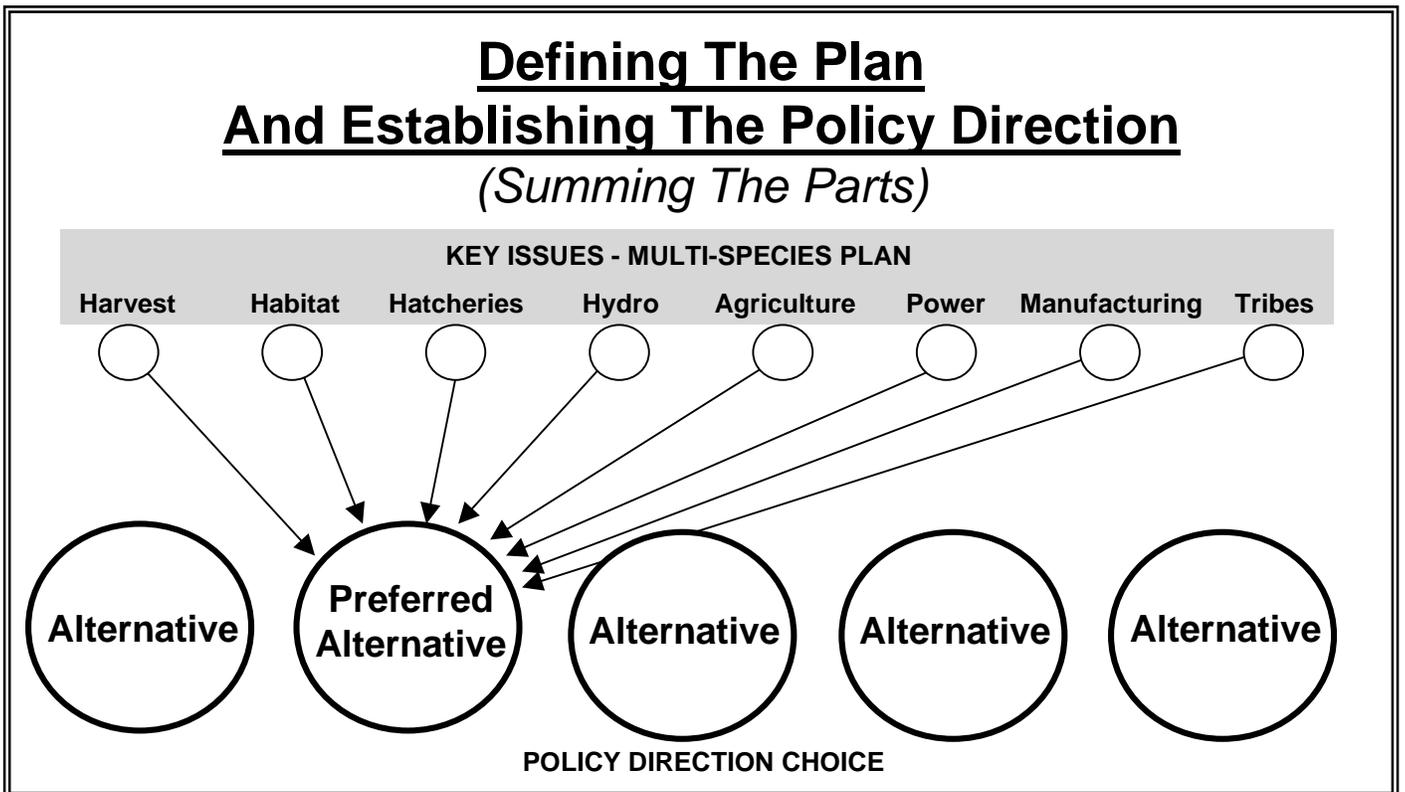
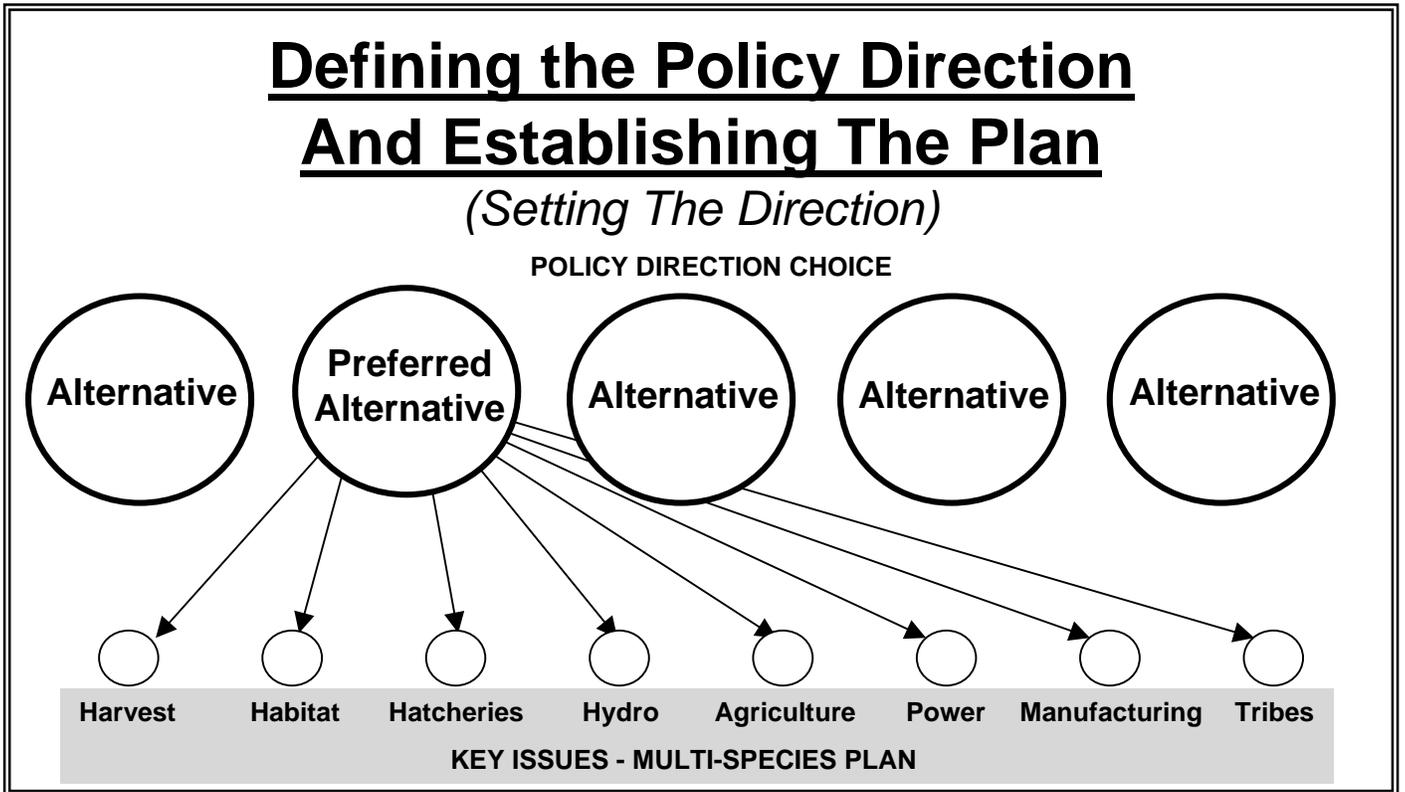
One constraint, however, is legal. There are certain laws that an alternative must meet to be viable. These laws include the ESA, the Regional Act, tribal trust and treaty responsibilities, and the CWA. But this is a forward looking policy-level DEIS. As such, BPA has not limited the analysis to existing conditions or legal authorities. Through scoping, we found many suggestions for alternatives that would require BPA (or others) to receive new legal authority to implement them. If scoping provided suggestions for an alternative that reflected a reasonable, focused, clearly articulated rationale, then we incorporated either that alternative or its actions into this DEIS. 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 recovery efforts: begin with a policy and define the actions to carry it out (policy first) or define the actions and then decide what policy they imply (actions first). Figure 3-1 shows how this would work. For this DEIS, we have identified five broad Policy Directions, plus the Status Quo, that cover the possible Policy Directions from which decisionmakers could choose.

- **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 are consistent with the overall Policy Direction selected. Only in those less frequent cases when specific group actions came into conflict would coordination with other regional groups be necessary. This would be done only 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.

Figure 3-1: Different Ways to Establish Policy Direction



This DEIS 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 Section 3A), the Administrator and others may determine *which* of the five Policy Directions (or combinations of Policy Directions) the regional actions most closely resemble. The relationship analysis used in this DEIS (see Section 3.1.6, below) will permit the BPA Administrator to evaluate that Direction and understand the overall environmental consequences of funding and implementing it. Then, BPA can implement a consistent, comprehensive, long-term fish and wildlife program.

EIS alternatives sometimes change unexpectedly as the process is underway or as new information or ideas are presented. This EIS structure allows BPA to address the broadest possible range of alternatives so as to be able to assess the effects of such changes. Such an approach also anticipates changes over time and extends the usefulness of the EIS. (See Chapter 4.)

### **3.1.2 Source for the Alternatives**

To help define the alternative Policy Directions in this DEIS, the many regional processes already underway were evaluated. We closely read the proposals submitted (see Section 1.3.3 and **Appendix D**) by all the major participants (Section 1.3.1), studied the many processes underway (Section 1.3.2) and the key issues, and 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, almost all can be categorized as falling generally under one or more major Policy Direction(s) regarding fish and wildlife recovery efforts.

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 (Section 3.3).

The key issues, which help to determine the questions being addressed by the processes and the shape of the alternative Policy Directions in this DEIS, were first identified during one of these major initial regional processes in November 1998. The Multi-Species Framework held a three-day workshop, meeting with numerous groups from throughout the region to consider fish and wildlife recovery efforts. Participants included representatives from the tribes and from state and federal government, as well as from commercial interests, private interests, and environmental groups. These participants identified numerous key issues as critical for resolution.

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As the Framework process continued and the Federal Caucus was formed, more key issues surfaced and the categories were combined and refined. The more-than-three-dozen key regional issues are listed in the table below, divided by area of focus. The issues have been numbered for convenient cross-reference with Section 3A (sample implementation actions) of this chapter.

This EIS is intended to guide implementation and funding of the region's fish and wildlife recovery efforts. Therefore, the actions listed here focus on fish and wildlife. However, these tables also highlight issues unique to commercial groups and tribes. Commercial interests, like federal and state agencies, may take actions in fish and wildlife mitigation and recovery but must also 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 which may generate actions not performed by other groups.

**Table 3.2-1: Key Regional Issues**

<b>Key Regional Issues</b>		
<b>1 Habitat</b>	<b>4 Hydro</b>	<b>7 Transportation</b>
1-1 Anadromous Fish	4-1 Dam Modifications and Facilities	7-1 Navigation
1-2 Resident Fish	4-2 Hydro Operations	7-2 Trucking, Railroads and Infrastructure
1-3 Introduced Species	4-3 Spill	<b>8 Agriculture</b>
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 Migration and Transport	8-4 Forestry
1-8 Mainstem Columbia	4-8 Adult Fish Passage	<b>9 Commercial Fishing</b>
1-9 Reservoirs	4-9 Flood Control	<b>10 Residential and Commercial Development</b>
1-10 Estuaries	<b>5 Power</b>	<b>11 Recreation</b>
1-11 Water Quality	5-1 Existing Generation	<b>12 Tribes</b>
<b>2 Harvest</b>	5-2 New Energy Resources	12-1 Tribal Harvest
2-1 Anadromous Fish	5-3 Transmission Reliability	12-2 Tradition, Culture, Spirituality

Key Regional Issues		
2-2 Resident Fish	<b>6 Industry</b>	
2-3 Wildlife	6-1 Industrial Development	
<b>3 Hatcheries</b>	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 a range of five alternative Policy Directions along the entire spectrum of potential variations. 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 performing the necessary actions to try to recover fish and wildlife in the region.

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

**The alternatives are comprehensive.** The Council's Approach, the Multi-Species Framework alternatives and Concept Papers, the Federal Caucus' Conceptual Plan and Basin-wide 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 Governors' Recommendations, and the tribal and regional plans form an essential and comprehensive database of information and ideas that fed into defining the range of Policy Direction alternatives for this DEIS. Additionally, the more-than-2000 sample implementation actions that accompany each Policy Direction were assembled directly from the proposals and plans generated by the regional processes. Section 3A, at the end of this chapter, shows the actions that might be taken under each of the Policy Directions in this DEIS.

**The alternatives are flexible.** The Policy Directions and sample implementation actions were designed to be broad enough to accommodate current and future possibilities for fish and wildlife recovery efforts within the Columbia River Basin (including the BPA service territory), across a wide spectrum of issues.

Other ways to approach the analysis could have been selected. However, given the thousands of potential alternative plans for action, 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 the major current regional proposals under the Status Quo and each of the five Policy Directions. Note that some proposals may fit under more than one Policy Direction. For more detail on the "shorthand" references in the Figure, please see Section 3A at the end of this Chapter, and **Appendix 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 DEIS. Ultimately, BPA will decide which alternative will guide the implementation and funding of its fish and wildlife mitigation and recovery efforts. However, this decision will not be made in a vacuum. Comments and guidance from other federal and state agencies, tribes, interest groups and the general public will be critical in this process. (Figure 3-3 shows how BPA's decisionmaking is integrated into regional processes.) A fundamental purpose for selecting one of the new 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. Nevertheless, the Status Quo alternative approach remains a reasonable alternative.

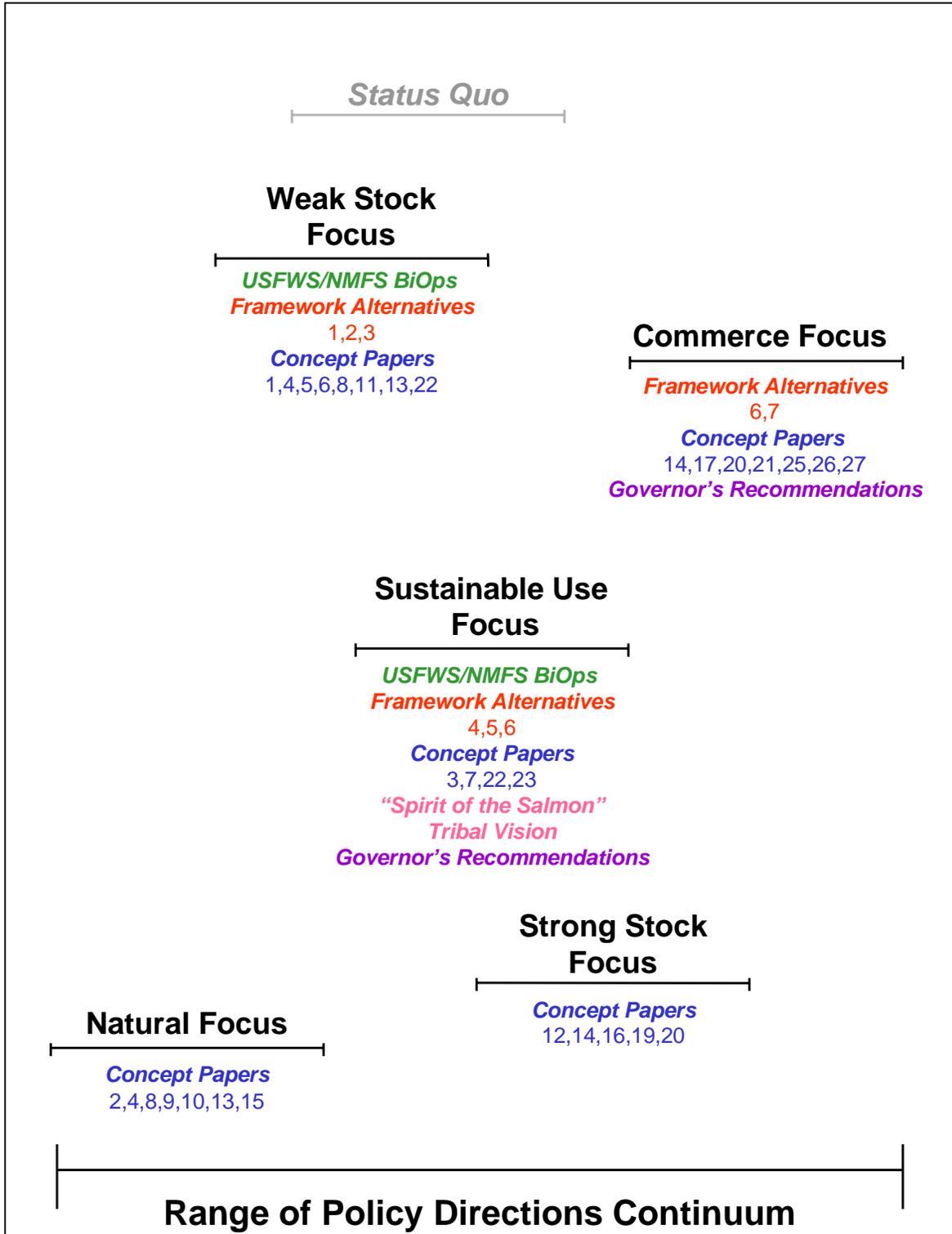
The draft EIS does not propose a preferred alternative because BPA wants to present all options equally at this time to promote creative public discourse on each of the Policy Directions. BPA is seeking suggestions for new alternatives or alternatives blended from the five Policy Directions that the reader thinks may better meet our needs. The Administrator will consider the blended options and reflect on these alternatives when making the initial policy level decision and in any future decision-making process. Obviously, the need to avoid jeopardizing listed species is critical, as is mitigating for fish and wildlife losses in a manner consistent with the Council's program. This DEIS demonstrates, however, that there are many other highly important resources affected by any Policy Direction BPA might take. Choosing a preferred alternative at this time could dampen or skew the dialogue that BPA desires in order to make a fully informed decision at the conclusion of this NEPA process. Therefore, BPA will not identify a preferred alternative until it prepares the final EIS.

### **3.1.5 From Definition to Comparison**

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

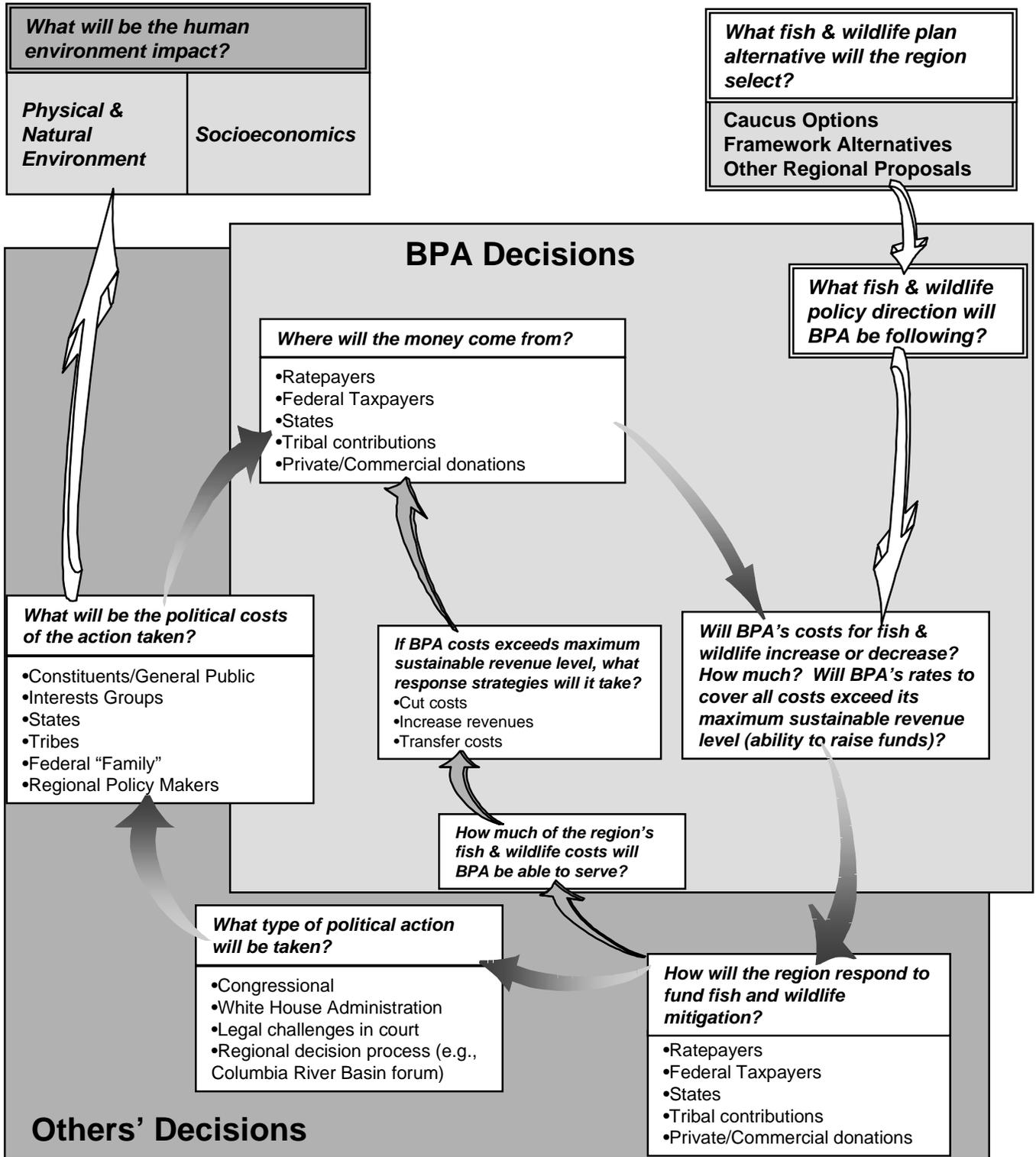
- First, we synthesized the Status Quo and five broad Policy Direction themes from the key issues and proposals in regional processes, such as the Multi-Species Framework Alternatives and the Federal Caucus Options (see Table 3.2-1 and Section 3.12).
- Then, we developed a set of sample implementation actions from the many regional proposals that matched the theme for each Policy Direction (see Section 3A, which follows this chapter).
- Next, we assessed these actions to determine the environmental consequences that might result from their implementation. We compared each Policy Direction to

**Figure 3-2: Illustration of Integrating Major Focus of Regional Alternatives and Policy Directions**

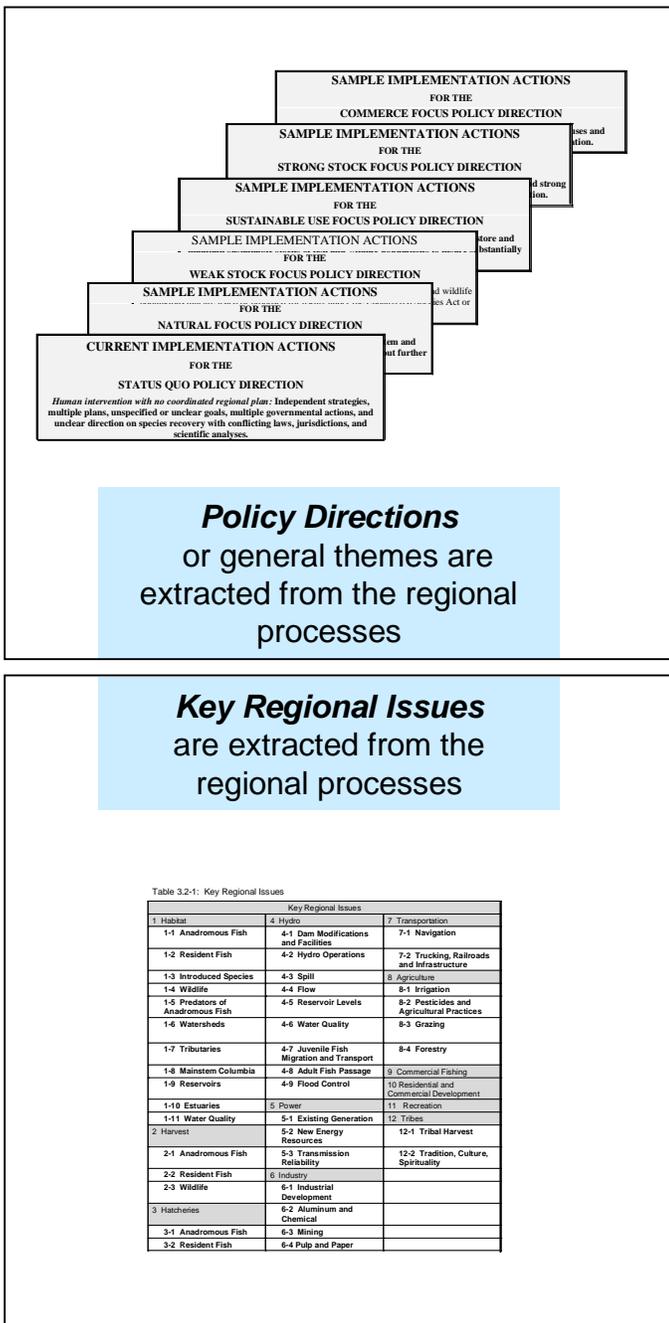


NOTE: The positions of the different Policy directions is illustrative only. The intent of this diagram is to help people understand that each Policy Direction is not just a point on a continuum, but rather just a smaller continuum of more focused actions that may overlap other Policy Directions in some cases.

**Figure 3-3: Understanding the Integration of BPA Decisions In the Regional Policy and Decision Making**



**Figure 3-4: Development of Environmental Consequences**



**SAMPLE IMPLEMENTING ACTIONS TABLES**

**SAMPLE IMPLEMENTING ACTIONS TABLES**

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 hydroelectric projects on the Columbia River and its tributaries. The agency is obligated to provide treatment for fish and wildlife that is compatible 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 \$1.7 billion 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 useful for monitoring and evaluation.
- A wide array of habitat improvement projects, including covering water diversions, replacing temporary irrigation dams with alternative fish friendly structures, fencing projects, water development projects, vegetative planting and plant control, and environmental monitoring and evaluation projects.
- Land and water acquisitions, conservation easements, minimum passage improvements, predator control actions, fish-friendly 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 1993, when the Northwest Forest Plan was adopted, federal agencies have taken important steps toward a common vision of land management. Habitat management inventories address landscapes, 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 invasive weeds on degraded landscapes).

The tribal viewpoint encompasses 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 riparian 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 financial and technical assistance, to help land and water users protect and restore aquatic and terrestrial habitat.

Sample implementing actions are given for each of the Key Issues to illustrate the Policy Direction theme. See Chapter 3, Section 3A

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

Sample Implementing 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	
<b>Existing Conditions</b>	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 <sub>2</sub> ), nitrogen (NO <sub>x</sub> ), particulate matter (PM <sub>10</sub> ), and sulfur dioxide (SO <sub>x</sub> ).
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	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.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Requires a large increase in replacement of hydropower from breaching or drawdown of up to six dams, mainly from new combustion turbines and prolonged use of existing coal facilities over Status Quo. Air pollutants would increase substantially under this Policy Direction. Increased coal generation would increase PM <sub>10</sub> , CO, CO <sub>2</sub> , SO <sub>x</sub> and NO <sub>x</sub> 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.
<b>Weak Stock Focus</b>	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 <sub>10</sub> , CO, CO <sub>2</sub> , SO <sub>x</sub> and NO <sub>x</sub> 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.
<b>Sustained Use Focus</b>	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.
<b>Strong Stock Focus</b>	Restricts hydro operations less than under Status Quo; delays the need for replacement power and related air emissions.
<b>Commerce Focus</b>	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 <sub>10</sub> and CO <sub>2</sub> air emissions slightly. Overall, air emissions are likely less than under Status Quo.

Policy Directions

Environmental Consequences

The sample implementing actions are assessed for their changes in environmental consequences from the Status Quo.  
 See Chapter 5, Sections 5.3

**COMPARISON**  
 (CONSUMER REPORT) TABLE  
 Policy Directions

Table 3.3-1: Comparison of the Alternatives Against Baseline Conditions\* and Summary of Effects

Effect Category	Status Quo*	Natural Focus	Weak Stocks	Sustainable Use	Strong Stocks	Com. Focus
<b>NATURAL ENVIRONMENT</b>						
<b>Land Habitat</b>						
Upland						
Riparian/Wetland						
<b>Water Habitat:</b>						
Nitrogen Supersaturation						
Non-Thermal Pollution						
Sedimentation						
Temperature/Dissolved Gas						
In-Stream Water Quality						
Amount River Habitat						
Reservoir Habitat						
<b>Fish &amp; Wildlife</b>						
Anadromous Fish**						
Resident Fish**						
Wildlife						
<b>Air Quality</b>						
<b>SOCIAL and ECONOMIC</b>						
<b>Commerce</b>						
Commercial Interests						
Recreation (including fishing & hunting)						
Economic Development						
<b>Tribes</b>						
Fishing Harvest						
Health, Spirituality, & Tradition						
<b>Costs and Funding</b>						
Cultural/Historical Resources						
Aesthetics						

\* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.  
 \*\* Although anadromous fish for Natural Focus and Commerce Focus appear the same, there are sharp differences between numbers of hatchery and naturally produced fish. For resident fish, the two Policy Directions differ substantially in numbers of native and non-native fish. See Chapter 5, Section 5.3.



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

Status Quo (which includes the existing environmental conditions: the current state of the natural environment elements and the socioeconomic elements; see Section 2.4), and the likely circumstances of taking no action to change current actions. Chapter 5 contains the figures and tables that show how the natural and socioeconomic environment would be affected under each Policy Direction.

- This Chapter (3) contains a more concise summary of environmental consequences, consolidated to help decisionmakers readily compare effects and likely outcomes, in the form of a comparative analysis table. The information can also be used to develop and evaluate the effects of additional proposals for combining the Policy Directions. This policy-level table is presented in Section 3.3.2.

This methodology will also be used by the BPA Administrator to evaluate the environmental consequences of future proposals, just as it allows others to develop their own proposed combination of Policy Directions and subsequent environmental consequences described above. 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 each of the alternative Policy Directions has environmental consequences. Before a choice can be made among the five alternatives, it is important to understand how those consequences are characterized. This DEIS uses a qualitative or "relationship analysis" to provide the decisionmaker with the needed background to make a choice among Policy Directions. The relationship analysis is characterized by qualitative description of effects rather than numerical analysis. Relationship analysis homes in on understanding the interplay of the factors that may be used in models, rather than trying to choose precise 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 unknowns, it is better to be generally correct than precisely wrong. Relationship analysis is the best choice in this circumstance. Experience has shown that quantitative analysis suggests a precision and accuracy 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 DEIS is focusing broadly, on the more dependable *interactions of relationships between people and their environment*. Relationship analysis is less precise, but it operates at a level that more reliably indicates future effects when reviewing regionwide policy.

For this policy-level analysis, the extensive regional database of fish and wildlife recovery actions has been used to establish an appropriate understanding about the relationships between actions and effects. Once established, these relationships can be used as a foundation to understand the possible effects associated with a broad spectrum of fish and wildlife Policy Directions, and can serve to aid in future fish and wildlife

decisions for BPA, other decisionmaking bodies, and the public. In fact, in the future it will be possible to work from this point and to look at the more specific analysis once specific actions are considered under the chosen Policy Direction and link them directly back to the broader relationship analysis. Please see Figure 1-6.

### **3.2 DESCRIPTION OF THE POLICY DIRECTION ALTERNATIVES**

- **This section describes the Status Quo and five Policy Direction alternatives, the philosophy behind them, and their likely components (focuses).**

This DEIS examines several Policy Directions. Each Direction represents a shift toward a focus or theme. More actions and more intensive actions consistent with that theme would be taken, but existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated. The exact actions taken under each Policy Direction, and the intensity of those actions, are generally not established at this time. Rather, actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate.

The Policy Directions are based completely on ideas set forth in the existing 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.

We have named the Policy Directions as follows:

<b><i>Status Quo</i></b>	<b>Weak Stock Focus</b>
<b>Natural Focus</b>	<b>Strong Stock Focus</b>
<b>Sustainable Use Focus</b>	<b>Commerce Focus</b>

Each of the Policy Directions summarized below is based on a concept for fish and wildlife policy developed or proposed by some persons 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 *current implementation actions*.

*Status Quo* represents a continuation of the policy direction that the region appears to be following at the present time.

*The **current implementation actions** represent a snapshot view of those actions currently being taken to implement Status Quo.*

It is also important to understand what "existing environmental conditions" are.

***Existing environmental conditions** are defined as the current state of:*

- 1) physical environmental elements such as air, land, and water; and*
- 2) socioeconomic elements, such as cultural resources, commerce and funding. (See also Section 2.4.)*

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

BPA has considered *all* concepts presented by the community and incorporated that information within the range of Policy Directions, even though *some* of the included actions in the different Policy Directions below may prove infeasible under current law or impractical for other reasons, and others may not seem to have the potential to achieve meaningful fish and wildlife recovery. (For a more detailed description of sample actions for the Policy Directions, see Section 3A at the end of this Chapter.)

In general, three basic models have emerged in the region:

- 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 an 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 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 least cost. 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 Current Implementation Actions)**

*The Status Quo Alternative (and the associated current implementing actions) represents the "no action" alternative—not changing the current ad-hoc approach. Analysis of a "Status Quo" alternative is required by NEPA. For this DEIS, the Status Quo serves as a baseline for comparison with the Policy Direction alternatives.*

*The Status Quo Alternative includes continued current actions and the future changes relative to existing environmental conditions that can be reasonably expected. Increasing population, economic growth, and additional urbanization are assumed based on existing trends; these assumptions are also included in the other Policy Directions except as they may be affected by the implementation actions under each Policy Direction. (For example, a policy that discouraged new construction might reduce population growth.)*

**Description:** *Human intervention with no unified or single regional plan:* a combination of other policy themes. Independent strategies, multiple plans, different and sometimes conflicting goals, multiple governmental actions, and unclear expectations of results for fish and wildlife policy.

#### **Emphasis:**

- Operation of hydrosystem primarily for authorized purposes: fish, power generation, recreation, navigation, irrigation, and flood control.
- Anadromous fish, especially ESA-listed species.
- Mitigation (e.g., flow augmentation, spill, juvenile transportation, predator control, and passage improvements, as well as off-site mitigation with replacement habitat) for the effects of hydro generation.
- Recognition of government's past trade-offs of fish, wildlife, and other resources for commodities and commercial activities.
- Increasing consideration of tribal viewpoint and co-management role.
- Hatcheries operated primarily in an effort to sustain anadromous and resident fish harvest.

- Mitigation efforts for terrestrial habitat consisting largely of purchases and preservation of land to replace habitat that was lost to hydro development.
- Boom and bust cycles of harvest, with recent trends away from maximizing fish harvest and toward weaker stock protection.
- Sustained commercial activity by preserving the hydrosystem and avoiding unbearably costly and restrictive mandates.

### **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 restoring *habitat* and reducing *hydro* operations to reestablish ecological processes. Gives priority to ecosystem protection by putting restoration of habitat quality over 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."<sup>2</sup>

#### **The Philosophy behind the Direction:**

*"A value for, and an emphasis on preserving 'wildness' and 'wild areas' from future human development."* (Cone, 1995:49-59)

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 restore 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 and eliminating non-native species.<sup>3</sup>

#### **Differences from Current Implementation Actions:**

- Restores habitat emphasizing passive techniques.
- Decreases harvest.
- Discontinues hatcheries.

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<sup>2</sup> Council (2000b), p. 15.

<sup>3</sup> Sources: Cone (1995), pp. 50-55; Kloor (1999).

- Removes six dams: McNary, John Day, Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases some commercial activity.
- Allows tribal harvest of healthy fish and wildlife populations.

### **3.2.3 Weak Stock Focus**

**Description:** Under a unified regional planning approach, emphasizes *human intervention to support recovery* of weak stocks of fish and wildlife populations that are listed or proposed for listing under the Endangered Species Act or other legal protections.

Focuses on restoring *habitat* and reducing *hydro* operations to enhance the life cycle of weak fish stocks and wildlife populations. Gives priority to restoring water quality and habitat for weak stocks over economic activity.

#### **The Philosophy behind the Direction:**

*"Extinction is not an option." (State of Washington, Statewide Strategy to Recover Salmon, September 1999)*

This alternative emphasizes an active posture to prevent the extinction of fish and wildlife populations, especially those listed as threatened or endangered under the Endangered Species Act or other legal protections. The focus would be on saving the weakest populations first. Reasons for preserving species may range from "existence value" to moral imperative to potential beneficial uses of species to humans.<sup>4</sup> The USFWS "ESA Basics" noted the connection between the passage of the ESA and American concern about the decline and possible extinction of many wildlife and plant species, not only around the world, but also especially within the U.S. Congress attached aesthetic, ecological, educational, recreational, and scientific value to the diverse environments of the nation and so sought to conserve and recover both endangered and threatened species and the ecosystems on which they depend. The ultimate ESA 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 enforcement of this law, this Policy Direction is likely to entail more emphasis on continued regulation.<sup>5</sup>

#### **Differences from Current Implementation Actions:**

- Restores more habitat for weak stocks.
- Decreases harvest.
- Manages hatcheries for weak stocks.

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<sup>4</sup> Summarized from Daniel J. Rohlf, *The Endangered Species Act: A Guide to Its Protections and Implementation* (Stanford Environmental Law Society, Stanford, CA), 1989:12-17.

<sup>5</sup> Sources: US Fish and Wildlife Service "ESA Basics" (June 1998).

- Removes four dams to assist weak stocks: Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases commercial activity that affects weak stocks.
- Uses selective techniques for tribal harvest to assist weak stocks.

### **3.2.4 Sustainable Use Focus**

**Description:** Under a unified regional planning approach, emphasizes *human intervention as part of a goal to restore and maintain* sustainable stocks of 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 *hatcheries*, modifying *hydro* operation, and restoring *habitat* to increase harvest opportunities. Gives priority to harvest over other economic activity. Removes dams if harvest goals are not achieved by other actions. Applies available resources to maintain and expand harvest opportunities. Emphasizes human management of targeted fish and wildlife species to balance intrinsic, sport, and commercial value.

#### **The Philosophy behind the Direction:**

*"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." (Gifford Pinchot, The Fight for Conservation: p. 81.)*

This Policy Direction emphasizes the expansion of opportunities to harvest fish and wildlife resources. The philosophy behind this Direction fundamentally emphasizes sustainable relationships between human beings and fish and wildlife. Humans and their technology are but one part of an integrated whole of nature and are responsible for maintaining appropriate, reciprocal relationships with fish and wildlife and a long-term connection to place. One of the tenets behind this Direction is that humans have rights to use natural resources to meet sustenance, spiritual, and economic needs. But humans also have an obligation to insure that those resources (e.g., fish populations) are self-sustaining, and therefore may intervene at all various stages in the life cycles of fish and wildlife species and their environments, to help those populations rebuild and maintain themselves in perpetuity.<sup>6</sup>

#### **Differences from Current Implementation Actions:**

- Restores habitat to maximize production.
- Increases harvest of natural and hatchery stocks.
- Increases hatchery production and supplementation (supplementing wild stocks).
- Improves hydro operations for fish and wildlife, including dam removal as a last resort if other measures fail to recover populations.

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<sup>6</sup> Source: CRTFC (1996).

- Decreases commercial activity.
- Increases tribal harvest overall.

### **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 into weakened conditions requiring legal protection. Focuses on maintaining *habitat* to sustain the strong fish stocks and strong wildlife populations. Gives priority to avoiding harm to currently strong stocks by protection and maintenance of habitat 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" (Thomas: 2000: 5).*

The focus here is on maintaining viable stocks and ecosystems to avoid broader collapse of fish and wildlife populations. Program priorities would be based on effectiveness of stock maintenance (as opposed to recovery). Costly efforts to recover populations that are so depleted that they cannot or likely will not be recovered without substantial costs to other species should be abandoned. These costs, which would be avoided by this Direction, include "massive changes in the number and lifestyle of [humans], changes that society shows little willingness to seriously consider, much less implement" (Lackey, 2000:1). "Effective options to reverse the decline of wild salmon, and especially to restore *depleted* runs, would be socially disruptive, economically costly, and ecologically equivocal" (Michael, 1999, in Lackey, 2000:4). "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 fishes 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" (Thomas, 2000: 4).<sup>7</sup>

#### **Differences from Current Implementation Actions:**

- Maintains habitat for strong stocks.
- Increases harvesting while maintaining strong stocks.

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<sup>7</sup> Sources: "The Future of Washington Salmon." John H. Michael. *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; Dr. Jack Ward Thomas, Columbia River Conference IV (March 16 & 17, 2000).

- Maintains hatcheries that support strong stocks.
- Decreases restrictions on hydro operations not affecting strong stocks.
- Increases commercial activity while maintaining strong stocks.
- Increases tribal harvest while maintaining strong stocks.

### **3.2.6 Commerce Focus**

**Description:** Under a unified regional planning approach, emphasizes *human intervention to enhance 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 (through other available means by using any of the other available resources of habitat, harvest, hatcheries, or hydro that do not 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" (Schaerer, 1996: 1).*

This Policy Direction emphasizes economic efficiency in choosing a recovery effort strategy. Money is a scarce resource and a major component in any recovery effort plan, and should be spent only when costs are justified by benefits. The Direction represents a "libertarian" approach to conservation, in that it decreases government regulation and instead emphasizes voluntary actions, financial incentives and market mechanisms to bring about desired results. Private companies and citizens are given flexibility to determine how they can best meet the goals of conservation, while still fulfilling their economic needs. Decisionmaking is decentralized, and the "command and control" approach is abandoned. Managers of a unified recovery plan would "adopt cost-effective recovery measures that create accountability, clear goals, priority setting, and effective monitoring and continuous program improvements" (PNWA, 1996). Cost efficiency would consider hydrosystem benefits and benefits foregone, as well as program costs. Conservation in this ideology allows for "wise use" of resources, with the option for landowners to set aside and preserve land from certain human uses, while still retaining title to the land. This Policy Direction relies on voluntary actions and incentives rather than government regulation. "The Columbia and Snake Rivers support a tremendous diversity of life and bring a remarkable array of benefits to the region and the nation. The rivers support complex ecological systems and are the lifeblood of the regional economy"

(PNWA, 2000). "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" (Smith, 1998:12).<sup>8</sup>

**Differences from Current Implementation Actions:**

- Emphasizes economically efficient restoration of habitat.
- Increases economically efficient harvesting.
- Increases economically efficient hatcheries.
- Operate hydrosystem for economic efficiency, including minimization of fish and wildlife mitigation costs.
- Increases other commercial activity.
- Targets fish farming and cost-effective production for tribal harvest.

**3.2.7 Hybrid Policy Directions**

Finally, the Policy Directions above do not limit BPA to those themes alone: combinations of themes (i.e., "hybrid" Policy Directions) are possible. Using the relationship analysis established in this DEIS (see Section 3.1.6), BPA can anticipate the environmental consequences of the Policy Direction selected by the region, even if it is an amalgam of several policy themes and/or independent implementing actions. Alternative current regional proposals, and any future proposals, may be compared against the sample implementation actions to determine which Policy Direction they most closely resemble, and therefore what natural and socioeconomic environmental effects are likely to result from their implementation. This methodology can be applied for proposals that cover a broad range of issues, as well as for those with a more narrow focus. See **Appendix I** (Build Your Own Alternative).

**3.3 COMPARING THE POLICY DIRECTIONS**

- **This section compares Status Quo and the five Policy Direction alternatives, first in terms of their likely environmental consequences, then against the DEIS purposes. In reading the comparison, please bear in mind that the environmental consequences are described in terms of relationships, not numerical computations (see section 3.1.6).**

**3.3.1 Important Policy Direction Decision Considerations**

Table 3.3-1 in Section 3.3.2 summarizes the major environmental consequences of implementing each Policy Direction. The following considerations are also very important in the consideration of any public policy choice, and should be borne in mind when reading and using this Table.

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<sup>8</sup> Sources: PNWA (1996); Schaerer (1996); Smith (1998); PNWA (2000).

**Legal parameters** –Some of the Policy Directions listed, or ones that others may create, may seem incompatible with current laws or regulations.<sup>9</sup> As with policies, laws and regulations change over time. A Policy Direction considered incompatible with the present laws might be quite viable and consistent with future legislation or interpretation of the law. Where individual actions within a particular Policy Direction would require legal reconciliation or adjustment prior to implementation, necessary measures would have to be taken to implement 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 will recognize that there are often conflicting values for natural resources in the Columbia River Basin. These different value systems are represented across the spectrum of Policy Directions.

**Political intervention** – Many of the actions that have been proposed for fish and wildlife 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 environmental consequences of that Policy Direction. Naturally, decisionmakers will want to minimize the effects on their constituents. The region, the public at large, must consider what kinds of tradeoffs it is willing to make. It is unlikely that a "sacrifice-free" option will emerge for recovering fish and wildlife populations. Political pressure is likely to play a significant role in the selection and successful implementation of any regional recovery effort plan.

### **3.3.2 Comparing Alternatives by Environmental Consequences**

The Administrator is to make a fully informed decision about BPA's funding and the implementation of its fish and wildlife obligations to support the region's recovery effort. That choice will be based on the need and purposes presented in Chapter 1, with consideration of the possible environmental consequences discussed in detail in Chapter 5.

This EIS is not intended to define the region's values or to determine what laws and regulations are applicable. It is designed to provide an understanding of how the many issues that affect the region's ability, and specifically BPA's ability, to reach a more comprehensive and consistent unified planning approach interact with the human environment and lead to certain environmental consequences.

Table 3.3.1 provides a summary of **Natural Environment**, and **Social and Economic Environment**,<sup>10</sup> consequences of Policy Directions, based on the analysis in Chapter 5.

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<sup>9</sup> 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, Forty Most Asked Questions Concerning CEQ's NEPA Regulations, 46 Fed. Reg. 18026, 18027 (1981).

<sup>10</sup> 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 3.3-1, please see Section 5.3.

Results are summarized as being more or less favorable for fish and wildlife, as well as more or less favorable to economic and social well-being. The summary table illustrates the anticipated long-term environmental effects of possible implementation actions of alternatives (see Section 3A) compared to environmental conditions in the Status Quo 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." Public policy evolves as the region responds to these trade-offs. The shade of the boxes indicates the direction in which the effects are moving *relative to the Status Quo Policy Direction*, and shows the reader whether the five Policy Directions would result in worse, the same, or better conditions relative to the Status Quo. Effect categories are condensed from the expanded list of categories described 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 tables, which are based on *relationship analysis*, it is useful to remember the following points:

- The Status Quo or the No Action Alternative is used as the baseline to gauge how the five Policy Directions (or combinations of Policy Directions) change relative to that baseline for the environmental consequences identified.
- The Status Quo is established by describing the types of actions being taken now and anticipated to continue without a unified Policy Direction.
- No judgment is made about whether the Status Quo 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. Making such a call is not appropriate for this EIS. This decision will be taken up during the preparation of the Record of Decision.
- The comparative tables that follow set the Status Quo as a "neutral" point for all of the environmental consequences. This is done to make it possible to determine whether working toward one of the five Policy Directions changes the condition of the environment. These changes are labeled as "better" and "worse." These terms are equivalent to the NEPA terms "beneficial" and "adverse." They describe environmental consequences in the conventional terms as defined by NEPA.

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 "plus" for one factor may mean a "minus" for another important factor. (For example, a "plus" for anadromous fish might mean a "minus" for resident fish.) As noted earlier, there will also be other considerations regarding laws, perceptions, and values. Many people are involved in developing a recovery effort plan,

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 five alternative 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 areas of greatest concern for environmental consequences will likely be for the different directions.** Here, mitigation (if available) will 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 (light-colored boxes).**
- 3. Then, determine how well the desired Policy Direction fulfills the purposes (Chapter 1). (See Tables 3.3-2 and -3 and 3.3-4.)**

**Note:** If none of these "fits" the reader's or decisionmaker's concept of a better Policy Direction, the table and the sample Implementing Actions (Section 3A) can be used to try to construct additional Policy Directions by "mixing and matching" the best parts of one Policy Direction with the best parts of another. For information on how to do this, please see section 3.4 or **Appendix I**.

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**Table 3.3-1: Comparison of the Alternatives Against Baseline Conditions\* and Summary of Effects**

<i>Effect Category</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
<b>NATURAL ENVIRONMENT</b>						
<b>Land Habitat</b>						
Upland						
Riparian/Wetland						
<b>Water Habitat:</b>						
Nitrogen Supersaturation						
Non-Thermal Pollution						
Sedimentation						
Temperature/Dissolved Gas						
In-Stream Water Quality						
Amount River Habitat						
Reservoir Habitat						
<b>Fish &amp; Wildlife</b>						
Anadromous Fish**						
Resident Fish**						
Wildlife						
<b>Air Quality</b>						
<b>SOCIAL and ECONOMIC</b>						
<b>Commerce</b>						
Commercial Interests						
Recreation (including fishing & hunting)						
Economic Development						
<b>Tribes</b>						
Fishing Harvest						
Health, Spirituality, & Tradition						
<b>Costs and Funding</b>						
<b>Cultural/Historical Resources</b>						
<b>Aesthetics</b>						

\* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.

\*\* Although anadromous fish for Natural Focus and Commerce Focus appear the same, there are sharp differences between numbers of hatchery and naturally produced fish. For resident fish, the two Policy Directions differ substantially in numbers of native and non-native fish. See Chapter 5, Section 5.3.



### 3.3.3 Comparing Alternatives against EIS Purposes

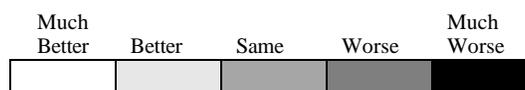
In Chapter 1, we described the state of significant disagreement within the region about the “best” way to recover endangered or threatened species and to restore self-sustaining populations. There is no clear regional consensus about what the goals of a recovery effort plan should be, and there is considerable uncertainty as to whether the proposed actions will produce the desired results.

However, also in Chapter 1, the BPA purposes (goals) were listed. For BPA, understanding the environmental consequences of implementing the Policy Direction selected by the region is paramount. An equally important objective of this DEIS is to present the BPA Administrator with a forecast of how the Policy Direction selected by the region will affect BPA’s ability to meet its obligations under legal statutes, its trust responsibility to Indian tribes, and its unique mission of providing public benefits to the citizens of the Northwest. The purposes, then, become the major criteria for measuring the effectiveness of the DEIS Policy Direction alternatives in meeting the need for action. The decisionmaker will consider the environmental consequences (3.3.2) together with the analysis of the purposes (3.3.3). Based on the most likely regional choice among the Policy Directions and the possible implementing actions for carrying it out, the Administrator will make his decision on implementation for BPA. Table 3.3-2 (below) evaluates each Policy Direction against those purposes.

**Table 3.3-2: Summary of Alternatives Compared against the BPA Purposes**

<i>Purpose</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
<b>Facilitate implementation of a regional unified planning approach</b>						
<b>Fulfill obligations under Regional Act</b>						
<b>Fulfill the Administration’s Fish Funding Principles</b>						
<b>Fulfill BPA’s other obligations under law</b>						
<b>Promote predictable and stable fish and wildlife costs and competitive rates.</b>						

\* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.



The differences among the Policy Directions (including Status Quo) often turn on differences in people’s opinions and perception. This DEIS has tried to condense

the information from thousands of pages of key sources across the region, present this information in a user-friendly way, and provide a reasonably objective discussion of the data. However, the opinions of the public, interest groups, and other interested parties (including decisionmakers) regarding fish and wildlife 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 such factors as legal challenges, political interventions, and direct pressure on the Administrator from these outside influences have been factored into the Table above to give an indication of how each Policy Direction diverges from the Status Quo situation. (See Table 3.3-3, below, for a detailed explanation of each purpose under each Policy Direction).

**Table 3.3-3: Comparison of Policy Direction Alternatives as They Meet the Purposes**

<i>Facilitate implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve: coordination, efficiency, and consistency</i>	
<b>Status Quo</b>	The current implementing actions are 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 recovery effort.
<b>Natural Focus</b>	This naturalistic approach to a unified plan may significantly change existing socio-economic patterns in the region. Since it maybe perceived as an extreme position, this Direction is much less likely than Status Quo to help achieve a unified planning approach.
<b>Weak Stock Focus</b>	This approach represents a distinct push toward new measures 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 fish and wildlife. Because its focus might be viewed as extreme, this approach is not as likely to help achieve a unified planning approach as Status Quo.
<b>Sustainable Use Focus</b>	This focus represents a more consistent approach to fish and wildlife recovery efforts. By focusing efforts through all stages of the life cycle of valuable species, it may be more efficient. Because it tries to balance the intrinsic value of natural resources and human need for increased comforts, this direction may be more acceptable. It has a much greater chance of facilitating an agreement on a unified planning approach than Status Quo.
<b>Strong Stock Focus</b>	The emphasis on strong fish stocks and healthy wildlife populations may alienate those who believe that the emphasis should be on ESA-listed fish and wildlife. Although this approach may be more balanced for some, it is less likely than Status Quo to help achieve a unified planning approach.
<b>Commerce Focus</b>	This focus favors a cost-and-benefit approach to fish and wildlife recovery efforts. Because it focuses on production, it is much less likely than Status Quo to help reach agreement on a unified planning approach.
<i>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.</i>	
<b>Status Quo</b>	Currently, BPA has substantial difficulty satisfying all its legal obligations under the Regional Act. The apparent lack of regional coordination among the numerous agencies

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	with competing authorities in the region causes BPA's current efforts to be less efficient and often inconsistent with other regional actions.
<b>Natural Focus</b>	This focus would require a dramatic change from reliance on the current hydro-based power system to one based on other types of resources, most likely new combustion turbines and renewable energy sources, where cost-effective. BPA's ability to remain a competitive, low-cost provider of electric power in the region would likely be compromised. Also, BPA's role as a major contributor to fish and wildlife recovery effort costs would decrease. Overall, BPA would experience greater difficulties than under Status Quo in meeting its Regional Act obligations, with corresponding changes to the transmission system.
<b>Weak Stock Focus</b>	Under a weak stock approach, BPA would face the same issues as under Natural Focus with somewhat less difficulty in meeting its obligations.
<b>Sustainable Use Focus</b>	This focus would probably allow BPA to remain competitive in the electric markets and maintain its low-cost electric power. BPA would retain its role as a major contributor to fish and wildlife recovery effort costs, as well as other Regional Act costs. BPA would likely be able to better meet its obligations under the Regional Act than under Status Quo.
<b>Strong Stock Focus</b>	This focus would provide greater certainty that BPA could fulfill its dual responsibilities under the Regional Act, and the added efficiency of a unified planning approach. The controversy over whether a strong stock focus is consistent with the Regional Act's intent for protecting, mitigating, and enhancing fish and wildlife would cause this direction to be only be slightly (if at all) better than Status Quo.
<b>Commerce Focus</b>	Under this focus, BPA's ability to protect, mitigate, and enhance fish and wildlife would likely be perceived as secondary to economic concerns. This approach would be more difficult to carry out than Status Quo.
<i>Fulfill the Administration's <b>Fish Funding Principles</b> 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.</i>	
<b>Status Quo</b>	Given the number of agencies with competing regional authorities to implement fish and wildlife responsibilities, BPA has substantial difficulty in satisfying all of the principles. Continued requests for fish and wildlife funding for actions outside BPA's normal authorities has created inefficiencies in BPA's ability to fund the fish and wildlife recovery effort. These high costs for fish and wildlife expenditures and the lack of regional coordination have compromised the probability of Treasury repayment without rate effects. Additionally, cost uncertainty is unsettling to customers, making it more difficult for BPA to gain stability and predictability from long-term contracts.
<b>Natural Focus</b>	With such a radical change to the region's energy power and transmission base and the subsequent negative effect on BPA's revenues and costs, it is likely that BPA costs would exceed revenues, i.e., MSR (see discussion under 2.3.2.3) would be exceeded. This would inhibit BPA's ability to meet the Principles more than under Status Quo.
<b>Weak Stock Focus</b>	In addition to the loss of the low-cost hydro-based system and the increased costs of replacement energy and transmission and of reconstructing historical habitat, this focus would cause BPA's rates to reach MSR quickly, lowering BPA's probability of making the Treasury repayment and make BPA's ability to fulfill the Principles much more difficult than under Status Quo.
<b>Sustainable Use Focus</b>	This focus could still be more costly than Status Quo. However, the increased chance of a comprehensive and consistent unified fish and wildlife recovery effort planning approach would provide BPA's customers more certainty for low-cost power. This difference increases the likelihood that BPA could meet the principles, repay the Treasury, and minimize rate effects than under Status Quo.

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<b>Strong Stock Focus</b>	This focus could be much less costly than Status Quo. Low-cost hydropower would continue, while focus on healthy populations of fish and wildlife would increase, a less costly combination. Even though the BPA revenues and costs would be better than under Status Quo, the increased difficulty in reaching a unified planning approach would reduce efficiencies. BPA's ability to fulfill the Principles would be somewhat better than under Status Quo.
<b>Commerce Focus</b>	This focus would be less costly; however, BPA's ability to satisfy its fish and wildlife and possibly its trust and treaty obligations, and the accounting of the full range of potential fish and wildlife costs would be compromised by an economic focus. BPA's ability to fulfill the Principles would be much more difficult than under Status Quo.
<i>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.</i>	
<b>Status Quo</b>	The multiple and potentially conflicting authorities held by various federal, state, and tribal entities working in the fish and wildlife recovery effort frequently causes confusion with the public and other interests over perceived statutory compliance. Legal challenges are often raised due to the lack of regional coordination and inconsistent multi-agency fish and wildlife actions.
<b>Natural Focus</b>	This focus could raise many historical issues connected with past fish and wildlife policy. Because some in the region perceive this focus (of returning things back to their natural state) as extreme, BPA likely would face more legal challenges than under Status Quo.
<b>Weak Stock Focus</b>	This alternative focuses heavily on listed fish stocks and wildlife populations. BPA could face more legal challenges for not being consistent with other laws and regulations, which would make fulfilling its obligations more difficult than under Status Quo.
<b>Sustainable Use Focus</b>	This focus is by design more balanced in its approach than Status Quo. Because it gives more equal weight to all laws and regulations, it is likely to meet less resistance than Status Quo to fulfilling these legal obligations.
<b>Strong Stock Focus</b>	This focus would likely be viewed by many as not being consistent with the ESA. This would make it much more difficult to BPA to fulfill this purpose as compared to Status Quo.
<b>Commerce Focus</b>	This approach is likely to lead to a decision by an Endangered Species Committee to prioritize economic considerations. The consistency with other environmental legal obligations is likely to call into question through legal challenges. BPA's ability to fulfill these obligations would likely much more difficult to achieve than under Status Quo.
<i>Promote predictable and stable fish and wildlife costs, enhancing BPA's ability to provide funding and remain competitive in the marketplace.</i>	
<b>Status Quo</b>	BPA's customers and potential customers have seen the fluctuating fish and wildlife costs as unpredictable under this Policy Direction. BPA's status as a low-cost power provider and its competitive position in the marketplace is constantly changing. Any significant costs changes such as those with fish and wildlife can cause BPA to encroach on its MSR level, which would reduce the amount of fish and wildlife funding available.
<b>Natural Focus</b>	This focus might eventually lead to more predictable and stable fish and wildlife costs, as a consequence of the seemingly drastic steps of breaching dams (thus removing further hydro changes in some areas) than under Status Quo. The likely level of funding fish and wildlife would be much lower than under Status Quo because of the lost hydro revenues. Increased replacement power costs would be higher.
<b>Weak Stock Focus</b>	This approach would be similar to that of Natural Focus, except that the fish and wildlife costs would increase more for the recovery of historic habitat and would continue to fluctuate based on the status of the listed species, while revenues declined from loss of hydro resources and replacement power costs increased. Thus, the predictability and stable

	fish and wildlife costs, as well as the amount available for funding, would be much worse than under Status Quo.
<b>Sustainable Use Focus</b>	Costs would be higher, and might seem more predictable for the short term, but the ambiguity about breaching in the long term would make this focus somewhat more unsure and costly than Status Quo. Additionally, the need for energy resources would be unpredictable.
<b>Strong Stock Focus</b>	This alternative would have more predictable and stable costs due to continuing existing fish and wildlife activities and would likely provide more funding to ensure that strong fish and wildlife stocks stay strong than under Status Quo, which spreads the funding over a much larger group of species. Also, the need for energy resources would not be accelerated.
<b>Commerce Focus</b>	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 recovery efforts via the enhanced economic provisions made for commerce, making the BPA funding for fish and wildlife go much further than under Status Quo. New energy resources would likely be postponed.

### 3.3.4 Other Considerations: Implementation

In addition to the environmental consequences and the purposes discussed in this document, decisionmakers will need to consider questions of implementation when selecting a Policy Direction. Practical concerns, such as availability of funding, the degree of political support, and the legal feasibility of implementation 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 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 (All-H Paper) process. These are examples only; each decisionmaker and stakeholder undoubtedly will raise his or her own questions, unique to their 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.

### 3.3.5 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

All of the Policy Directions analyzed in this EIS involve short-term changes in the physical environment (air, land, and water) with varying degrees of success in maintaining and enhancing the long-term productivity of fish and wildlife in the natural

environment. Operations intended to benefit anadromous fish should contribute to the recovery of species listed under ESA and to the maintenance of other stocks. Some of the Policy Directions would improve conditions for resident fish and wildlife, and thus improve the long-term productivity of these resources. However, some of the alternatives (Weak Stock, Natural Focus, and Life Cycle) do so at considerable expense of long-term socioeconomic productivity, including cultural resources and commercial activities. Alternatively, the Commerce Focus and, to a lesser degree, the Strong Stock Focus Policy Direction(s), are designed such that short-term uses of the environment would enhance long-term socioeconomic productivity.

All of the Policy Direction alternatives evaluated in this EIS involve varying amounts of construction and operation of generation and transmission resources, although some would occur sooner than others. Alternatives that anticipate dam removal, such as Natural Focus and Weak Stock, would cause greater construction activity and infrastructure improvements than the other alternatives. Additionally, some alternatives include an increase in hatcheries to support production of targeted stocks. All of these activities require both long-term and short-term uses of the environment, although many of these short-term impacts can be substantially mitigated.

In the short-term, construction would cause noise, soil compaction and erosion, and degradation of water and air quality. In the long-term, there could be impacts on air quality, altered land use, reduced water quality, and contributions to global warming from construction and operation of generation and transmission resources and fish hatcheries. Renewable resources, such as wind power, generally have less air and water impact than thermal resources, such as combustion turbines (CTs). However, since renewable resources are often located farther from load than CTs, the associated impacts from transmission would be greater.

At a minimum, each of the proposed Policy Directions fosters both fish and wildlife recovery in the region and the delivery of electric energy to BPA's customers. To the extent that a Policy Direction delivers cost-effective electric energy and enhances fish and wildlife recovery, the corresponding short-term uses of the environment would have a beneficial effect on the long-term socioeconomic productivity. However, often these goals counterbalance one another within a Policy Direction.

### **3.3.6 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. NEPA requires that these effects be identified and described where possible.

Many types of actions included in the Policy Directions are construction projects. Construction projects may be reversible, but the energy, labor, and capital consumed in construction are not retrievable. Construction actions include new generation and transmission facilities, dam construction, removal or breaching, habitat creation or active restoration, and construction of hatcheries.

A dam can be built and removed, but the energy and labor required for building is not recovered when the dam is removed. In fact, the dam removal will require more energy, labor, and capital. Construction has IIC effects, and deconstruction or removal also has IIC effects. Some physical components of the dam might be recovered and used elsewhere, but most components are rendered useless and actually require an additional cost for disposal or storage.

The Natural Focus Policy Direction would have IICs primarily from dam removals and construction of new thermal capacity. In comparison to Status Quo, some types of construction activities—new hatcheries and active restoration projects, for example—would be reduced. The Weak Stock Focus would also have IICs from dam removals and construction of new thermal capacity; IICs from active habitat restoration would be more than Status Quo. The Sustainable Use Focus would not have IICs from dam removals, but some IICs would result from increases in thermal capacity; IICs from active habitat restoration would probably be the largest of any Policy Direction. The Strong Stock Focus might reduce the need for IICs from new thermal capacity, but new hatchery construction would result in IICs. The Commerce Policy Focus would reduce IICs from thermal capacity. The availability of low-cost power might result in more IICs from construction related to economic growth.

The consumption of fossil fuels required for new generation is not reversible. The amount of fossil fuel consumption, in order from most to least, would probably be Natural Focus, Weak Stock, Sustainable Use, Status Quo, Strong Stocks, and Commerce Focus. For all of the alternatives, relying upon conservation and renewable resources would reduce consumption of fossil fuels.

Other irreversible effects may include destruction of cultural resources, loss of habitat, or species extinction(s). Destruction of cultural resources is primarily related to dam breaching in the Natural Focus and Weak Stock Policy Directions. Permanent loss of habitat might be largest in the Commerce Focus. The probability of species extinction(s) would probably be greatest in the Commerce Focus and Strong Stock Policy Directions.

### **3.4 TAILORING A POLICY DIRECTION**

We recognize that no single Policy Direction described and compared in this chapter may be exactly the Direction that decisionmakers ultimately choose. However, it is expected that the ultimate Policy Direction will be encompassed within the range of Policy Directions analyzed. The region, as well as the decisionmaker, may wish to modify and adapt the Policy Directions to reflect an entirely new one. Individual readers may also wish to "build their own Policy Direction alternatives." Or, in the future, conditions may change and the region may wish to make additional changes in Policy Direction or choose a new Policy. This DEIS contemplates such modifications (see Chapter 4 and **Appendix I**).

### **3.4.1 Decisionmakers' Changes that Determine a Modified Policy Direction**

Initially, regional decisionmakers are likely to select a Policy Direction and implementing action plan similar to one of the identified Policy Directions, but somewhat different in design. To accommodate this likelihood, a means to "mix and match" components of the sample implementation actions (Section 3A) to create "hybrid" alternatives has been designed. These hybrids can combine the themes or sample actions of more than one Policy Direction to meet the changing needs of the region. 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. This document will provide them with the necessary structure to understand the environmental consequences without being drawn into a needless protracted procedural process at a time when expedient decisions are essential to the recovery of fish and wildlife species.

Because BPA has *individually* identified the actions for implementation, and has analyzed the *environmental consequences* of those actions under the entire spectrum of Policy Directions, the BPA Administrator (and other decisionmakers) can quickly assess the overall environmental consequences of potential alternatives for fish and wildlife recovery efforts. The mix-and-match approach can also be used to simulate actual regional alternatives and provide a basic analysis of environmental consequences.

### **3.4.2 Build Your Own Alternative**

The directions for building a hybrid Policy Direction are:

- 1. Pick a new combination of underlying characteristics for the Policy Direction, using Table 3.3-1.**
- 2. Review the sample Implementing Actions (Section 3A) behind the different Policy Directions to see if the mix can work.** Remember that *some* implementing actions might be incompatible or would cancel each other out. For example, it would not be possible to match up parts of Natural Focus, which includes dam breaching, with the Commerce Focus aspects that require the dams to be in place. Remember also that when actions are combined differently, the associated environmental effects must also be considered.

Several cautions are in order for anyone wishing to "mix and match."

- **Compatibility.** Not all combinations of actions are possible; some actions are mutually exclusive.
- **Consistency.** Choosing actions from several different Policy Direction implementation actions may result in a plan that is truly indicative of none.
- **Effectiveness.** A "scattershot" technique that tries to reach too many goals with too little money for each will dilute the desired effect.
- **Clarity and Coordination.** The more that different "pieces" of different Directions are mixed, the more likely that confusion might result in interpreting who does what and how.

- **Cause-and-Effect.** If you change or substitute an action, remember that you are also substituting the *effects* (natural resource and/or socioeconomic) of that action.

Please see **Appendix I** for detailed information and helpful tools for performing the mix-and-match.

**The Bottom Line :** The more consistent the application of a Policy Direction, the more coordinated and effective mitigation and recovery efforts will be.

- **Chapter 4, Implementation, discusses factors that can influence the direction of and success in implementing each Policy Direction, and presents ways to assist implementation and change. It also presents the criteria for implementation results.**

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### **3A SAMPLE IMPLEMENTATION ACTIONS**

The tables that follow contain over 2000 sample implementation actions. For each Policy Direction, BPA has compiled—from regional proposals—a sample list of actions in the Key Issue areas. Where regional proposals did not address a particular action area, the EIS Team has supplied sample actions to give the reader a more comprehensive view of each Policy Direction. These are marked "Sample Action." All other actions in the tables are identified by the name of the process or document from which they came, for example: *Conceptual Plan*, or *Framework Alternative 2*.

Once a Policy Direction is selected within the region by active choice or default, every agency, commercial entity, tribe, and private citizen will decide how (or whether) to implement the Policy Direction in their respective jurisdiction(s). The Policy Direction approach described in this EIS is intended to allow stakeholders flexibility and freedom to support the fish and wildlife recovery effort in a manner appropriate to their particular circumstances. So long as they are consistent with the Policy Direction selected, actions could be implemented on a *voluntary* basis, through *incentives*, or through *regulation*. However, in order to aid regional decisionmakers and the BPA Administrator in understanding the level of effort and resources each Policy Direction would likely require, BPA is providing a preview of the kinds of implementing actions that might take place under each Policy Direction. ***The actions found in these pages are examples only and do not necessarily represent all specific possibilities nor do they represent the position, an implied endorsement, or commitment by the BPA.***

#### **How to Read the Tables in this Section**

The sample implementation actions Tables are made up of two main components—the Policy Direction or theme and then the sample implementing actions for that theme. The implementation actions are grouped by the Key Issues that were identified in section 3.2 to help the reader better understand and find the types of actions that might be taken for their issue area. Figure 3-5 illustrates this breakdown of the components.

It is important to recall the distinction between *Status Quo* and *the current implementation actions*.

- **Status Quo** represents a continuation of the policy **direction** the region appears to be following now.
- **The current implementation actions** represent a snapshot view of those **actions** currently being taken to implement that Policy Direction.

This allows for comparing the changes in regional direction on fish and wildlife policy. As further implementing actions are taken, the Current Implementation Actions will have been changed. The Status Quo Policy Direction on the other hand could be continued, although the actions taken to implement it will change. The Policy Direction is a reflection of the objectives and beliefs guiding implementation. These two concepts must not be confused when evaluating the potential consequences of implementing a Policy Direction.

Readers may notice that some actions appear more than once throughout the tables. There are two reasons for this. First, a sample implementation action may be appropriate for more than one Policy Direction. Second, the categories (Fish and Wildlife, Commerce, and Tribes) are not mutually exclusive. Commercial and tribal activities may appear in the Fish and Wildlife section also. Recovery and mitigation will encompass a broad range of players and sectors throughout the region—and in fact, must be inclusive if efforts are to be successful.

Actions in the Fish and Wildlife section would likely be implemented by government agencies with jurisdiction over habitat, harvest, hatcheries, and hydropower. Actions that appear in the Commerce section are focused on changes in economic activity that could be implemented or funded by commercial entities to support the fish and wildlife recovery measures listed in the Fish and Wildlife sections. Actions in the Tribal section are focused on changes that might be made in harvest and hatchery practices, or in habitat located on tribal lands, to support fish and wildlife recovery measures listed in the Fish and Wildlife sections.

The following is a list of many of the sources used for the sample implementation actions in this section.

- Northwest Power Planning Council's (Council) Framework Concept Papers 1-28
- Multi-Species Framework Alternatives 1-7
- Framework Human Effects Analysis Appendix D
- Council Artificial Production Review
- Council Draft 2000 Fish & Wildlife Program
- Draft Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (All-H Paper) (General)
- Draft Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (All-H Paper) Habitat, Harvest, Hatcheries, and Hydro Appendices
- Final Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (All-H Paper) Dec. 2000
- US Fish and Wildlife Service Biological Opinion 2000
- National Marine Fisheries Service Biological Opinion 2000
- Spirit of the Salmon
- Tribal Vision
- Columbia River System Operation Review (SOR) Final EIS Alternatives
- Inter-Columbia Basin Ecosystem Management Project (ICBEMP) Final EIS
- Lower Snake River Juvenile Salmon Migration Feasibility Study EIS
- Lower Columbia River Estuary Program
- Governors' Recommendations

Figure 3-5: Integration of Policy Directions and Sample Implementation Plans

**Policy Direction**  
(Policy direction title and theme or basis)

**SAMPLE IMPLEMENTATION ACTIONS**  
FOR THE  
**NATURAL FOCUS POLICY DIRECTION**

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*).

**SAMPLE Implementation Plan**  
(Includes Key Issues and examples of the types of actions for each issue)

**FISH & WILDLIFE**

**1 HABITAT**

Humans would have less control of the system in this alternative (Framework Alternative 1). Options must focus on recreating key natural ecosystem components within which...fish evolved and prospered, not focus on attempting to circumvent natural ecosystem processes (Framework Concept Paper 9). Effort and money...would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development (Framework Alternative 1). The ecosystem is able to achieve conditions consistent with native fish and wildlife with a minimum of external support (Draft Framework Alternative 1).

Restore as many areas as possible through natural means (Framework Alternative 1). Phase out use of artificial means of salmon recovery, such as barging and hatcheries, as habitat is restored (Framework Alternative 1). Restore the ecosystem to a much more natural state by eliminating dams, hatcheries and other artificial constraints and approaches (Framework Alternative 1). Restore natural processes throughout entire watershed and ecosystem. Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' [support] the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

Humans are just beginning to realize how complex the interconnections in the ecosystem really are. What we do know is that our present society recognizes that our ecosystem has been thrown off balance. Those living in the Columbia Basin have identified salmon recovery to be of utmost priority and concern. It has been said that the first step to solving a problem is acknowledging it exists. A proactive strategy that stresses prevention followed by mitigation is an effective tool that can be used to help our troubled ecosystem. The challenge lies in making sure the situation does not get worse, and moving from there to make it better (Framework Concept Paper 16).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, and their habitats (Framework Concept Paper 4). Increase habitat connections throughout the basin (Framework Alternative 5). Where designated lands identified in the habitat assessment are already publicly owned, implement management practices that ensure that those lands function naturally (LCREP). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Maintain habitats by permitting natural forces, including disturbance events such as fire, to continue whenever these processes will contribute to long-term sustainability of habitat (ICBSDEIS, T-O2).

Establish riparian and upland area conditions that provide the full set of functions needed to maintain water and habitat quality that will support native aquatic species, achieved mainly through natural regenerative processes (Draft AII-H paper Dec. 1999). Establish riparian reserves to protect vegetation and soils (Spirit of the Salmon). Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5). Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision).

[W]e prefer to benefit salmon through strategies and actions that emphasize and build upon natural processes. While we recognize this may not always be feasible, we think it is an important policy decision that will, in turn, clarify the region's choice of strategies and allow us to make most effective use of our finite financial resources (Governors' Recommendations, July 2000).

Restoration efforts must focus on restoring habitats and developing ecosystem conditions and functions that will allow for expanding and maintaining a diversity within, and among, species in order to sustain a system of robust populations in the face of environmental variation (Council's 2000 Fish and Wildlife Program).

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. Where a species native to that particular habitat cannot be restored, then another species native to the Columbia River Basin should be used (Council's 2000 Fish and Wildlife Program).

[The following] fundamental principles will be the basis...for the measures used to characterize the Columbia Basin ecosystem and its interrelated parts and to evaluate ecosystem changes that may result from various strategies and actions: 1) The abundance and productivity of fish and wildlife reflect the conditions they experience in their ecosystem over the course of their lifecycle; 2) Natural ecosystems are dynamic, evolutionary, and resilient; 3) Ecosystems are structured hierarchically; 4) Ecosystems are defined relative to specific communities of plant and animal species; 5) Biological diversity accommodates environmental variation; 6) Ecosystems develop primarily through natural processes. 7) Ecological management is adaptive and experimental; and 7) Human actions can be key factors

- Idaho Department of Fish and Game and Title 36 Idaho Code
- Thoreau Institute
- Columbia River Conference IV
- BPA-Sponsored Public Meeting.

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# 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.

### FISH & WILDLIFE

#### 1 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 hydropower 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 useful for monitoring and evaluation.
- A wide array of habitat improvement projects, including screening water diversions, replacing temporary irrigation dams with alternative fish friendly structures, fencing projects, water development projects, vegetative plantings and plant control, and environmental monitoring and evaluation projects.
- Land and water acquisitions, conservation easements, mainstem 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 1993, 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 rangelands.

The tribal viewpoint encompasses the need to take actions that restore habitat to levels that support not only de-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.

#### 1-1 Anadromous Fish

The ESA and federal land and resource management plans infer limited road building, grazing restrictions, and more protective stream buffers. Anadromous fish habitat restoration is based on pilot projects and political priorities. Current mitigation programs provide fish primarily for harvest. The ESA provides protections for listed stocks.

1-2 Resident Fish
Resident fish habitat receives lower priority than anadromous fish habitat. The focus is on mitigating for fish losses in areas around and above water storage projects. Sturgeon are a major focus.
1-3 Introduced Species
Resident fish above blockages are often introduced (rather than native) species. Habitat programs focus on opening up access (e.g., culverts), fencing, riparian, and streambed work to promote native species; and actions to reduce non-native predators.
1-4 Wildlife
Effects on wildlife from dam development are mitigated through land purchases and dedications, wildlife trusts, and land acquisitions to establish preserves. Mitigation agreements with states and tribes aim to replace inundated wildlife habitats.
1-5 Predators of Anadromous Fish
Programs aim to reduce non-native predators of anadromous fish. For example, the Northern Pikeminnow Management Program was designed to substantially reduce predation losses of juvenile outmigrants—Northern pikeminnow harvest fisheries have been employed since 1990. Also, terns that feed on anadromous fish are controlled (e.g., at Rice Island).
1-6 Watersheds
Currently, watershed approaches to habitat management are being funded by BPA and used throughout the Columbia Basin to implement the Fish and Wildlife Program. In many cases, the Natural Resources Conservation Service through its county offices is facilitating these efforts with participation from the states of Oregon, Washington, and Idaho, and the tribes. The focus is moving from piecemeal approaches to whole watersheds, with projects tested on a pilot basis by watershed.
1-7 Tributaries
Habitat projects on tributaries address anadromous fish, resident fish, and wildlife. Below blockages, the focus is on anadromous fish; above blockages, the focus is on resident fish. The selection process for tributary habitat actions generally lacks a prioritization component.
1-8 Mainstem Columbia
Habitat actions on the mainstem focus on migration corridors, with little attention to habitat structure.
1-9 Reservoirs
Two flow management strategies are used for reservoir operations: 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 draft from storage reservoirs during the summer to increase summer flows.
1-10 Estuary and Ocean
Estuarine and ocean habitat currently receives little or no emphasis. Dredging to deepen the Columbia River navigation channel is planned. Selected actions are conducted in estuary habitat to reduce imminent risks and improve survival of listed stocks (e.g., Rice Island measures).
1-11 Water Quality
Habitat measures to address water quality focus on federal projects in the mainstem, primarily total dissolved gas (nitrogen supersaturation) and water temperature issues.

## 2 HARVEST

### 2-1 Anadromous Fish

Anadromous fish harvest restrictions vary for ocean and in-river fisheries. Ocean fisheries are governed by U.S. and Canadian regulations, and the Pacific Salmon Treaty (PST). The PST is a 10-year agreement that implements an abundance-based (rather than quota-based) ocean harvest regime for chinook and coho salmon. The regime is moving from a catch-based to escapement-based harvest management strategy. The agreement places special emphasis on further restrictions for fisheries that incidentally harvest weak stocks, and on getting the required number of fish onto the spawning grounds. The two primary principles of the treaty are fish conservation and equity (harvest sharing). Ocean fisheries have been greatly curtailed—increasingly restrictive regulations, shortened seasons, area closures, special gear regulations, license moratoria, and buyout of fishing fleets have all occurred to limit harvests. Also, the PST establishes funds to pay for commercial salmon fleet reduction and improve fisheries knowledge.

In-river commercial fisheries include the non-Indian gillnet fishery below Bonneville Dam, and the treaty Indian gillnet fishery above Bonneville Dam and McNary Dam. Freshwater sport fisheries operate in the mainstem and in tributaries throughout Oregon, Washington and Idaho (run sizes permitting). And Tribal subsistence and ceremonial fisheries are conducted in the mainstem and in some tributaries as well (run sizes permitting).

Incidental harvest of listed stocks occurs inadvertently. The amount of incidental harvest varies by geographic area and species. Fishing in mixed stock areas would continue to be constrained by natural stocks present in the fishery and harvest allocation requirements. The current harvest management trend, accelerated by ESA listings, is to reduce harvest rates in mixed stock areas in favor of harvest in fisheries closer to the rivers of origin where the stocks can be segregated and more selectively caught. Large mixed-stock fisheries that once were managed to maximize catch are now managed to reflect the productive capability and conservation needs of naturally spawning fish and to achieve allocation objectives to river-of-origin fisheries. Management techniques such as time, area, and gear management would be used to ensure greater harvest selectivity. New mass marking technologies that make it possible to identify and selectively harvest hatchery fish, even in mixed stock areas, would continue to be developed and employed.

For many species of Columbia River salmon, harvest allocation between non-Indian and treaty Indians is subject to continuing jurisdiction of the federal courts under *United States v. Oregon* and *United States v. Washington*. Under those cases, certain tribes are entitled to a fair share (50%) of the harvestable fish. The central issues in both of these long-standing cases deal with state regulation of treaty Indian fishing (primarily involving harvest allocation), and legal standards for conservation and management. The parties to *U.S. v. Oregon* are presently negotiating harvest and hatchery programs in hopes of developing a management plan that addresses conservation under the ESA while meeting trust obligations to the tribes.

Fisheries law enforcement in sport and commercial fisheries is conducted by the states and the United States acting through the Coast Guard, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. Tribal fisheries enforcement is implemented by the respective tribes and cooperatively through the Columbia River Inter-tribal Fisheries Enforcement Office.

### 2-2 Resident Fish

Resident fish are managed by the states for sport and maintenance of species. Some species also are managed by Indian tribes for subsistence. Federally-listed species, such as bull trout, receive special protection.

### 2-3 Wildlife

Wildlife are managed by the states for sport and maintenance of hunted species; and some species are managed by Indian tribes for subsistence, ceremonial and cultural purposes. Federally-listed wildlife species receive special protection.

## 3 HATCHERIES

There are more than 150 hatcheries and associated facilities for anadromous and resident fish in the basin. Federal and state agencies, Indian tribes and private interests operate them. Many are intended to mitigate the impact of dams, which have blocked access to about one-third of the salmon and steelhead habitat that existed historically in the Columbia basin. Resident fish hatcheries, like salmon and steelhead hatcheries, mitigate losses caused by the hydropower system. In some cases, such as in areas blocked by dams, losses of anadromous species are mitigated through the production of resident species, which may include native and nonnative species adapted to the altered environment. Artificial production programs produce the majority of salmon and steelhead that annually return to the Columbia River, and significant amount of resident trout and other resident fish. Most of the artificial production programs in the Columbia River Basin are financed with federal money in some way.

The emphasis of the hatchery programs is on a coordinated habitat restoration/production program in which artificial

production efforts are tied to habitat improvements. Focuses of hatcheries are on: mitigation for fish losses associated with hydrosystem construction and operation; improvement of the quality and survival of hatchery fish produced and released; conserving genetic resources; and testing new methods to enable use of hatcheries in ESA recovery efforts.

### 3-1 Anadromous Fish

The majority of the funds spent under the Mitchell Act have been used to mitigate for the salmon and steelhead losses that occurred throughout the river by developing hatchery production in the lower Columbia. Mitchell Act facilities are largely concentrated in the lower Columbia below Bonneville Dam (16 facilities) or in the Bonneville Dam pool area (7 facilities). Two facilities are located in the mid-Columbia area upstream of the confluence with the Snake River. Cutbacks in Congressional appropriations have been largely responsible for the reduction in total production. Production to preserve lower-river and ocean harvest opportunities has been the main focus of the Mitchell Act program.

In the Water Resources Development Act of 1976, Congress authorized funding for a program to mitigate for fish and wildlife losses caused by construction and operation of the four lower Snake River hydroelectric projects (Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams), known as the Lower Snake River Compensation Plan (LSRCP). Three recently completed fall chinook facilities on the Snake and Clearwater rivers (Pittsburg Landing, Big Canyon, Capt. John's Rapids), although part of the LSRCP program, have operations and evaluation costs directly funded by Bonneville Power Administration. The purpose of the LSRCP has been to replace lost salmon, steelhead and trout fishing opportunities, with management goals focused on replacing the loss of returning adult steelhead and salmon, rather than on releasing a given number of smolts.

Separate from the LSRCP is a production program to mitigate for steelhead and resident trout losses caused by the construction of Dworshak Dam, blocking the North Fork Clearwater River in Idaho. For this purpose, the Corps of Engineers funded the construction of the Dworshak National Fish Hatchery and the USFWS receives funds via the Corps to operate the facility, all reimbursed by Bonneville (the Dworshak hatchery also produces spring chinook as part of the LSRCP). The primary goal of fishery mitigation at Dworshak has been to preserve artificially the North Fork steelhead run.

Authorized in 1966 and operational by 1978, the Warm Springs National Fish Hatchery is located on the Warm Springs River in Oregon and funded and operated by the U.S. Fish and Wildlife Service. This is one of the few federally funded anadromous production facilities in the basin outside of the Mitchell Act facilities that are not directly or by reimbursement funded by Bonneville.

Anadromous fish mitigation for dams on tributaries on the Willamette River is provided by the Leaburg, McKenzie, Marion Forks, South Santiam, and Willamette hatcheries. The Oregon Department of Fish and Wildlife operates the hatcheries under a cooperative agreement with the Corps, and the Corps provides a majority of the funding while the State of Oregon also provides a substantial portion of the funds. The Bonneville Power Administration reimburses the Corps funded portion.

In addition to federally funded production programs, privately owned and public electric utilities produce millions more fish as mitigation for the impacts of their FERC-licensed dams.

State fish and wildlife agencies and tribes operate many of the federally financed production facilities. They also operate most of the production facilities associated with FERC-licensed projects. But the state agencies also operate hatcheries in the basin that are not federally funded or linked to FERC-licensed projects, projects funded by the states themselves and developed primarily to address declining fisheries.

### 3-2 Resident Fish

Hatcheries continue to produce significant numbers of native and non-native resident fish species. Frequently, resident fish species are substituted for anadromous species in aquatic areas blocked by hydro or other development. Special hatchery provisions are used to address species listed for protection under the ESA.

## 4 HYDRO

### 4-1 Dam modifications and facilities

Existing dams and hydro facilities remain in place. Ongoing improvements to the hydro system would continue, with roughly the existing annual level of investment continuing into the future. Improvements address concerns for fish passage and water quality targets of the federal Clean Water Act.

Fish passage efforts emphasize year-to-year planning and project implementation to improve passage at eight mainstem dams via structural modifications, more or improved spillway flow deflectors, turbine improvements, adult fish attraction modifications, new trash booms, modifications to fish separators, added cylindrical dewatering screens,

and juvenile fish bypass systems including new fish barges.

Major additional structural modifications under consideration include:

- Modifying adult ladder entrances and exits to improve adult passage survival.
- Installing juvenile bypasses at all major dams with high fish mortality rates.
- Installing fish screens at dams and over irrigation diversion outlets.
- Developing fish byways to divert and rejoin rivers.
- Constructing a smolt canal paralleling the Snake and Columbia Rivers from the mouth of the Clearwater to just below Bonneville Dam.
- Developing new facilities and equipment to improve the juvenile fish transportation program.
- Installing locks at additional dams to expand the navigation system.
- Modifying recreational facilities to allow their use over a wider range of operating conditions.

No hydro facilities fish passage facilities specifically designed for bull trout. As a result, it is unknown if the existing fishways at the Lower Snake or Columbia River Dams are suitable for bull trout. There are no fish passage facilities at Albeni Falls Dam at the outlet of Lake Pend Oreille.

#### 4-2 Hydro Operation

The federal hydro system is operated to serve an array of individual project and system purposes, including power generation, flood control, irrigation, recreation, fish and wildlife and other purposes defined by Congressional authorizations. Systemwide purposes focus on supplying electrical energy to meet existing and projected loads, flood control, and more recently, salmon recovery. Current hydro operations reflect recommendations of Biological Opinions to promote recovery of listed fish stocks. Measurable performance standards are being developed to guide future system improvements.

Water is managed per the 1995 Water Budget, as well as additional water for flow augmentation to benefit the anadromous fish migration. The additional water is stored in Grand Coulee, Libby, and Arrow, and provided on a sliding scale tied to runoff forecasts. Flow targets are established at Lower Granite and McNary.

Since 1991, special flow operations for Kootenai River white sturgeon spawning and egg incubation have been in effect at Libby Dam project from April 1 through early July. In recent years, operating guidelines developed by the USFWS have specified that discharges from Libby Dam not be fluctuated for electrical load following purposes.

A selective water withdrawal system at Libby Dam provides temperature control to protect cold-water fish such as bull trout in the Kootenai River. The USFWS has specified special rates for reducing flow in the Kootenai River downstream from Libby Dam following flow augmentation for sturgeon spawning and incubation. Temporary flow-ramping rates and stable flows are established when necessary to minimize stranding and desiccation of bull trout and other aquatic life along the river edges. The USFWS also requested that steady flows of 8,000 cfs be maintained between the end of the sturgeon flows and the start of augmentation flows for salmon. The present strategy for improving bull trout habitat conditions includes maintaining steady summer streamflows and reducing short-term flow fluctuations downstream from both Libby and Hungry Horse Dams.

Presently, there are no specific measures designed to improve conditions for burbot migrations or spawning, nor are there any specific operations or structural measures in place to improve conditions for white sturgeon in the Lower Snake or Columbia Rivers, or westslope cutthroat.

#### 4-3 Spill

Voluntary spill has been used as an interim passage strategy for anadromous fish since the late 1970s, pending development of more effective alternatives. Spill is an action provided to reduce turbine-related mortality of juvenile salmon and steelhead at lower Snake and Columbia River hydroelectric projects.

Currently, voluntary spill for fish passage is provided at each of the eight federal mainstem dams in the spring, up to 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/day, and for 12 hours/day at John Day, McNary, Lower Monumental, Little Goose, and Lower Granite Dams.

When the falling water plunges into the water below, air can be entrained and dissolved under pressure, thus raising dissolved gases. This can form bubbles in fish, which may result in injury or death. The amount of spill is at the levels recommended in Biological Opinions, assuming that waivers are obtained from the states of Oregon and Washington to exceed their 110% TDG state water quality standards. Federal agencies would continue to provide spill for fish passage, but not to exceed TDG levels allowed under the standard. Both structural and operational measures (e.g., flow detectors) have been employed to reduce dissolved gas supersaturation levels during periods of spill. Other measures are also employed to manage dissolved gas and additional measures are under development for potential future consideration.

4-4 Flow

Current flow programs, with some protection for upstream reservoirs, would continue. Flow augmentation, or use of water from storage reservoirs to augment natural streamflows, is one of the primary strategies to mitigate the effects of impoundments and the regulated hydrograph on juvenile passage. The general concept of flow augmentation is to increase flows and water velocities when most juvenile migrants are present. Water from key storage reservoirs – Grand Coulee, Dworshak, Hungry Horse, Libby, Snake River reservoirs, and Canadian reservoirs – is used to augment natural flows to meet these targets, to the extent possible. The probability of meeting these targets varies depending on snow pack and the runoff volume forecasts, shape of the runoff, and general weather patterns throughout the spring and summer flow augmentation period.

A flow augmentation program aims to restore more natural flow patterns during the time juvenile and adult salmon and steelhead are migrating. Biological Opinions include two flow management strategies: (1) limiting the winter and spring drafts of storage reservoirs to increase spring flows and the probability of full reservoirs at the beginning of summer; and (2) drafting from storage reservoirs during the summer to increase summer flows. In the Snake River, operational measures would continue to include flow augmentation from Dworshak Reservoir as needed to moderate temperatures in the lower Snake River. Water from Canadian storage reservoirs may be secured to meet flow needs.

4-5 Reservoir Levels

Spanning the river, the dams form a physical barrier that impedes the river's flow, forming an artificial lake or reservoir. Water pools behind each dam covering land that was previously exposed, allowing navigation and creating opportunities for recreation, irrigation, and water supplies. Reservoir levels would continue to be managed as multi-use facilities that provide navigation, hydropower, irrigation, recreation, and fish and wildlife conservation benefits.

Storage reservoir levels would be managed to maximize availability of flow augmentation water in the spring and summer. Some mainstem run-of-river reservoirs (Little Goose, Lower Monumental, and Ice Harbor) on the lower Snake River and John Day Reservoir on the Columbia River would be lowered during the spring and summer migration periods to increase water velocity, which is intended to increase the migration rate and survival of salmonid smolts. However, the Lower Snake River dams are all run-of-river dams, which means that they have limited storage capacity in their reservoirs and pass water through the dam at about the same rate as it enters the reservoir.

4-6 Water Quality

The federal hydropower system would continue to operate to reduce water temperatures during periods of juvenile and adult fish migration and to reduce the harmful effects of elevated levels of spill-generated total dissolved gas (TDG) on anadromous and resident fish. For example, flows would be released from Dworshak Dam to help reduce water temperatures in the lower Snake River for migrating fall chinook salmon and steelhead. Gas concentrations would be controlled by limiting the amount of spill at mainstem dams and by installing gas abatement structures that reduce the generation of TDG.

4-7 Juvenile Migration and Transportation

Juvenile migrating fish pass dams in three ways under a spread-the-risk strategy: (1) through the turbines, (2) over the spillways, or (3) through bypass systems where they are diverted to trucks or barges for transport. Some juvenile fish may enter the intake openings of the powerhouse, move with water through the turbines and exit on the other side. The fish may experience trauma from pressure changes, turbulent water conditions, or striking the machinery; however, about 90 to 95 percent of fish entering the turbines survive past the dam.

Currently, most juvenile migrants pass dams through non-turbine routes. Some juvenile fish travel in water passing through the spillway and falling to the lower river. These fish may be damaged in the fall or be affected by dissolved gasses in the water; however, about 98 percent of fish passing through the spillway survive.

Juvenile fish bypass systems include screened turbine intakes, and ice and trash sluiceways. Turbine intake screens are devices designed to intercept fish that enter turbine intakes. The two kinds of screens that are currently employed are submersible traveling screens and extended-length submersible bar screens. The Dalles Dam is the only federal mainstem dam without mechanical screens. The screens guide the fish to a channel that conveys them to the downstream side of the dam and back into the river or into trucks or barges for transportation to below the dam. Juvenile fish bypass facilities would be operated continuously during the fish passage period from April through November. All juvenile fish bypass systems would be operated and maintained based on the Corps' criteria, as modified.

Juvenile fish transportation is a means to convey fish past multiple dams and reservoirs to reduce the cumulative effects of dam-related and reservoir-related mortality. Juvenile migrants that are guided by turbine intake screens are collected in channels or holding tanks, and loaded onto trucks or barges and transported for release below Bonneville Dam where they continue their migration to the ocean. The collected and transported fish may suffer delays and

handling stress; however, about 98 to 99 percent of the transported fish survive to the point of release below Bonneville Dam.

Research covering various aspects of juvenile fish passage would be implemented annually based on provisions in Biological Opinions and through coordination with regional work groups. These studies would be intended to provide information related to key passage uncertainties, for improving operational criteria, modifying/improving existing fish passage facilities, and constructing new passage facilities.

4-8 Adult Fish Passage

General concepts for adult fish passage at low-head dams were fairly well established at the time that large dams were constructed on the Columbia River. As a result, adult passage facilities, such as fishway entrances, collection/transportation channels, and ladders, were incorporated into the original construction of some mainstem dams. These adult fish passage facilities would continue to be operated and maintained. In general, the migration rate of adult migrants through dams and reservoirs would be similar to that of pre-impoundment.

All the mainstem hydroelectric dams in the Columbia/Snake migration corridor have fish ladders and associated auxiliary water supply and powerhouse collection facilities. The adult fish passage period is March through November at Bonneville, The Dalles, and John Day dams; and March through December at McNary and the four lower Snake River projects. Adult salmonids (and other species) are counted at each mainstem dam, with the schedule varying according to location and time of year.

The height difference between the river on the downstream side of the dam and the reservoir behind the dam is approximately 100 feet for all of the Lower Snake Dams. Fish ladders, which have been in place since the dams were built, and devices to attract fish to the entrances of the ladders are the primary aid to surmounting the dams. The Corps would continue to investigate and adopt new technologies for maximizing the number of fish that safely pass the dams in both directions.

Research covering various aspects of adult fish passage would be implemented annually based on provisions in Biological Opinions and through coordination with regional work groups. These studies would be intended to provide information related to key passage uncertainties, for improving operational criteria, modifying/improving existing fish passage facilities, and constructing new passage facilities.

4-9 Flood Control

Existing dams with flood control capabilities would continue to be operated for that purpose. The four Lower Snake dams were not built to control floods, and would not be modified for that function.

**COMMERCE**

**5. POWER**

5-1. Existing Generation

System operations and configurations for power generation would continue as they have been, as modified to protect and recover fish listed under the ESA.

5-2. New Generation

New generation resources would continue to be developed to meet increasing demand. New generation sources would be subject to environmental laws including NEPA, Clean Air and Water Acts, and FERC licensing.

5-3. Transmission Reliability

Actions to maintain and improve power transmission reliability would continue to meet demands for economic growth and development. Upgrades and improvements would be subject to environmental laws including NEPA, Clean Air and Water Acts, and FERC licensing.

**6. INDUSTRY**

6-1. Industrial Growth

Proposed new industry is reviewed at the local level for compliance with existing local zoning and environmental ordinances. Local zoning plans and plans for water supply and other public services may be subject to federal or state environmental documentation requirements. New industry is subject to environmental regulations, including the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA); the Toxic Substances Control Act of 1976 (TSCA); the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); the Resource Conservation and Recovery Act (RCRA); the Clean Air Act (CAA); the Clean Water Act (CWA); the Endangered

Species Act (ESA); and others. Common law and statutory law regarding environmental impacts, damages and liability may also affect the behavior of industrial growth.
6-2. Aluminum and Chemical
Aluminum and chemical production facilities would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others.
6-3. Mining
Existing and future mining operations would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others. On federal land, mining operations are managed according to federal land and resource management plans.
6-4. Pulp and Paper
Pulp and paper production facilities would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others.
<b>7. TRANSPORTATION</b>
7-1. Navigation and Barging
The Columbia and Willamette Rivers would continue to be dredged to maintain the shipping channels. A lower Columbia navigation channel-deepening project is planned to enhance river transportation. Navigation locks would continue to be operated to lift and lower boats and barges between the lower river levels downstream of the dams and the higher reservoir levels. The federal Rivers and Harbors Act would continue to regulate potential obstructions in navigable waterways.
7-2. Trucking and Railroads
Existing railroads and trucking facilities would continue to operate and complement the barging industry along the rivers.
<b>8. AGRICULTURE</b>
Environmental considerations for agricultural operations are addressed by a variety of federal, state, and local programs for public and private lands. Take avoidance and critical habitat provisions of ESA would continue to affect agricultural practices.
8-1. Irrigation
Millions of acres of land in the Basin would continue to be irrigated. Although most withdrawn water eventually returns to streams from agricultural runoff or from ground water recharge, crops consume much of the water. Idaho, Oregon, and Washington water resources agencies have adopted limited, temporary moratoria on new water diversion permits from sensitive salmon streams. The Corps would continue to issue permits for water withdrawal structures in waters of the United States and in navigable waterways.
8-2. Pesticides and Agricultural Practices
On federal land, agricultural management and pesticide application would continue as directed by existing and amended land and resource management plans. Standards would continue or be modified to address conservation recommendations from the Biological Opinions for listed species. On private land, programs administered by the USDA and EPA may influence agricultural practices. Many USDA conservation subsidies, some targeted to water conservation and water quality, currently are provided under the Environmental Quality Incentives Program. Cost sharing and technical assistance are provided for approved practices. Some agricultural lands are leased and put in long-term conserving uses under the Conservation Reserve and Wetlands Reserve Programs. The USDA and EPA would continue to administer laws and programs to control pesticide use on private lands and to reduce potential adverse effects of agricultural practices.
8-3. Grazing
On federal land, grazing would continue to be managed according to land and resource management plans, as modified to address ESA species listings.
8-4. Forestry
Environmental effects of forestry practices are addressed by a number of federal and state laws and programs. On federal land, forest management would be directed by federal land and resource management plans. On private land,

state laws regulate practices and federal laws provide certain management incentives to provide conservation outcomes.

#### 9. COMMERCIAL HARVEST

Commercial harvest of salmon within the Columbia River is regulated by the Columbia River Compact, a bi-state compact established by the legislatures of Oregon and Washington in 1918. Compact fishing regulations are implemented under the state laws of Oregon and Washington and allow the sale and purchase of fish caught commercially in non-Indian and treaty Indian fisheries. The Compact is supported by the state staffs of Oregon and Washington, and the Technical Advisory Committee, composed of representatives of the state, tribal and U.S. agencies that are parties to *U.S. v. Oregon*. The tribal governing bodies of each of the tribes collaborate with the Compact agencies in establishing fishing regulations that affect tribal members.

With the exception of a limited commercial fishery in 2000, no commercial in-river fisheries directed at upper Columbia River spring chinook have occurred since 1977, and impacts have been limited to tribal ceremonial and subsistence and very minimal incidental catch levels. As a result, the average harvest rate on that spring chinook presently averages less than 6 percent. For summer chinook, there have been no commercial fisheries since 1965. Taking into account the very limited tribal ceremonial and subsistence fisheries, the harvest rate for the summer chinook run has averaged less than 3 percent annually since 1986. There has been no commercial harvest of sockeye salmon since 1988 (with the exception of a very limited three-day commercial fishery targeting sockeye in the mainstem Columbia River in 2000). Columbia River sockeye are not known to be harvested in ocean fisheries.

Presently, there are no commercial or sport fisheries directed at Lower Columbia River chum salmon, although chum are taken incidentally in gillnet fisheries for coho and chinook salmon, and a minor catch occurs in tributary recreational fisheries.

Ocean commercial fisheries have been greatly curtailed, with a corresponding reduction of the ocean commercial salmon fishing fleet. Increasingly restrictive regulations, shortened seasons, area closures, special gear regulations, license moratoria, and buyout of fishing fleets have all occurred to limit harvests. The annual commercial and sport catch of chinook off Washington and northern Oregon coasts (where Columbia River chinook predominate in the catch) has declined from nearly 600,000 fish in 1974 to an average of about 15,000 fish since 1994.

#### 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Local land use, zoning and planning regulations guide residential and commercial development, which is affected by ESA, CWA, NEPA, and other federal laws and incentives.

#### 11. RECREATION

Ocean recreational fishing would continue to harvest Columbia River salmon off the Oregon, Washington and California coasts. Also, recreational fisheries occur in the mainstem, and in various tributaries in Idaho, Oregon, and Washington. Marine harvest regulations would continue to be enforced by the states and the U.S. through the NMFS, USFWS and Coast Guard. Sport fishing for anadromous fish in state waters is regulated and administered by the respective fish and wildlife departments in Idaho, Oregon and Washington. Recreational fishing would emphasize the use of hook-and-line gear.

#### TRIBES

##### 12-1. Tribal Harvest

There is a unique and long-standing relationship between the U.S. government and the region's Indian tribes. The United States holds a trust responsibility to all tribes to protect tribal trust resources, including natural resources such as fish, wildlife, timber and water, and cultural resources. In treaties between some tribes and the U.S. government, the tribes reserved certain rights, including fishing rights, that have been adjudicated through court proceedings notably, *U.S. v. Oregon*. Many people believe that multiple agency, tribal, and individual efforts in the region lack overall direction and focus, and that the existing governance structures do not adequately include tribal sovereign governments in decision making.

Current mitigation programs attempt to provide fish for harvest and protection mechanisms for listed stocks. All-Hatchery fish would continue to be marked to enable selective harvest. Tribal harvest would be managed to achieve escapement goals of adults to spawning grounds.

To the extent the resource permits, tribal people would continue to fish for ceremonial, subsistence, and commercial purposes employing--as they always have using a variety of technologies. Tribal people fish from wooden scaffolds and from boats using set nets, spears, dip nets, and poles and lines.

Ecosystem and fish production actions would be taken that promote and sustain fishing opportunities in treaty

reserved usual and accustomed fishing areas. Ceremonial, subsistence, and commercial fisheries would be conducted, consistent with court interpretations of Indian treaties. As run sizes permit, tribal members would continue to catch salmon primarily with set gillnets in the mainstem Columbia River.

#### 12-2. Tradition, Health, Spirituality

Tribal society is closely linked with the natural world. 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. Tribal people still maintain a dietary preference for salmon, and its role in ceremonial life remains preeminent. Salmon is important and necessary for physical health and for spiritual well being.

The present condition of the ecosystem and its fish and wildlife resources limits the ability of tribal governments to enjoy those resources and to exercise self-determination. As a result, tribal well-being, health, economics, and all other aspects of tribal culture are compromised.

## SAMPLE IMPLEMENTATION ACTIONS

### FOR THE NATURAL FOCUS POLICY DIRECTION

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*).

#### FISH & WILDLIFE

#### 1 HABITAT

Humans would have less control of the system in this alternative (Framework Alternative 1). Options must focus on recreating key natural ecosystem components within which...fish evolved and prospered, not focus on attempting to circumvent natural ecosystem processes (Framework Concept Paper 9). Effort and money...would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development (Framework Alternative 1). The ecosystem is able to achieve conditions consistent with native fish and wildlife with a minimum of external support (Draft Framework Alternative 1).

Restore as many areas as possible through natural means (Framework Alternative 1). Phase out use of artificial means of salmon recovery, such as barging and hatcheries, as habitat is restored (Framework Alternative 1). Restore the ecosystem to a much more natural state by eliminating dams, hatcheries and other artificial constraints and approaches (Framework Alternative 1). Restore natural processes throughout entire watershed and ecosystem. Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' [support] the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

Humans are just beginning to realize how complex the interconnections in the ecosystem really are. What we do know is that our present society recognizes that our ecosystem has been thrown off balance. Those living in the Columbia Basin have identified salmon recovery to be of utmost priority and concern. It has been said that the first step to solving a problem is acknowledging it exists. A proactive strategy that stresses prevention followed by mitigation is an effective tool that can be used to help our troubled ecosystem. The challenge lies in making sure the situation does not get worse, and moving from there to make it better (Framework Concept Paper 16).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, and their habitats (Framework Concept Paper 4). Increase habitat connections throughout the basin (Framework Alternative 5). Where designated lands identified in the habitat assessment are already publicly owned, implement management practices that ensure that those lands function naturally (LCREP). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Maintain habitats by permitting natural forces, including disturbance events such as fire, to continue whenever these processes will contribute to long-term sustainability of habitat (ICBSDEIS, T-O2).

Establish riparian and upland area conditions that provide the full set of functions needed to maintain water and habitat quality that will support native aquatic species, achieved mainly through natural regenerative processes (Draft All-H paper Dec. 1999). Establish riparian reserves to protect vegetation and soils (Spirit of the Salmon). Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5). Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision).

[W]e prefer to benefit salmon through strategies and actions that emphasize and build upon natural processes. While we recognize this may not always be feasible, we think it is an important policy decision that will, in turn, clarify the region's choice of strategies and allow us to make most effective use of our finite financial resources (Governors'

Recommendations, July 2000).

Restoration efforts must focus on restoring habitats and developing ecosystem conditions and functions that will allow for expanding and maintaining a diversity within, and among, species in order to sustain a system of robust populations in the face of environmental variation (Council's 2000 Fish and Wildlife Program).

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. Where a species native to that particular habitat cannot be restored, then another species native to the Columbia River Basin should be used (Council's 2000 Fish and Wildlife Program).

*[The following]* fundamental principles will be the basis...for the measures used to characterize the Columbia Basin ecosystem and its interrelated parts and to evaluate ecosystem changes that may result from various strategies and actions: 1) The abundance and productivity of fish and wildlife reflect the conditions they experience in their ecosystem over the course of their lifecycle; 2) Natural ecosystems are dynamic, evolutionary, and resilient; 3) Ecosystems are structured hierarchically; 4) Ecosystems are defined relative to specific communities of plant and animal species; 5) Biological diversity accommodates environmental variation; 6) Ecosystems develop primarily through natural processes. 7) Ecological management is adaptive and experimental; and 7) Human actions can be key factors structuring ecosystems (NPPC Artificial Production Review, October 1999, Section II.A).

Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1).

Research, Monitoring, and Evaluation:

Establish pre-development baseline information and restore to those conditions (Tribal Vision).

Implement multiple-scale assessments and data management systems (USFS, BLM) (Final All-H Paper Dec. 2000).

1-1 Anadromous Fish

*Leave natural predators and leave spawned-out adult fish carcasses to provide nutrients to juvenile fish (Sample Action).*

Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3 and Spirit of the Salmon). Increase the abundance of anadromous fish to increase the biomass of ocean-derived energy and nutrients delivered to freshwater areas (Draft Framework Alternative 1). Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1). Increase connections within freshwater areas to facilitate wide distribution of energy and nutrients within the system. Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-02).

Through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM) (Final All-H Paper Dec. 2000).

Accelerate land acquisition, using LWCF [*Land and Water Conservation Fund*] funds prioritizing fish habitat (USFS, BLM) (Final All-H Paper Dec. 2000).

Complete HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000).

1-2 Resident Fish

Restore ecosystem components that were represented by healthy anadromous fish runs to benefit native resident fish and wildlife by increasing the prey base and nutrient cycling, and reducing constraints on resident fish management actions through more normative management actions for anadromous fish. Direct management actions include restoring free-flowing river reaches and associated riparian habitats (Framework Concept Paper 6). Increase the abundance of adfluvial and migratory resident fish to distribute energy and nutrients within freshwater areas, especially above anadromous blockages (Draft Framework Alternative 1).

Research, Monitoring, and Evaluation:

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

*Cease introductions of exotic fish and wildlife species (Sample Action).*

Discourage proliferation of non-native species and conditions favoring non-native species (Framework Alternative 1). Avoid the introduction of unwanted exotic species and control the deliberate introduction of desirable exotic species in the lower Columbia River and estuary (LCREP). The ecosystem would be restored and managed primarily with respect to native fish, wildlife and plant species (Draft Framework Alternative 5).
1-4 Wildlife
Restore river health, thereby restoring fish and wildlife in conditions under which they evolved (Framework Concept Paper 2).
1-5 Predators of Anadromous Fish
Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Increased amount of riparian vegetation will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1). Restore natural biological communities in tributary streams such that they exhibit natural predator/prey relationships (Draft All-H paper Dec. 1999). Restore more natural predator-prey conditions (e.g., broader food base for aquatic, terrestrial and avian predators (Framework Concept Paper 6). Reduce non-native predators (Framework Concept Paper 1). Remove Rice Island. Don't relocate the terns (Public Meeting). <sup>1</sup>
1-6 Watersheds
Restore natural processes throughout entire watershed and ecosystem. Identify, protect, and restore aquatic refuges and reserves. Restore damaged riparian areas and watersheds, re-establish more natural streamflows; and let floodplains be floodplains (Framework Concept Paper 1). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision). Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000). Implement wetland restoration and management practices that help maintain stream flows, filter pollutants, and provide flood storage (Draft All-H paper Dec. 1999). Support water acquisitions using federal funding (Final All-H Paper Dec. 2000). Restore soil, riparian vegetation and re-create wetlands (Framework Concept Paper 3).  Re-establish ecological linkages in watersheds, linking the aquatic system with the terrestrial. This should also include watersheds where dams create an ecological barrier, isolating a portion of the river from others (Framework Concept Paper 10).  Emphasize watershed restoration in all management decisions and reduce commodity subsidies that harm salmon and steelhead habitat (Framework Concept Paper 1). Develop floodplain management and shoreland zoning protection programs (LCREP). <i>[Encourage]</i> non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000). Return water to streams throughout the basin to recreate natural flows and hydrograph of pre-dam and pre-diversion conditions (Framework Concept Paper 1).
1-7 Tributaries
Focus intensively on improvements in both the mainstem sections of the Columbia and Snake Rivers and their tributaries. Protect, connect, and restore habitat on the tributaries throughout the basin (Framework Alternative 1). Manage river regulation of tributaries to remove thermal blockages that impede biological exchange within the basin (Draft Framework Alternative 2,3). Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000). Coordinate mitigation plans with system operating plans, reclaiming spawning and rearing habitat by opening migration corridors and repairing degraded tributaries. Coordinate funding among federal, state, and private sources (Framework Concept Paper 2).  Management actions to implement instream flow protection for small streams and tributaries throughout the region include: 1) supporting agency efforts to address small stream and tributary streamflow issues, including information gathering and analysis, and development of policies and programs; and 2) seeking out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows. Stakeholders include water right holders; watershed councils and other community groups; non-governmental organizations including land and water trusts; and federal, state and local governmental agencies and tribes (Framework Concept Paper 17).  Re-establish sources of large woody debris for each stream adequate to maintain long term supply and to meet the structure and nutrient needs of the stream (Framework Concept Paper 10).  Protect and restore degraded habitats in tributary watersheds. Emphasize the use of natural processes to restore native habitat characteristics and ecological functionality. Use minimal structural or other actions to restore these habitats. Restore normative seasonal flow patterns in tributaries through voluntary measures. Remove or bypass physical or biological impediments (e.g., culverts, highways and railroads) that fragment habitats for different species and life

<sup>1</sup> Pasco Public Meeting

stages and between aquatic and terrestrial areas (Draft Framework Alternative 6; Framework Concept Paper 21). Outside of major urban areas, develop incentives, zoning or other measures to protect riparian areas and to allow normative development of riparian zones (Draft Framework Alternative 6).

Reclaim spawning and rearing habitat by reopening access to fish migrations and repairing degraded tributaries (Framework Concept Paper 8). Establish instream flows in tributaries that reflect natural seasonal flow patterns. Restore natural biological communities in tributary streams such that they exhibit natural predator/prey relationships (Draft All-H paper Dec. 1999, derived from the draft NPPC Multi-Species Framework Alternatives). Provide instream flows adequate to support the natural functioning of small streams and tributaries as part of the Columbia River Basin's natural ecosystem (Framework Concept Paper 17).

*Research, Monitoring, and Evaluation:*

With the Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000). Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

Develop and implement TMDLs for anadromous fish tributaries within five years. Coordinate TMDL and Water Quantity planning assessments with NPPC program. Provide TMDL technical assistance to states (Final All-H Paper Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

1-8 Mainstem Columbia

Focus intensively on improvements in both the mainstem sections of the Columbia and Snake Rivers and their tributaries (Framework Alternative 1). Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures; add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; mimic natural hydrographs to the extent practicable; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper Dec. 1999).

Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP). Implement restoration programs (BPA) (Final All-H Paper Dec. 2000). Protect Hanford Reach (FWS, DOE) (Final All-H Paper Dec. 2000). Designate Hanford Reach under the Federal Wild and Scenic Rivers Act; re-establish normative river conditions there (Tribal Vision). Evaluate opportunities to improve spawning habitat in the Ives Island area (Final All-H Paper Dec. 2000).

[Implement] significant land use changes on both public and private lands (Framework Alternative 1). Mainstem habitat is returned to natural conditions that are linked to a downstream passage survival rate closer to that which existed prior to construction of the dams (Spirit of the Salmon).

*Research, Monitoring, and Evaluation:*

The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, federal, tribal, and Canadian agencies in developing its analysis. Within 6 months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids). A final study plan shall be provided to NMFS and all interested agencies 4 months after submitting the draft plan for review. The Corps shall provide a draft feasibility

analysis to all interested agencies, NMFS, and the peer-review panel by September 2005 (NMFS Biological Opinion Action Table Dec. 2000).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000). BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be reported annually (NMFS Biological Opinion Action Table Dec. 2000).

#### 1-9 Reservoirs

*No reservoirs at John Day, McNary and four Lower Snake project sites, except those created by natural conditions. Reservoirs at other dams may be drawn down (Sample Actions).*

The Action Agencies will work with the Service and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

#### 1-10 Estuary and Ocean

*Restore estuaries to pre-settlement conditions. Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Naturally restore estuarine habitats from shore to deep water (Sample Actions).*

Re-establish normative estuarine conditions to expand the size of the estuary and increase its productivity (Draft Framework Alternative 2, 3,5).

Restore estuarine conditions that provide for adequate prey production, cover and habitat complexity for both smolts and returning adults. Restore quantity and quality of shallow water estuarine habitats (e.g., wetlands and marshes, tidal channels, submerged aquatic vegetation) to those that will support natural aquatic communities. Restore estuarine flow, sediment, and nutrient levels to those that support natural aquatic communities. Restore estuarine temperature, turbidity, bacteria, dissolved oxygen and gas and salinity concentrations that support natural aquatic communities (Draft All-H paper Dec. 1999). Reestablish floodplains, wetlands and estuary areas to promote passive flood control, develop spawning and rearing habitat and enhance water quality (Framework Concept Paper 7). Restore 3,000 acres of tidal wetlands along the lower 46 river miles to return tidal wetlands to 50 percent of the 1948 level (LCREP).

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower

Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000).

Prioritize habitats for protection and restoration (2001) (LCREP) (Final All-H Paper Dec. 2000).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Facilitate Lower Columbia River Estuary Program implementation (LCREP, EPA). Strengthen Lower Columbia River Estuary Program authority (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); Establish Greenway Habitat Protection Fund to protect 10,000 acres of wetlands; 3,000 acres of upland (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

- Habitat mapping and priorities for protection or restoration
- Habitat acquisition/protection
- COE habitat restoration
- Monitoring
- Public education and outreach.

Research, Monitoring, and Evaluation:

Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

1-11 Water Quality

Improve water quality through watershed habitat improvements and compliance with federally approved state and tribal water quality standards. Establish sediment regimes (input, storage, transport) consistent with those under which the aquatic ecosystem evolved (Draft All-H paper Dec. 1999).

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3).

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Determine water quality standards for fish habitat—for example, water temperatures can be no higher than 60°F. If standards are not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP). Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1). Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon).

Limit the amount of sediment in spawning habitat and in streams generally (Sprit of the Salmon). BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion Action

<p>Table Dec. 2000).</p> <p>Within 2 years from the date this [2000 Biological Opinion] is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>Support TMDL development and implementation (BPA) (NMFS Biological Opinion Action Table Dec. 2000; Final All-H Paper Dec. 2000). The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>By June 30, 2001, the Action Agencies shall develop and coordinate with the Service, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).</p>
<p><b>2 HARVEST</b></p>
<p><i>Develop stable system capable of supporting sustainable fish populations and harvest, equal to the level of historical (pre-dam) conditions (Sample Action).</i></p> <p>Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1). The needs of the ecosystem with regard to native fish and wildlife take precedence over other management objectives such as harvest (Draft Framework Alternative 1).</p>
<p><b>2-1 Anadromous Fish</b></p>
<p>Reduce virtually all fishing except that related to tribal ceremonial and subsistence purposes (Framework Alternative 1).</p> <p>Require that fish be caught in their rivers of origin (Framework Alternative 1). Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1). Impose sanctions on nations that illegally catch salmon and steelhead (Framework Concept Paper 1).</p> <p>Establish escapement objectives by population in each watershed that maintain natural selection and nutrient enrichment of streams with salmonid carcasses (Framework Concept Paper 10).</p>
<p><b>2-2 Resident Fish</b></p>
<p><i>Cease stocking. Attempt to eliminate introduced species (Sample Action).</i></p> <p>Reduce virtually all fishing except that related to tribal ceremonial and subsistence purposes (Framework Alternative 1).</p> <p>Develop stable system capable of supporting sustainable resident fish populations and harvest, equal to the level of historical (pre-dam) conditions (Framework Concept Paper 13). <i>[Most harvest eliminated in the short term.]</i></p> <p>Continue to suspend stocking of fluvial rainbow trout in tributaries utilized by adfluvial rainbow trout (Framework Concept Paper 13).</p>
<p><b>2-3 Wildlife</b></p>
<p><i>Allow hunting for subsistence purposes, if ecological balance is maintained, and to control nuisances. Manage populations to the carrying capacity of available habitat (Sample Action).</i></p>
<p><b>3 HATCHERIES</b></p>
<p>Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources <i>[extremely endangered species]</i> (Framework Alternative 1).</p> <p>Protect and enhance naturally spawning Columbia Basin fish and wildlife populations. This includes all salmonids and wildlife native to the Columbia Basin. Honor tribal rights, including treaty fishing rights, to catch fish for ceremonial and subsistence purposes. Sustain viable sport fisheries. Sustain viable commercial fishery (Framework Concept Paper 20).</p> <p>Expand the safety net program for the most at-risk populations; use a variety of conservation hatchery techniques to aid the recovery effort (NMFS/BPA/USFWS) (Final All-H Paper Dec. 2000).</p>

Implement aggressive monitoring & evaluation programs to reduce uncertainties, e.g., hatchery/wild fish interactions, the effectiveness of hatchery spawners, etc., and assess performance of conservation efforts (Final All-H Paper Dec. 2000).
3-1 Anadromous Fish
Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources (Framework Alternative 1). Do not accept artificial production in lieu of habitat protection. Use funds saved by downsizing hatchery programs to restore habitat (Framework Concept Paper 1).
3-2 Resident Fish
Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources (Framework Alternative 1).
4 HYDRO
Support those measures that restore or mimic natural functions (Framework Alternative 1). Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1).
The Action Agencies shall coordinate with NMFS, USFWS, and the states and tribes in pre-season planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2) (NMFS Biological Opinion Action Table Dec. 2000).
4-1 Dam Modifications and Facilities
Breach or lower one or more mainstem dams to re-establish riverine conditions in the mainstem Columbia and Snake rivers (Draft Framework Alternatives 1,2,3). Breach the John Day, McNary, and four Lower Snake dams (Framework Alternative 1). <i>Dams that remain may be drawn down (either seasonally or year-round) or operated to achieve a natural hydrograph, to the extent possible (Sample Action).</i>
Adopt mitigation measures, up to and including modifications and removal of dams, which are consistent with the ISAB recommendations to create a more natural or "normative" river system. On non-federal dams, remove projects for which it is extremely costly or difficult to adequately mitigate the adverse impacts (e.g., Condit, Enloe) (Framework Concept Paper 1; Framework Concept Paper 21). On other non-federal dams, utilize relicensing or license reopener clauses, to adopt mitigation measures consistent with the ISAB recommendations to create a more natural or "normative" river system (Framework Concept Paper 1).
Change from an engineering driven process to an environmental science driven process that results in aquatic environments conducive to productive populations that are capable of sustaining the future populations of the Pacific Northwest (Framework Concept Paper 15).
Compare the structure of the dams with the natural river structure to see what dimensions of the dams are outside of the ranges of the natural river structures (Framework Concept Paper 15).
Develop conceptual modifications for all of the hydropower projects that incorporate the river structure dimensions into the structure of the dams so that the fish can pass in safety with sufficient quantity and quality of flow to ensure a healthy and productive environment for all aquatic life (Framework Concept Paper 15).
Evaluate feasibility of breaching (B1, B2) John Day Dam, and implement by 2012 (Framework Concept Paper 6).
Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).
Redesign the dams to mimic the natural aquatic bathymetric structure using Wheels, Pools, and Falls approach to mitigation of hydroelectric project impacts in the Columbia Basin (Framework Concept Paper 15).
Set up a systematic process whereby other dams (irrigation, navigation, flood control, etc..) in the Columbia River Basin and the impacts of such projects on ecological processes are identified, quantified, and addressed (Framework Concept Paper 5).
Achieve natural river-level drawdown of lower Snake projects (partially dismantling Lower Granite, Little Goose, Lower Monumental, and Ice Harbor by removing the earthen portion of each dam by spring 2005) (Framework Concept Paper 2).
In the Snake River (Objectives 1-3): achieve objectives for all Snake River stocks by implementing natural river in the

lower Snake by 2005 (bypass 4 dams, removing the earthen portion of Lower Granite, Little Goose, Lower Monumental, Ice Harbor) (Framework Concept Paper 2).

Remove existing extended length turbine intake screens; halt construction of new screens; consider removing existing standard length screens (Tribal Vision).

The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

4-2 Hydro Operation

*Draw down, breach, or remove Lower Snake dams, John Day, and McNary (Sample Action).*

Provide a more normative hydrograph in the Columbia and Snake rivers to create and maintain mainstem riverine habitats in unimpounded areas. This would move away from an emphasis on minimum flows toward a regime that would include periodic flooding and droughts between years and smooth ramping to and away from the spring freshet within a year (Draft Framework Alternative 1).

Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).

4-3 Spill

*Some spill would be used for flood control purposes. Storage of water would be limited in order to create a more natural hydrograph (i.e., closer to what existed prior to the construction of storage dams) (Sample Action).*

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

4-4 Flow

Augment/manipulate flows and storage volumes to more closely approximate the natural historic hydrograph (Tribal Vision). Restore natural river levels and hydrograph to lessen impacts to natural ecosystem (Framework Concept Paper 4).

Manage flows in the Hanford Reach to match natural seasonal and daily patterns (Framework Alternative 5). Implement a normalized annual hydrograph below Priest Rapids (Framework Concept Papers 2,5). In the Columbia, the development of normative flow conditions with flow augmentation from the Upper Columbia and IRCs at storage projects (would) create a more natural hydrograph (Framework Concept Paper 5). Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 5). Restore normative flow conditions from Priest Rapids dam to the estuary, using spring and summer flow augmentation under a system operating plan that implements a normalized hydrograph. From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration (Framework Concept Paper 5).

Analyze the dynamics of the water flowing through the river structures and the ranges of the flow, velocity, head, turbulence and other parameters that would have occurred under the natural environmental fluctuations (Framework Concept Paper 15).

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of "Variable Q" flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H paper Hydro Option 2, Dec. 1999).

BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts

(NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Analyze the dynamics of the water flowing through the river structures and the ranges of the flow, velocity, head, turbulence and other parameters that would have occurred under the natural environmental fluctuations (Framework Concept Paper 15).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Kooconusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

#### 4-5 Reservoir Levels

Reduce the amount of water stored for hydropower production to provide for more natural flows, including periodic flooding and droughts to restore native plants (Framework Alternative 1). At other lower Columbia dams [*besides John Day and McNary, which would be breached under this Policy Direction*], operate at lowest possible reservoir elevation (generally MOP) (Framework Concept Paper 5).

Implement Integrated Rule Curves (IRCs) at upstream projects (e.g., Libby, Hungry Horse) to benefit resident fish and wildlife, and to restore a more natural hydrograph with no loss of flood controls (Framework Concept Papers 2,8,13).

BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

#### 4-6 Water Quality

*Adopt, monitor, and enforce strict water quality standards including turbidity, temperature, velocity, and pollutants (Sample Action).*

Enforce existing pollution control laws and meet the standards of the Clean Water Act (Framework Concept Paper 1). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of the flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

#### Research, Monitoring, and Evaluation:

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

The Action Agencies shall monitor the effects of TDG [*Total Dissolved Gas*]. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs (NMFS Biological Opinion Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the systemwide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG

levels associated with system spill (NMFS Biological Opinion Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with the Service, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall evaluate and report to the Service on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with the Service, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion Action Table Dec. 2000).

#### 4-7 Juvenile Fish Passage and Transportation

Eliminate fish transportation (Framework Alternatives 2,3; Framework Concept Papers 1,2,3,4; Tribal Vision; SOR FEIS Alternative 9a).

Eliminate juvenile fish transportation and allow fish to migrate on their own through the river in order to connect with selected adaptations such as travel time, feeding regimes, escaping overcrowding, disease transmission, suitable arrival timing to estuary, and normal levels of natural mortality (Framework Concept Paper 5).

All fish screens should be removed and transportation discontinued. It has been proven that bypass systems have a higher mortality than the turbines (Framework Concept Paper 11).

Barging of juvenile fall chinook from the Snake River would not be possible with this operation (SOR FEIS Alternative 5c).

Achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications (Framework Concept Paper 1).

#### 4-8 Adult Fish Passage

Re-connect instream aquatic habitats via the removal, modification or circumvention of physical or biological impediments (e.g., culverts, diversion structures, highways, high temperatures) to passage (Draft All-H paper Dec. 1999).

Achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications (Framework Concept Paper 1). Make low-cost capital improvements to enhance in-river migration (e.g., gas abatement deflectors, adult fish ladder improvements, and experiments with low-cost notched spill gates for juvenile passage). At The Dalles, evaluate measures to reduce passage problems caused by the unusual configuration (Framework Concept Paper 2).

In the mid- and lower-Columbia (Objectives 4-6): achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications. Restore normative flow conditions from Priest Rapids dam to the estuary, using spring and summer flow augmentation under a system operating plan that implements a normalized hydrograph. Implement Integrated Rule Curves (IRCs) at upstream projects (e.g., Libby, Hungry Horse) to benefit resident fish and wildlife, and to restore a more natural hydrograph with no loss of flood controls (Framework Concept Paper 2).

Study the natural aquatic environment to determine the dimensions of the river structures—pools, falls, rapids, and habitat—that proved to be safe for fish passage as demonstrated by the existence of healthy productive populations (Framework Concept Paper 15).

Implement state fish passage regulations (e.g., WAC 220-110-070 [Water Crossing Structures]; RCW 77.55.060 [Fishways required in dams, obstructions]; RCW 77.55.070 [Modify inadequate fishways and fish guards]; ORS 498.268 and ORS 509.605 through 509.645 [Maintenance of fish passage at all man-made in-channel obstructions in streams where fish are present]).

#### 4-9 Flood Control

*Flood control operations in remaining reservoirs would be conducted to mimic natural hydrology to extent possible (Sample Action).*

Allow seasonal flooding of mainstem areas within unimpounded reaches to restore floodplain conditions and vegetation patterns (Draft Framework Alternatives 2,3). Relax [and/or] seek flexibility in rigid flood control rule curves to re-create normative hydrographs and reclaim floodplains (Tribal Vision).

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8). Develop floodplain management and shoreland zoning protection programs (LCREP). Re-connect stream channels, flood plains, and wetlands such that inundation and water table elevation is consistent with naturally functioning patterns. [Encourage] wetland restoration and management practices that help maintain stream flows, filter pollutants, and provide flood storage (Draft All-H paper Dec. 1999).

Implement Integrated Rule Curves (IRCs) and careful use of VARQ flood control strategy at all storage projects except John Day and McNary, which would be breached under this Policy Direction (Framework Concept Papers 2, 8, 13). Create IRCs for projects that do not presently have integrated operational rules, by modeling watershed technology. (Significant expertise is readily available from scientists in Montana and the USACE.) Refine IRCs using a team of site-specific experts. After IRCs are developed, a system model with sufficient time resolution (e.g., weekly or daily) can incorporate operating rules at various dams (Framework Concept Papers 2,8).

Reduce reservoir drawdown and improve reservoir refill probability to assure a sustainable basin-wide operation for all native species and their prey in the Columbia River watershed. Replace static flow targets in the lower Columbia with attainable normative-type flow targets resulting from basin-wide application of IRCs (Framework Concept Paper 8). Implement IRCs and tiered flow regime from Libby Dam to provide sufficient flows and habitat for successful white sturgeon spawning and recruitment (Framework Concept Paper 13).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by

October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Authorize systemwide flood control review (Final All-H Paper Dec. 2000). By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

Authorize systemwide flood control review (Final All-H Paper Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, the Service and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion Action Table Dec. 2000).

**COMMERCE**

**5. POWER**

**5-1. Existing Generation**

Eliminate hydropower generation in the Lower Snake and reduce hydropower generation in the Columbia River (Framework Alternative 1). Breach Snake River dams as soon as Congressional authorization and appropriation occur (Draft All-H paper).

Natural river operation would eliminate the system's load-shaping and reduce average annual energy by taking turbines out of service (SOR FEIS Alternative 5c).

Provide support for increased electrical costs (Framework Concept Paper 5).

**5-2. New Generation**

*Invest in new sources of generation to replace hydroelectric power. Renewable and non-polluting technologies would receive first priority (i.e., wind and solar power, fuel cells); however, at least in the short term, thermal power generation would be used to replace most of lost hydropower capacity. Prices and incentives would encourage conservation (Sample Actions).*

### 5-3. Transmission Reliability

*Major changes to transmission system will be required if the Snake River dams are breached (refer to the Lower Snake Drawdown EIS). Additional changes not included in this EIS would also be required for the John Day and McNary dams' drawdown or breach. New power plants that are constructed to provide replacement power may also require transmission additions, depending on their location (Sample Action).*

*Changes in vegetation management maintenance practices to meet habitat requirements will require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as un-maintained areas becomes widespread and effective monitoring becomes impractical. Public safety is a direct concern both at individual sites and for power users that may be affected by the blackouts (Sample Action).*

*Reduced road densities on public lands could affect access to transmission facilities, which impairs the ability to perform maintenance in a timely manner, causing the potential for longer outages in emergencies (Sample Action).*

*Costs increase for routine maintenance practices as additional objectives are met (Sample Action).*

To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion Action Table Dec. 2000).

BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity (FWS Biological Opinion Dec. 2000).

## 6. INDUSTRY

### 6-1. Industrial Growth

*Provide strong incentives for "clean" industry, pollution abatement, reduced development impacts, and no new development on riparian or natural lands. Actively and passively restore abandoned riparian locations (Sample Action).*

*[Assume] increased facility deconstruction and material salvage (e.g., Deconstruction – Building Disassembly and Material Salvage: The Riverdale Case Study. Peter Yost and Eric Lund, Upper Marlboro, MD: NAHB Research Center 1997).*

Protect high quality aquatic habitat on private lands while allowing restricted use. *[Encourage]* urban storm runoff control, municipal waste management, road management, *[and]* obstruction removal (Human Effects Analysis Appendix D). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3).

Increase emphasis on eco-efficiency including the three Rs of conservation—reduce, reuse, recycle (e.g., World Business Council for Sustainable Development); and eco-effectiveness whereby all the products and materials manufactured by industry provide nourishment for something new after each useful life (e.g., Paul Hawken, *The Ecology of Commerce* 1993).

### 6-2. Aluminum and Chemical

*Eliminate or reduce to insignificance most discharges from aluminum and chemical facilities (Sample Action).*

Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP).

### 6-3. Mining

*Reduce polluting mining activities, and provide incentives for water quality improvements. Passively and actively restore abandoned mining sites (Sample Actions).*

Improve mining discharges *[and]* mining practices. Rehabilitate *[and reclaim]* marginal and closed mines (Human Effects Analysis Appendix D). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

<p>Implement recommendations from the International Institute for Environment and Development's Mining Minerals and Sustainable Development Project (e.g., <i>Planning for Outcomes: A Framework for the Consideration of Options</i> [<a href="http://www.iied.org/mmsd/index.html">http://www.iied.org/mmsd/index.html</a>]).</p>
<p>6-4. Pulp and Paper</p>
<p>Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes [<i>of the pulp and paper industry</i>] (LCREP).</p> <p>Increase emphasis on eco-efficiency including raw material reduction, reuse, and recycling (e.g., World Business Council for Sustainable Development).</p> <p>Promote the use of agricultural residues and other non-wood fibers in currently wood-dependent pulp and paper and building materials industries (e.g., <a href="http://www.fiberfutures.org">http://www.fiberfutures.org</a>).</p>
<p>7. TRANSPORTATION</p>
<p>7-1. Navigation and Barging</p>
<p><i>Commercial navigation on the lower Snake and mid-Columbia eliminated (Sample Action).</i></p> <p>Remove dikes and manage dredging and other measures to restore estuarine habitats. Manage dredging to avoid increased predation (Human Effects Analysis Appendix D).</p>
<p>7-2. Trucking and Railroads</p>
<p><i>Improve infrastructure to upgrade trucking and increase railroad volume (Sample Action).</i></p> <p>Provide support for alternative forms of transportation of agricultural and other products including improved rail service (Framework Concept Paper 5).</p>
<p>8. AGRICULTURE</p>
<p><i>Remove some agricultural lands from production and use natural processes to restore lands and water to the extent possible (Sample Action).</i></p> <p>Re-create key natural ecosystem components within which fish evolved and prospered. Do not attempt to circumvent natural ecosystem processes (Framework Concept Paper 9).</p> <p>BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000). Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).</p> <p>Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (e.g., Washington Forests &amp; Fish model) (Final All-H Paper Dec. 2000).</p> <p>Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).</p> <p><u>Research, Monitoring, and Evaluation:</u></p> <p>By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).</p>
<p>8-1. Irrigation</p>
<p><i>Emphasis on land retirement and passive restoration. Limit new irrigation, Substantially reduce existing irrigation, especially on dewatered tributaries, on riparian lands (for habitat), and for water temperature or other quality management (Sample Action).</i></p> <p>Restore normative seasonal flow patterns in tributaries through measures such as improved irrigation efficiency, use of xeric (less water intensive) crops, lease or sale of water rights or other voluntary measures (Draft Framework Alternative 2,3).</p>

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Framework Concept Paper 3).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Spirit of the Salmon). Maximize irrigation efficiency and decrease out-of-stream water withdrawals (Tribal Vision). Implement soil and water conservation practices that control erosion and runoff in order to reduce stream sedimentation, flooding, and bank erosion and those that help to maintain or improve base streamflows (Draft All-H paper).

Habitat objectives would be accomplished by land and water lease, purchase, subsidy and similar incentives (Human Effects Analysis).

Reduce existing permits for water withdrawal. Encourage cultivation of less water-intensive crops. *[Initiate more intensive]* agricultural water conservation, irrigation waste water treatment, and irrigation withdrawals screening (Human Effects Analysis Appendix D).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

#### 8-2. Pesticides and Agricultural Practices

*Substantially reduce use of pesticides (Sample Action).*

Reduce the use of pesticides in agriculture to lower input to terrestrial and aquatic areas (Framework Alternative 1,2,3).

Encourage integrated pest management and sustainable farming practices, and end inefficient, unauthorized, and illegal use of water (Framework Concept Paper 1). *[Encourage]* nutrient and pest management practices needed to limit delivery of pollutants that create eutrophic or toxic conditions for fish and other aquatic organisms (Draft All-H paper Dec. 1999). *[Encourage]* pesticide/herbicide reduction (Human Effects Analysis Appendix D).

Lower irrigation pumps to adjust to changed river levels (Framework Concept Paper 5).

*Eliminate agricultural practices in riparian areas and farmed wetlands; reduce and manage agriculture in upland areas, especially marginal farmland (Sample Action). Restore Prior Converted Croplands (Sample Action).*

Use federal and state cost-share programs to reduce the impacts of agricultural practices through water quality and habitat improvement (e.g., provide incentives for farmers and ranchers to establish riparian buffers through the Conservation Reserve Enhancement Program).

#### 8-3. Grazing

*Eliminate grazing in riparian areas; reduce and manage grazing in upland areas (Sample Action).*

Prevent damage to and destruction of riparian vegetation by fencing and other means, such as purchasing grazing permits and restore impacted riparian areas (Tribal Vision). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

*[Encourage]* nutrient and pathogen load reduction from grazing/agriculture. Reduce grazing impacts to riparian/aquatic ecosystem (Human Effects Analysis Appendix D).

#### 8-4. Forestry

*Eliminate timber harvest in riparian areas and aquatic buffer zones; reduce timber harvest in upland areas (Sample Action).*

Allow a more normative fire frequency on public forest lands within limits imposed by safety considerations. Allow a more normative fire frequency on private forest lands using incentives and similar means within limits imposed by safety considerations (Draft Framework Alternative 2,3; Human Effects Analysis Appendix D).

Reduce road densities on public forested lands (Draft Framework Alternative 2,3). Reduce forestry impacts to riparian/aquatic ecosystem. Limit size and frequency of clearcuts. Develop normative forest age structure. Provide gradual forest ecotones. Reduce forest road density (Human Effects Analysis Appendix D).

Restore vegetation patches, patterns, structure, and species composition to be more consistent with the landform,

<p>climate, and biological and physical characteristics of the ecosystem, and provide the source of habitat for terrestrial species. Manage disturbances to make vegetation patterns more consistent with their location in the landscape (ICBSDEIS, R-O2).</p>
<p><b>9. COMMERCIAL HARVEST</b></p>
<p><i>Eliminate most ocean harvest and freshwater mixed stock harvest; remaining commercial harvest is tribal (Sample Action).</i></p> <p>Promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).</p>
<p><b>10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT</b></p>
<p><i>Avoid new development on natural or riparian lands. Increase interjurisdictional coordination and planning for rural land development (Sample Action).</i></p> <p>Develop floodplain management and shoreland zoning protection programs (LCREP). Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).</p>
<p><b>11. RECREATION</b></p>
<p><i>Restrict recreation on rivers and riparian areas so that habitat can return to a natural balance without human interference. In the long term, recreation consistent with a natural hydrograph (i.e., whitewater rafting) would be gradually re-established (Sample Action).</i></p> <p>Use the Wilderness Act to promote a network of wild lands. Estimate the total economic benefits of wilderness by considering wilderness as a multiple-use resource that provides a multitude of benefits to the current generation as well as future ones (e.g., Pete Morton, <i>The Economic Benefits of Wilderness</i>, The Wilderness Society, Denver, CO 1999).</p> <p>Honor tribal rights, including treaty fishing rights, to catch fish for ceremonial and subsistence purposes (Framework Concept Paper 20).</p>
<p><b>TRIBES</b></p>
<p><b>12-1. Tribal Harvest</b></p>
<p><i>Tribal harvest would be limited to ceremonial and subsistence only. Commercial fishing would be eliminated (Sample Actions).</i></p> <p>Restore tribal fisheries at all usual and accustomed fishing sites (Spirit of the Salmon). Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27). Take habitat actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).</p> <p>Decrease/eliminate artificial fish production overall (FC All-H paper).</p>
<p><b>12-2. Tradition, Culture, Spirituality</b></p>
<p><i>Passively restore ecosystem health and associated species. Over time, as the system is naturally restored, improve tribal well-being and the ability of tribes to exercise their respective rights and to enjoy traditional values (Sample Action).</i></p> <p><i>Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Action).</i></p> <p>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 (Tribal Vision).</p> <p>Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-045). Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-061). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-069).</p>

# SAMPLE IMPLEMENTATION ACTIONS

## FOR THE

### WEAK STOCK FOCUS POLICY DIRECTION

Emphasizes *human intervention to support recovery* of weak stocks of fish and wildlife populations that are listed or proposed for listing under the Endangered Species Act or other legal protections.

#### FISH & WILDLIFE

##### 1 HABITAT

Implement actions that result in the best survival of listed stocks (ESA-listed anadromous salmonids) (Framework Concept Paper 6). The ecosystem recovers depleted populations to the point of self-sustainability with a very low probability of extinction in the foreseeable future (Draft Framework Alternative 2,3,4,5). Minimize short-term risk, especially to threatened, endangered or proposed species, important species habitats, and riparian areas (ICBSDEIS Alternative S2). Increase the overall productivity and resilience of the Columbia River ecosystem by stopping the loss of biological diversity of fish, wildlife, and plants, especially those listed under the Endangered Species Act (Framework Alternative 2,3,5,6). Contribute to recovery of federally listed or proposed species (or subspecies or populations) across their ranges by maintaining and restoring habitat quality, quantity, and effectiveness (ICBSDEIS, B-O52).

Establish a basin-wide policy for the conservation of native wild populations, their population structure and biological diversity (Framework Concept Paper 10). Conserve and restore different types of habitat and corridors between those habitats within each ecosystem, preserve genetic diversity (Framework Concept Paper 1).

Balance the need for restorative actions to address long-term threats to listed and proposed species with the short-term need to protect listed and proposed species (ICBSDEIS, B-O53). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Specific habitat components or features that contribute to the viability of species should be maintained and, where needed, restored. These features include, but are not limited to caves, mines, cliffs, talus or burrows (ICBSDEIS, B-O46).

Protect, connect, and restore key habitats (Framework Alternative 3). Increase habitat connections throughout the basin (Framework Alternative 1,2,5). Manage public lands, which provide critical wild salmon habitat, for the benefit of salmon (Framework Concept Paper 1).

Improve measurements of survival through all salmonid life stages to identify high mortality areas and reduce mortality (Framework Concept Paper 26).

Percent of fish and wildlife budget in a subbasin should match the percent of impact to that subbasin. Strategies: CBFWA should develop a formula for dividing up recovery efforts based on miles of river impacted, acres of reservoir created, and wildlife units lost. Funding should then follow similar distribution (Framework Concept Paper 22).

Review existing laws that are destructive to habitats that are critical for indigenous species (Framework Concept Paper 4).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' we are supporting the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

The timeframe for seeing change in the ecosystem must also be defined before any mitigative measures are undertaken (Framework Concept Paper 16).

Use and improve computer models to assemble existing data and relationships to predict effects on salmon and steelhead from management actions (Framework Concept Paper 26).

<p>Protect weak salmon and its habitat in order to maintain resource productivity (Framework Concept Paper 19).</p> <p>Establish and apply an effective management system to control human activities that affect salmon (Framework Concept Paper 19).</p> <p>Geographic areas with the highest potential for increasing numbers of naturally spawning fish will be emphasized (Framework Concept Paper 20).</p> <p>Focus greater emphasis on areas of the salmonid ecosystem that have not traditionally received much attention (e.g., estuary/ocean) (Framework Concept Paper 20).</p> <p>Protect existing high quality habitat and improve degraded habitat. If savings can be found in existing management actions, the savings will be applied to the most critical fish and wildlife activities (Framework Concept Paper 20).</p> <p>Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision).</p> <p>Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1). Land and water users and managers should meet specified habitat conditions associated with targeted salmon survival rates (Framework Concept Paper 3).</p> <p>State, tribal, local, and federal entities would significantly increase their level of coordination, planning and habitat implementation. There would also be an increase in federal funding for habitat assessments, plans, immediate actions, and monitoring. Initially, there would be an increased allocation of federal funds to assessments and planning that would precede all but immediate actions. Immediate actions would reduce imminent risks and immediately improve survival (Draft All-H Paper Habitat Option 2, Dec. 1999).</p> <p>Increase regulation by the federal agencies under the CWA and ESA, to be implemented if the region cannot develop a coordinated plan with state and local governments (Draft All-H Paper Habitat Option 3, Dec. 1999).</p> <p>A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of conservation options that it could choose to support. These choices would include: purchasing land to establish preserves, purchasing conservation easements, paying bounties for endangered species on private lands, buying conservation contracts, offering grants or low-interest loans to conservation projects, and conducting research (with a small, fixed percentage of the fund) (O'Toole 1993; Thoreau Institute).<sup>1</sup> The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).</p> <p>The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the level of FCRPS funding to develop and implement a basin-wide hierarchical monitoring program. This program shall be developed collaboratively with appropriate regional agencies and shall determine population and environmental status (including assessment of performance measures and standards) and allow ground-truthing of regional databases. A draft program including protocols for specific data to be collected, frequency of samples, and sampling sites shall be developed by September 2001. Implementation should begin no later than the spring of 2002 and will be fully implemented no later than 2003 (NMFS Biological Opinion Action Table Dec. 2000).</p>
<p>1-1 Anadromous Fish</p>
<p>Implement actions that result in the best survival of listed stocks (ESA-listed anadromous salmonids) (Framework Concept Paper 6). Give the highest priority to protecting the habitat for fish that reproduce in the wild (Framework Concept Paper 22). Actively restore watersheds where salmon populations are in imminent danger of extirpation (Framework Concept Paper 3; Spirit of the Salmon). Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3).</p>

<sup>1</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:  
<http://www.teleport.com/~rot/schaerer.html#RTFToC2>  
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Based on the historical strengths of the Columbia River, increase the abundance and resilience of chinook salmon with the ocean-type life history by providing or restoring spawning and rearing habitats in main-stem and lower tributary areas (Draft Framework Alternative 5; Draft Framework Alternative 6).

Rebuild Snake River fall chinook in the Blue Mountains ERU by attaining a 2-6% adult return rate (to Snake-Clearwater confluence, by restoring spawning habitat in the lower Snake, by substantially improving smolt survival from the mouth of the Clearwater to the mouth of the Snake, and by normalizing flows in existing habitat below Hells Canyon dam (Framework Concept Paper 2).

Recover Snake River sockeye by attaining a 1.5-2.0% adult return rate to Redfish Lake, in the Central Idaho Mountains ERU (Framework Concept Paper 2).

Increase connections within freshwater areas to facilitate wide distribution of energy and nutrients within the system. Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Closely and continuously monitor tributary production and escapement to improve management (Tribal Vision).

Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Restore and maintain flow regimes sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient and wood routing (ICBSDEIS, R-O7). Restore and maintain the timing, variability, and duration of floodplain inundation and water table elevation (ICBSDEIS, R-O8). Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

Protecting and recovering salmonids and other aquatic species requires protecting land on and around fish-bearing streams. Building upon successes elsewhere, we endorse creation of salmon sanctuaries that protect key aquatic habitats and related uplands through voluntary conservation easements, leases, land purchases, and tax-incentive donations. The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish (Governors' Recommendations, July 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall study the feasibility (including both biological benefits and ecological risks) of habitat modification to improve spawning conditions for chum salmon in the Ives Island area (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall fund actions to improve and restore tributary and mainstem habitat for Columbia River chum salmon in the reach between The Dalles Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall investigate and partition the causes of mortality below Bonneville Dam after juvenile salmonid passage through the FCRPS (NMFS Biological Opinion 2000 Action Table Dec. 2000).

In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improve existing habitat and fully evaluate passage opportunities through relicensing and Section 7 consultation for Idaho Power Company dams (Final All-H Paper Dec. 2000).

Through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM) (Final All-H Paper Dec. 2000).

Implement multiple-scale assessments and data management systems (USFS, BLM) (Final All-H Paper Dec. 2000).

Accelerate land acquisition, using LWCF funds prioritizing fish habitat (USFS, BLM). Protect existing high quality habitat and accelerate restoration in high priority subbasins. Complete HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall continue to fund studies that monitor survival, growth, and other early life history attributes of Snake River wild juvenile fall chinook (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Initiate at least three tier studies (each necessarily comprising several sites) within each ESU (a single action may affect more than one ESU). In addition, at least two studies focusing on each major management action must take place within the Columbia River basin. The Action Agencies shall work with NMFS and the Technical Recovery Teams to identify key studies in the 1-year plan. Those studies will be implemented no later than 2003 (FCRPS Biological Opinion 2000).

1-2 Resident Fish

Increase the abundance and resilience of bull trout, burbot, cutthroat trout and other native aquatic species by providing or restoring spawning and rearing habitats in areas above anadromous fish blockages. It is recognized that non-native species may be important components of these communities in some cases, however, the focus is on development of native habitats and communities (Draft Framework Alternative 2,3).

Restore ecosystem components that were represented by healthy anadromous fish runs to benefit native resident and wildlife by increasing the prey base and nutrient cycling, and reducing constraints on resident fish management actions through more normative management actions for anadromous fish (Framework Concept Paper 6).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to determine the movements of bull trout from the Hood River and other tributaries into Bonneville Dam reservoir (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, and the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate re-establishment of fluvial bull trout in the Klickitat River (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine use and suitability of bull trout habitat for all life history stages in the Lower Columbia River (FWS Biological Opinion Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Discourage proliferation of non-native species (Framework Alternative 3,12).

Attention should be given to controlling or eliminating exotic fish that prey on and displace anadromous salmonids (Framework Concept Paper 11).

1-4 Wildlife

Determine problem areas for wildlife (blocked migration corridors, staging areas, etc.); mitigate for displaced wildlife and their habitat (Tribal Vision). Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 5).

Watershed improvements for salmon and steelhead and resident fish will benefit other aquatic, wildlife and plant species as well (Draft All-H paper Dec. 1999).

Increase the abundance and range of existing populations and habitats. Expand and connect existing habitat pockets to facilitate development of normative population structures for aquatic communities. Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 1). Implement vegetative practices that provide suitable cover to control erosion and runoff as well as provide food and shelter for wildlife (Draft All-H Paper Dec. 1999).

Specific habitat components or features that contribute to the viability of species should be maintained and, where needed, restored. These features include, but are not limited to caves, mines, cliffs, talus or burrows (ICBSDEIS, B-O46). Develop broad-scale connectivity/linkages of wide-ranging carnivore habitat (ICBSDEIS, B-O49). Minimize isolation of wide-ranging carnivore populations (ICBSDEIS, B-O50). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects (Council's 2000 Fish and Wildlife Program).

1-5 Predators of Anadromous Fish

Immediately authorize expanded predator controls (MMPA) (Final All-H Paper Dec. 2000). Improve predator control (including developing a sea bird management plan) (COE, NMFS, FWS) (Final All-H Paper Dec. 2000). Reduce predator populations in the mainstem and estuary (Framework Concept Paper 25). Create and maintain sufficient activity on Rice Island to discourage occupation by Caspian Terns and Cormorants that prey on smolts, and if necessary make changes to the island that discourage avian predator habitat (Framework Concept Paper 27). Reduce predator populations in the mainstem and the estuary (Framework Concept Paper 25). Discourage proliferation of non-native species (Framework Alternative 3,12). Attention should be given to controlling or eliminating exotic fish that prey on and displace anadromous salmonids (Framework Concept Paper 11). Take direct action to control the bird population on Rice Island, marine mammals, and Northern pikeminnow that prey on salmon (Framework Alternative 7). Remove Rice Island. Don't relocate the terns (PM).<sup>2</sup>

Increased amount of riparian vegetation will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1). Rice Island and the peninsula at the mouth of the Walla Walla River should be planted in vegetation that discourages nesting of terns (Framework Concept Paper 11).

The Unified Regional Plan must address the full scope of the region's fish and wildlife resources and their interactions with each other, the economy and the interests of humans. For example, marine mammal populations and laws and policies that protect them must be balance with efforts to recover weak naturally spawning salmon and steelhead populations where marine mammal predation is a documented problem (Framework Concept Paper 14).

The legitimate, but disparate, focus of varying federal laws, including the Endangered Species Act, the Migratory Bird Treaty Act and the Marine Mammal Protection Act present management challenges as we seek to protect ESA-listed juvenile and adult salmon and steelhead that, in turn, are prey for the birds and mammals also protected by these laws. We support actions to improve the coordination among these laws so that they are not working at cross-purposes (Governors' Recommendations, July 2000).

We recommend that the U. S. Army Corps of Engineers (Corps), NMFS and the Fish and Wildlife Service develop a long-term management plan to address predation by fish-eating birds and marine mammals. The relocation of Caspian terns within the estuary was a good start but is not sufficient by itself. The number of Caspian terns, as well as that of double-crested cormorants, should be significantly reduced in the Columbia River Estuary. The Caspian tern predation rate on juvenile salmon and steelhead remains unacceptable, as is the inability of the federal agencies to agree upon a common approach and a lead agency status for this effort. We recommend that such an approach be presented to the region by the appropriate federal agencies by the end of the year. As part of the long-term management strategy for seals and sea lions, we recommend congressional approval of NMFS's Framework Concept Paper to acquire additional authority to take seals and sea lions that persistently impact listed salmonid species (Governors' Recommendations, July 2000).

We recommend changing existing sport fishing restrictions to concentrate on species that prey on, and compete with, salmon for food, including northern pikeminnow. Sport fishing regulation changes also should strive to minimize

<sup>2</sup> Pasco Public Meeting

effects of exotic species on native species. The region could experience short-term benefits from increased fishing opportunities for these competitor species (Governors' Recommendations, July 2000).

The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g., water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses at Bonneville Dam. The Corps shall work with NMFS, FPOM, USDA Wildlife Services, and USFWS on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies, in coordination with the Caspian Tern Working Group, shall continue to conduct studies (including migrational behavior) to evaluate avian predation of juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these predators (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall quantify the extent of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. A study plan shall be submitted to NMFS by September 30, 2001, detailing the study objectives, methods, and schedule. Based on study findings, and in consultation with USFWS and NMFS, the Action Agencies shall develop recommendations and, if appropriate, an implementation plan (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall recover PIT-tag information from predacious bird colonies and evaluate trends, including hatchery-to-hatchery and hatchery-to-wild depredation ratios (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS, shall investigate marine mammal predation in the tailrace of Bonneville Dam. A study plan shall be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish (NMFS Biological Opinion 2000 Action Table Dec. 2000).

1-6 Watersheds

Actively restore watersheds where salmon are in imminent danger of extirpation (Framework Concept Paper 3; Spirit of the Salmon). Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8).

Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

Actively restore watersheds where salmon populations are in imminent danger of extirpation. Use "Coarse Screening Process" to develop demonstration projects (Framework Concept Paper 3).

Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3).

Clearly anadromous fish are a key component to watershed and subwatershed interactions. Targeting appropriate experimental design strategies in combination with multi-scale landscape characterizations may produce a more informed understanding of species/habitat interactions. Initially, the interactions between the watershed and subwatersheds may be addressed. Most agencies have several years of data and local expertise relating to the

managed resource (Framework Concept Paper 24).

Establish reference watersheds and populations throughout the basin to serve as a control for management actions. Streams already included in this status are John Day, MF Salmon, and Wenaha. Reference watersheds should cover range of species and ecological conditions (Framework Concept Paper 10).

1) Construct a suite of coarse scale (1:24,000 base) ecological characterizations for each watershed (e.g., Grande Ronde Watershed); 2) Identify the available data that is ecologically relevant to the pattern of the managed resources; 3) Develop functional thresholds, which characterize significant (measurable) changes in the watershed; 4) Review and publishing of case studies that link abstract and empirical models; and 5) Target ecological functions and patterns at critical/ESA spatial scales (Framework Concept Paper 24).

Support watershed improvements and processes in the Oregon and Washington Plans (Framework Concept Paper 27).

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 by October 1, 2002. Plans for all watersheds in the Columbia River Basin should be developed by 2005 (Governors' Recommendations, July 2000).

Land and water users and managers should meet specified habitat conditions associated with targeted salmon survival rates (Framework Concept Paper 3). Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall initiate programs in three priority subbasins (identified in the Conceptual Recovery Plan) per year over 5 years, in coordination with NMFS, FWS, the states and others, to address all flow, passage, and screening problems in each subbasin over 10 years. Under the NWPPC program, BPA addresses passage, screening, and flow problems, where they are not the responsibility of others. BPA expects to expand on these measures in coordination with the NWPPC process to complement BOR actions (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for a program to acquire and digitize aerial or satellite imagery of the entire Columbia River basin once every 3 to 5 years (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement seven watershed restoration initiatives targeting core populations most at risk (USFS, BLM) (Final All-H Paper Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

*[Encourage]* non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion Action Table Dec. 2000; Final All-H Paper Dec. 2000).

## 1-7 Tributaries

*Prioritize tributary habitat restoration efforts to address stream reaches inhabited by weak stocks that are listed or proposed for listing under the ESA (Sample Action).*

Protect, connect, and restore habitat on the tributaries throughout the basin (Framework Alternative 1). To protect and recover tributary habitat, land and water users and managers must meet a series of habitat conditions associated with survival rates (Framework Concept Paper 3). Promote aggressive habitat recovery methods for tributaries and in the Columbia and Snake River mainstems that optimize spawning and rearing habitat, including breaching dams in the tributaries where biologically and economically feasible (Framework Concept Paper 7).

Test the effectiveness of restoring habitat in tributary watersheds (Framework Alternative 4).

Maintain and improve egg-to-smolt survival in natal tributaries (Framework Concept Paper 2).

Management Actions: The best available technology would be used to improve stream quality at a random selection of replicate streams in a watershed or ecosystem. Response variables would be measured annually with annual assessments comparing treated and nontreated/control streams. Decision rules and time frames would be established *a priori* to determine success of remediation actions. Different subsets of streams would receive different remediation actions to compare strategies and identify cost-effective approaches to stream-wide recovery (Framework Concept Paper 23).

Management actions to implement instream flow protection for small streams and tributaries throughout the region include: 1) supporting agency efforts to address small stream and tributary streamflow issues, including information gathering and analysis, and development of policies and programs; and 2) seeking out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows. Stakeholders include water right holders; watershed councils and other community groups; non-governmental organizations including land and water trusts; and federal, state and local governmental agencies and tribes (Framework Concept Paper 17).

Objective: Stream-wide recovery measured by improvements in adult salmon return numbers, spawner-recruit ratios, and fingerling-to-adult ratios would be the objective of adaptive management strategies. These measures of recovery provide integrated responses of survival and fecundity useful in monitoring environmental quality. The purpose of field trials would be to assess whether remediation actions enhance responses over yet nontreated control streams. Advantageous treatments would then be applied to new sets of streams for further comparison with prior treatments. A stair-step design would be implemented where adaptive management would test progressively better strategies for stream remediation based on prior field trial results. Strategy: The stair-step strategy to field testing progressively better remediation actions is motivated by large numbers of candidate streams and annual resources to address only some fraction each year. The experimental prerequisites of replication and randomization can be used to establish cause-and-effect linkages between remediation actions and improvements in survival and fecundity responses of salmonids. Environmental covariates concerning water quality, biotic responses of invertebrate populations, and habitat quality would be systematically measured to interpret variation in stream responses to remediation actions (Framework Concept Paper 23).

Re-establish sources of large woody debris for each stream adequate to maintain long term supply and to meet the structure and nutrient needs of the stream (Framework Concept Paper 10).

Operate fish weirs on spawning tributaries to assess adult escapement and potential introgression of hatchery fish into the spawning population. Weir tributaries to allow only wild fish pass above the weir to spawn (Framework Concept Paper 13).

For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

Fix flow, screening and passage problems in priority subbasins, beginning in 2001 in the Methow, Upper John Day

and Lemhi (Final All-H Paper Dec. 2000).

Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000).

Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Develop and implement TMDLs for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

Establish in-stream flows for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to determine the movements of bull trout from the Hood River and other tributaries into Bonneville Dam reservoir (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control) (NMFS Biological Opinion Action Table Dec. 2000).

#### 1-8 Mainstem Columbia

*Emphasize upper Columbia River spring chinook and steelhead, middle Columbia River steelhead, Willamette steelhead and other ESA-listed species; reduce hydro peaking (apply to more than mainstem Columbia). Use gravel from upstream to replenish mainstem spawning areas (Sample Actions).*

Provide habitat and conditions in the mainstem rivers to result in a high rate of survival for juvenile and adult migrating salmon and other fish species (Framework Alternative 2,3; orig. Framework Alternative 5). Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River. (LCREP). Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Use drawdown to test restoration effects on mainstem habitat (Framework Alternative 4).

Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; mimic natural hydrographs to the extent practicable; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper Dec. 1999).

Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5).

BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be reported annually (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000).

Implement restoration programs (BPA) (Final All-H Paper Dec. 2000).

Evaluate opportunities to improve spawning habitat in the Ives Island area (Final All-H Paper Dec. 2000).

Protect Hanford Reach (FWS, DOE) (Final All-H Paper Dec. 2000).

1-9 Reservoirs

Operate reservoirs and modify water diversions to provide optimum instream flows needed by salmon and other native aquatic species. (Framework Concept Paper 1). Provide instream and reservoir environmental conditions necessary to provide adequate survival of resident fish and other aquatic species. Explore ways to stabilize reservoir levels (Draft All-H paper Dec. 1999).

By October 1, 2002, the Corps shall develop and, if feasible, implement a revised storage reservation diagram for Libby Reservoir that replaces the existing fall draft to a fixed end-of-December elevation. One option is to evaluate variable drafts based on the El Niño Southern Oscillation Index (SOI) predictions or other forecast methodologies of runoff volume. To implement this change, the Corps shall complete successful coordination with Canada under the Columbia River Treaty (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-10 Estuary and Ocean

Re-establish normative estuarine conditions to expand the size of the estuary and increase its productivity (Draft Framework Alternative 2,3,5). Restore estuarine habitats by removing dikes and managing dredging and other navigational measures consistent with prudent safety considerations. Investigate, and where feasible implement, measures to restore normative input of sediment and organic matter into the estuary. Manage dredging in the estuary to minimize creation of habitats that artificially increase predation or have other adverse ecological effects (Draft Framework Alternative 5).

Protect and restore critical estuary habitat (Framework Concept Paper 3; Spirit of the Salmon). Restore 3,000 acres of tidal wetlands along the lower 46 river miles to return tidal wetlands to 50 percent of the 1948 level (LCREP). Restore 13,000 acres of tidal wetlands in the lower 46 miles of river and adjoining tributaries; take additional actions based on recommendations of LCREP, EPA and Corps study (to be conducted). Coordinate federal and state threatened and endangered species recovery activities in the lower Columbia River and estuary and help local communities meet species recovery requirements (LCREP).

Provide public information and education efforts about the lower river and estuary that focus on endangered species, habitat loss and restoration, biological diversity, and lifestyle practices and connections to the river (LCREP). *[Implement more]* public education and outreach (Final All-H Paper Dec. 2000).

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Between 2001 and 2010, the Corps and BPA shall fund a monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts (Management Plan Action 28) to address the estuary objectives of this biological opinion (NMFS Biological Opinion 2000 Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with

modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary [*and Columbia River Plume*]. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000).

Prioritize habitats for protection and restoration (2001) (LCREP; Final All-H Paper Dec. 2000). Facilitate Lower Columbia River Estuary Program implementation (LCREP, EPA; Final All-H Paper Dec. 2000). Strengthen Lower Columbia River Estuary Program authority (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); establish Greenway Habitat Protection Fund to protect wetlands and uplands (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

- Habitat mapping and priorities for protection or restoration
- Habitat acquisition/protection
- COE habitat restoration
- Monitoring.

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

Dedicate research funding to investigate ocean conditions and impacts on salmon including adequacy of the ocean food chain (Framework Concept Paper 27).

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

1-11 Water Quality

Emphasize a substantial and explicit tie between water quality compliance efforts (already under court orders in three states) and salmon recovery (Draft All-H Paper Habitat Option 2, Dec. 1999). Determine water quality standards for fish habitat -- for example, water temperatures can be no higher than 60°F. If standards are not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP). Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1,2,3,4).

Establish a sediment threshold for spawning areas that is not limiting to salmonid egg development and fry emergence (Framework Concept Paper 10).

Establish a temperature standard that is not limiting to salmonid adults, juveniles, and eggs (Framework Concept Paper 10).

Implement the Clean Water Act, including the timely development of total maximum daily load regimes and enforcement of state ambient water quality standards and designated waterway uses in Idaho, Montana, Oregon, and Washington (Framework Concept Paper 5).

Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Framework Concept Paper 3).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon). Remove toxic pollution sources and other contaminants. At a minimum, meet applicable water

quality criteria (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1). Limit the amount of sediment in spawning habitat and in streams generally (Spirit of the Salmon).

Enforce existing pollution control laws and meet the standards of the Clean Water Act (Framework Concept Paper 1). Implement increased regulation by the federal agencies under the CWA and ESA (Draft All-H Paper Habitat Option 2, Dec. 1999). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Establish a transboundary board in coordination with the International Joint Commission to improve water quantity and quality (Tribal Vision).

Acquire in-stream water rights/conservation easements to improve stream flows (Tribal Vision). Maximize irrigation efficiency; protect riparian vegetation via fencing or other methods; change land use activities/practices that degrade water quality (Tribal Vision). Restrict new dredging and improve existing dredging practices (Tribal Vision).

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 are concerned, however, that the timelines for these tasks be fully consistent with the timeline required for salmon recovery. Therefore, 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 (Governors' Recommendations, July 2000).

The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Support TMDL development and implementation (BPA) (Final All-H Paper Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Monitor existing water withdrawals; enforce existing regulations (Tribal Vision).

## 2 HARVEST

*Significantly reduce or eliminate harvest of weak fish stocks and wildlife species (Sample Action).*

Manage fisheries for the resource, not harvest (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5). Weak stock management reforms are permanent. Future increases in mixed stock area fisheries will depend almost entirely on increased production of weak natural populations and/or greater harvest selectivity (Draft All-H paper Dec. 1999). Target strong stocks [for harvest] and minimize impacts on weak and imperiled stocks (Framework Concept Paper 1).

Initially, harvest rates would be low in tributary, mainstem and ocean fisheries until measurable responses were obtained from combined actions, and then harvest rates would increase consistent with recovery and rebuilding goals (Framework Concept Paper 6).

Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5).

Expand genetic diversity by allowing sufficient escapement to achieve full seeding of each protected stock's spawning habitat (Framework Concept Paper 25).

Improve gear for selective harvests (Framework Concept Paper 27).

Manage harvest to protect weakest protected stocks (currently, ESA-listed stocks) to achieve adequate spawning ground escapement and seeding (Framework Concept Paper 26).

Manage for escapement to spawning grounds (Framework Concept Paper 27).

Place a moratorium on harvest of wild stocks in the mainstem, with tributary-by-tributary escapement goals for protected wild stocks. Mainstem harvest can be allowed only to the extent that the weakest wild stock subject to protection has adequate spawning escapement for adequate seeding (Framework Concept Paper 26).

Implement harvest actions that protect weak stocks (Framework Concept Paper 4).

Ensure adequate natural spawner escapement to streams (Framework Concept Paper 20).

Utilize production/harvest regimens that minimize impacts on naturally spawning populations, including mixed stock conflicts (Framework Concept Paper 20).

Implement region-wide and international management of harvest, including ocean (Framework Concept Paper 20).

We commit to support a recovery approach designed not only to achieve ESA de-listing 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. We respect the legal status and cultural importance of Indian treaty fishing rights. Changes in harvest management suggested below must be developed in partnership with the treaty tribes so they are consistent with the ongoing harvest and production litigation under *U.S. v. Oregon*, and also with federal and state governments to comply with the Pacific Salmon Treaty (Governors' Recommendations, July 2000).

#### 2-1 Anadromous Fish

Maintain escapements: the escapement goal is the annual number of adults, or a range of values, that the management entity intends to successfully spawn within a designated watershed (Framework Concept Paper 19). Allow enough wild salmon from each stock to escape harvest to spawn naturally and perpetuate the run (Framework Concept Paper 1).

Harvest rates should be set to ensure the productivity of the associated natural population. Manage salmon harvest to meet spawning and ecological escapement needs (Draft Framework Alternative 2,3).

Manage harvest to protect weak stocks by stopping All-Harvest of wild fish (Framework Alternative 7).

Where stock information is inadequate or absent, managers should acknowledge this uncertainty and manage conservatively. Harvest managers must acknowledge that salmon productivity varies over time and should act conservatively to account for limitations in assessment information and management capabilities (Council's 2000 Fish and Wildlife Program). Allow harvest only where impacts to wild fish are quantified and minimized (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5). Fish would be caught in their rivers of origin to emphasize benefits to local communities and to minimize impacts on weak wild stocks (Framework Alternative 1). Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5).

As part of the Pacific Salmon Treaty process, the Pacific Salmon Commission should adopt a coast-wide abundance-based regime for chinook to protect depressed and less productive natural stocks. This is extremely necessary for Columbia and Snake River chinook that traverse through and graze for much of their adult life in Gulf of Alaska or Canadian waters. Harvest impacts for chinook would be reduced to 50% total mortality throughout their range (Framework Concept Paper 5).

Conduct one-time purchase of replacement selective harvest gear for affected harvest interests with monies saved through operational changes at dams (Framework Concept Paper 26).

Establish a harvest management process that achieves escapement objectives and is accountable each year for those objectives (Framework Concept Paper 10).

Establish escapement objectives by population in each watershed that maintain natural selection and nutrient enrichment of streams with salmonid carcasses (Framework Concept Paper 10).

Redirect lower river mixed-stock commercial harvest to terminal harvest away from mainstem migration corridor. No improvement in upriver stocks is possible with present high levels of mixed stock harvest (Framework Concept Paper 26).

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and terminal harvest in tributaries (Framework Concept Paper 26).

Reduce mixed stock harvest and mark all hatchery fish to facilitate selective harvest. Eliminate or modify hatcheries and hatchery practices that negatively impact wild stocks (Framework Concept Paper 25).

Replace mixed stock fisheries with known stock fisheries with the purpose of achieving spawner abundance goals. The fisheries should be managed as a by-product of salmonid protection (Framework Concept Paper 10).

Selectively decrease commercial harvest of Columbia River salmon in the ocean by negotiating agreements with commercial fishing interests that provide economic incentives not to fish during return periods for designated stocks (Framework Concept Paper 27).

Shift to terminal fisheries to allow for selective stock harvest (Framework Concept Paper 27).

Work toward elimination of ocean salmon harvest, including treaty negotiations with Canada. If each country catches "its own" salmon, search, production and management costs of commercial salmon harvest will decrease, along with political friction (Framework Concept Paper 26).

Maintain salmon escapements within ranges necessary to conserve and protect potential salmon production and to maintain normal ecosystem functioning (Framework Concept Paper 19).

Harvest salmon in a manner consistent with the degree of uncertainty regarding the status and biology of the resource (Framework Concept Paper 19).

Maintain public support and involvement for sustained use and protection of salmon resources (Framework Concept Paper 19).

Geographic areas with the highest potential for increasing numbers of naturally spawning fish will be emphasized (Framework Concept Paper 20).

Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).

Buy selective gear for harvesters and by improving harvest enforcement (Framework Alternative 7).

Limit fishing during the Pacific Decadal Oscillation period and stop hunting endangered species on the way to their breeding grounds (PM).<sup>3</sup>

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000)

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Provide sufficient funding for managing fisheries and contributing to the transition to selective fisheries, and for the 1999 Pacific Salmon Treaty Agreement (Final All-H Paper Dec. 2000).

OCEAN FISHERIES:

<sup>3</sup> Pasco Public Meeting

Work toward elimination of ocean salmon harvest (Framework Alternative 7). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Eliminate certain fisheries, such as that in Southeast Alaska (Framework Alternative 4). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Implement the recently negotiated Pacific Salmon Treaty conditions for Alaskan and Canadian fisheries, except that additional voluntary reductions would be sought in these fisheries. All other harvest impacts on listed populations would be reduced to conservation crisis levels for a period of years, after which harvest could be adjusted (Draft All-H Paper Harvest Option 3, Dec. 1999). Renegotiate international treaties to prevent overfishing, provide conservation incentives, and impose sanction on nations whose fleets illegally catch salmon and steelhead (Framework Concept Paper 1).

Given that long-term, biologically based management for the ocean is now in place, other steps can be explored to reduce ocean impacts on listed fish through use of more selective fishing techniques and a license buyback program that can reduce the current excess fishing capacity. Additional opportunities may exist to align viable fisheries with the opportunities available through a license buyback program given the excess fishing capacity that currently exists.

Finally, a random-observer program is needed to ensure the collection of information necessary for managers and the industry to reduce salmon bycatch mortality (Governors' Recommendations, July 2000).

#### RIVER FISHERIES:

*Improve harvest data and stock information to promote better harvest management and protect weaker stocks (Sample Action).*

Implement conservation crisis levels, defined as levels similar to the 1999 harvest rates for listed spring/summer chinook, and comparable conservation crisis levels for listed Snake River fall chinook and listed steelhead. All of these rates would be frozen until recovery goals are achieved (Draft All-H Paper Harvest Option 3, Dec. 1999).

Ban harvest in the mainstem (Framework Alternative 7).

Implement the recently negotiated Pacific Salmon Treaty (PST) conditions in all ocean fisheries and, as contemplated in that agreement, further constrains U.S. fisheries south of Canada in some years if necessary to comply with the ESA. It would apply the constraints currently being developed for upper Willamette and lower Columbia chinook salmon. When abundance of listed stocks is similar to 1999, the in-river fisheries would be managed to limit impacts on listed summer chinook to 5 percent or less and on spring chinook to 7 percent or less. In-river fall fisheries would be managed so as not to exceed the 1999 harvest rate limits for Snake River fall chinook and B-run steelhead. In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as abundance increases (Draft All-H Paper Harvest Option 1, Dec. 1999).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper

Dec. 2000).

Pursue conservative harvest policies (weak stock management) (Final All-H Paper Dec. 2000).

Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-H Paper Dec. 2000).

#### 2-2 Resident Fish

*Eliminate bag limits on exotic predator fish in the mainstem; eliminate resident rainbow trout harvest in steelhead streams; harvest exotics and limit harvest on natives (rainbow trout seasons in anadromous streams) [Define or identify weak stocks.] (Sample Action).*

Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).

#### 2-3 Wildlife

*Protect fragile populations and their food sources. Enforce prohibitions on harvesting listed or candidate species (Sample Actions).*

Continue monitoring wildlife populations to determine success of measures; establish post-enhancement recovery goals and limits on harvest (Tribal Vision).

### 3 HATCHERIES

Enhance production of harvestable populations of salmon resources to the extent they can be harvested by means that do not interfere with quantitative stream escapement goals for naturally spawning salmon populations (Framework Concept Paper 14). Do not harm wild salmon stocks (Framework Concept Paper 1). Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

Experimentally manipulate hatchery releases. In a reverse staircase, hatchery releases would be initially reduced, and then increased, to provide contrast to treatments (Framework Concept Paper 6).

All management and action plans should be review by independent scientists. All assumptions should be displayed and the scientific basis for the action should be carefully defined so that it is subject to peer review (Framework Concept Paper 10).

Complete the review of, and alter where necessary, all federal (e.g., Mitchell Act and Lower Snake River Compensation Plan) and private- and public utility-sponsored (dams operated according to FERC license terms) hatchery mitigation programs to secure consistency with basin-wide wild fish escapement and production goals and objectives (Framework Concept Paper 5).

Design artificial propagation programs as monitored experiments; ensure reporting protocols are consistently updated and all facility operations subject to periodic independent scientific review (Framework Concept Paper 5).

Determine genetic and life history diversity of fish populations as a benchmark for management and recovery actions (Framework Concept Paper 10).

Establish a basin-wide policy for the conservation of native wild populations, their population structure and biological diversity (Framework Concept Paper 10).

Establish a licensing and review process for state, tribal and federal hatcheries that are periodically reviewed for relicensing. This would allow adaptive management to influence the operations of the hatchery (Framework Concept Paper 10).

Focus on wild native fish, while recognizing appropriate roles of hatchery and non-native fish where ecologically prudent (Framework Concept Paper 9).

Focus on listed anadromous fish, while optimizing benefits and minimizing risks to resident and non-listed anadromous fish. Wherever possible, options should provide complementary benefits among resident and anadromous fish, as well as native wildlife populations (Framework Concept Paper 9).

Maintain and protect population structure including small, less productive populations (Framework Concept Paper 10).

Preserve or enhance existing native stock structures and genetic diversity (Framework Concept Paper 9).

The Program should give the highest priority to protecting the habitat for fish which reproduce in the wild. Lower priority should be given to hatchery programs for fisheries which need a temporary boost (< one generation) to fill newly created habitat. Lowest priority should be given to hatchery programs which are long term and provide fisheries with low potential for becoming self sustaining. Hatchery programs for endangered species should be reviewed on a case by case basis (Framework Concept Paper 22).

Utilize production/harvest regimens that minimize impacts on naturally spawning populations, including mixed stock conflicts (Framework Concept Paper 20).

The manner of use and value of artificial production must be considered in the context of the environment in which it will be used (Council's Artificial Production Review, October 1999, Section II.D; Council's 2000 Fish and Wildlife Program). Artificial production must be implemented within an experimental, adaptive management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties. Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors. A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation. Appropriate risk management needs to be maintained in using the tool of artificial propagation (Council's 2000 Fish and Wildlife Program).

In recognition of the risk and uncertainty associated with artificial production, each artificial production activity must be approached experimentally with a plan detailing the purpose and method of operation, the relationship to other elements of the subbasin plan, including associated habitat and other projects within the subbasin plan, specific measurable objectives for the activity, and a regular cycle of evaluation and reporting of results. This approach will allow the region to address the remaining uncertainties on a case-by-case basis and quickly make adjustments in artificial production activities where warranted (Council's 2000 Fish and Wildlife Program).

Over the next three years, every artificial production program and facility in the basin, federal and non-federal, should undergo a review to determine its consistency with these strategies, scientific principles, and policies. After five years, the Council, other regional decision-makers and Congress should assess whether existing review, funding and planning processes are successful in implementing needed reforms in artificial production practices (Council's 2000 Fish and Wildlife Program).

Artificial production programs might be used to rebuild populations of fish that spawn naturally and also provide fish for tribal, sport and commercial harvest. In doing so, they should minimize the adverse impacts from interactions between artificially produced fish and those that spawn naturally. Interactions can adversely impact the unique genetics of fish that spawn naturally and, over time, dilute or weaken the unique genetic makeup of those populations (Council's Artificial Production Review, October 1999, Executive Summary Section III.B; Council's 2000 Fish and Wildlife Program).

Where the critical habitat is largely intact, artificial production is not currently occurring, and the fish population has good potential, then no artificial production should be used. Those populations and their associated spawning and early rearing habitat should be preserved and protected (Council's 2000 Fish and Wildlife Program).

Hatcheries intended solely to produce fish for harvest may be used to create a replacement for the lost or diminished harvest. The hatchery must be located and operated in a manner that does not lead to adverse effects on other stocks through excessive straying or excessive take of weak stocks in a mixed-stock fishery (Council's 2000 Fish and Wildlife Program).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for a hatchery research, monitoring, and evaluation program consisting of studies to determine whether hatchery reforms reduce the risk of extinction for Columbia River basin salmonids and whether conservation hatcheries contribute to recovery (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

*Research, Monitoring, and Evaluation:*

Establish an annual status review for each wild native population in the basin (Framework Concept Paper 10).

Review the hatchery program and its effect on native, wild salmonids and the ecosystem that supports them (Framework Concept Paper 10).

Increase the resources devoted to collecting and analyzing natural production information and data (Framework Concept Paper 5).

### 3-1 Anadromous Fish

Make careful use of some artificial methods such as hatcheries (Framework Alternative 3). Increase programs to conserve genetic resources, and significantly decrease mitigation programs below currently planned levels (Draft All-H Paper Hatcheries Option 3, Dec. 1999). For re-creating self-sustaining populations, stock fish that are as locally adapted and undomesticated as possible in as small an amount as possible for as few years as possible. Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1). Do not accept artificial production in lieu of habitat protection. Use funds saved by downsizing hatchery programs to restore habitat (Framework Concept Paper 1).

Allow hatchery programs to continue only where there is no impact to wild salmonids. Where hatchery programs continue, adopt dramatically different hatchery practices that mimic natural conditions in broodstock selection, rearing, feeding, acclimation, and release (Framework Concept Paper 5).

Develop and test the concept of a conservation hatchery where the purpose is to conserve wild, native salmonid populations including their evolutionary potential, locally adapted gene pools, and characteristic phenotypes and behaviors (Framework Concept Paper 10).

Establish a biodiversity institute for the basin with the purpose of attracting scientists from many disciplines and given the time to evaluate and analyze information and develop a science based salmonid rebuilding program (Framework Concept Paper 10).

Maintain genetic and life history diversity represented by each population in each watershed (Framework Concept Paper 10).

Mark all hatchery fish [*with an identifiable external mark*] to facilitate selective harvest (Framework Concept Paper 26; Framework Concept Paper 27).

[*End*] the transfer of salmonids among hatcheries and subbasins (Framework Concept Paper 10).

Set performance standards based upon returning fish, with an emphasis on wild fish (Framework Concept Paper 27).

Terminate hatcheries that contribute to the decline of native salmonid populations through disruption of genetic and life history diversity and have negative ecological effects on target and non-target native populations (Framework Concept Paper 10).

Allow use of hatcheries in areas below dams that block salmon migration, but require that the fish release closely match those lost (Framework Alternative 3,4; orig. Framework Alternative 5). Adopt safeguards to prevent stocking programs from harming wild salmon, and if stocking will harm a wild population, do not stock (Framework Concept Paper 1). Eliminate or modify hatcheries and hatchery practices that negatively impact wild stocks (Framework Concept Paper 25).

Mark all-hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27). To facilitate a robust harvest program for hatchery fish in a way that does not impact wild fish, we endorse a program that results in the marking of hatchery fish that pose threats to ESA-listed fish, to the fullest extent consistent with the Pacific Salmon Treaty. We also urge tribal, state and federal fish managers to put such a program in place promptly, as it will be difficult to implement many improved harvest techniques until it is possible to identify hatchery-reared fish (Governors' Recommendations, July 2000).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall fund the development of NMFS-approved HGMPs for implementation, including plans for monitoring and revising them as necessary as new information becomes available. HGMPs have to be completed first for the facilities and programs affecting the most at-risk species (Upper Columbia and Snake River ESUs), followed by those affecting mid-Columbia, and then the Lower Columbia ESUs. HGMPs for all the Columbia basin hatchery programs and facilities should be completed (and approved by NMFS) by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall implement the reforms identified in the HGMP planning process for the Grand Coulee mitigation anadromous fish hatchery programs, beginning immediately following completion of the relevant (NMFS approved) HGMPs and completing the work as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the federal Treasury for an appropriate share of the capital costs. BOR shall have begun to implement reforms for programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall implement the reforms identified in the HGMP planning process for the Corp's Columbia River basin mitigation anadromous fish hatchery programs, beginning immediately after the relevant HGMPs are completed and are approved by NMFS. The work shall be completed as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the federal Treasury for an appropriate share of the capital costs. The Corps shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall implement the reforms identified in the HGMP planning process for federal and federally funded hatcheries, beginning immediately after the relevant HGMPs are completed and approved by NMFS. The work shall be completed as expeditiously as possible. BPA shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Working through regional prioritization processes to the extent feasible and in coordination with NMFS, BPA shall collaborate with the regional, state, tribal, and federal fish managers and the Pacific States Marine Fisheries Commission to enable the development and implementation of a comprehensive marking plan. Included in this action are the following four steps (NMFS Biological Opinion 2000 Action Table Dec. 2000):

1. Develop a comprehensive marking strategy for all salmon and steelhead artificial production programs in the Columbia River basin by the end of 2001.
2. Provide funding by March 1, 2001, to begin marking all spring chinook salmon that are currently released unmarked from federal or federally funded hatcheries.
3. Provide funding, beginning in FY 2002, to implement the Action Agencies' share of the comprehensive marking plan for production not addressed in (2) above.
4. Obtain funding contributions as appropriate for additional sampling efforts and specific experiments to determine relative distribution and timing of hatchery and natural spawners.

BPA shall, in coordination with NMFS, USFWS, and the relevant state and tribal co-managers, fund the four-step planning process described above as quickly as possible and, if so determined by that process, implement safety-net projects as quickly as possible at least for the following salmon and steelhead populations: 1) A-run steelhead populations in the Lemhi River, main Salmon River tributaries, East Fork Salmon River, and Lower Salmon River; 2) B-run steelhead populations in the Upper Lochsa River and South Fork Salmon River; and 3) spring/summer chinook populations in the Lemhi, East Fork, and Yankee Fork Salmon rivers, and Valley Creek (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, in coordination with NMFS, USFWS, and the relevant state and tribal co-managers, fund the development of HGMPs for the Grande Ronde and Tucannon spring/summer chinook safety-net programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall commit to a process whereby funds can be made quickly available for funding the planning and implementation of additional safety-net projects for high-risk salmon and steelhead populations NMFS identified during the term of this biological opinion (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Develop approved HGMPs for all hatchery facilities in the Columbia Basin (Final All-H Paper Dec. 2000).

Implement HGMPs at federal, state and tribal facilities by making necessary operational improvements and capital changes in programs and facilities (Final All-H Paper Dec. 2000).

Expand the safety net program for the most at-risk populations; use a variety of conservation hatchery techniques to aid the recovery effort (NMFS/BPA/USFWS) (Final All-H Paper Dec. 2000). In 2002, BPA shall begin to implement and sustain NMFS-approved, safety-net projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement aggressive monitoring and evaluation programs to reduce uncertainties e.g., hatchery/wild fish interactions, the effectiveness of hatchery spawners, etc., and assess performance of conservation efforts (Final All-H Paper Dec. 2000).

Prepare and implement HGMPs for state-run hatcheries (Final All-H Paper Dec. 2000).

### 3-2 Resident Fish

*Eliminate non-native species; eliminate hatchery outplanting of non-native species of resident fish into anadromous fish streams; support weak native species with production facilities; retrofit existing hatcheries or build new facilities*

*to supplement weak stocks (Sample Action).*

Attempt to restore and enhance conditions to increase and maintain native resident fish species wherever possible. Allow mitigation with non-native species only in limited situations. Depending upon the results of research and study of population dynamics, the effort should be placed on the enhancement of wild spawning rather than on the use of hatchery production to increase target populations (Framework Concept Paper 12).

Terminate hatcheries that contribute to the decline of native salmonid populations through disruption of genetic and life history diversity and have negative ecological effects on target and non-target native populations (Framework Concept Paper 10).

The Action Agencies shall continue to maintain the preservation stocking program [of Kootenai River white sturgeon] operated by the Kootenai Tribe of Idaho, and associated rearing facilities operated by B.C. Ministry of Environment, Lands and Parks (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall maintain the current level(s) of monitoring associated with all stages of natural recruitment, and the preservation stocking program (FWS Biological Opinion Dec. 2000).

Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species (Council's 2000 Fish and Wildlife Program).

4 HYDRO

*Emphasize breaching Lower Snake dams (Sample Action).*

The federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival (Draft All-H Paper Hydro Option 2, Dec. 1999).

If the population-level analysis indicates that the combination of actions affecting all life stages of a species will not result in a high probability of survival and a moderate to high likelihood of recovery, mortality caused by the hydrosystem must be reduced to no more than the level that would occur if the hydrosystem was not in place. The FCRPS can achieve this goal through off-site mitigation, if it is not feasible to achieve through FCRPS improvements (Draft Biological Opinion, page 14, July 2000).

Each state commits, by October 1 this year (2000) and annually thereafter, to provide a list of priority fish passage projects to the Council for proposed funding. The list could include such things as screening diversions and replacing culverts, as well as removal of, or passage at, tributary dams, as is being done at Condit, Wapatox and Marmot dams (Governors' Recommendations, July 2000).

The Action Agencies shall coordinate with NMFS, USFWS, and the states and tribes in pre-season planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Use relicensing and ESA consultation to improve flows, passage, etc. at non-federal dams on the Deschutes, Lewis, Cowlitz, and other basins (FERC) (Final All-H Paper Dec. 2000).

4-1 Dam Modifications and Facilities

*Breach dams if necessary to recover weak stocks (Sample Action).*

Breach one or more dams (Framework Alternative 1,2,3). Breach Lower Snake River Dams (Draft All-H Paper Hydro Option 3 Dec. 1999; Framework Concept Papers 1,2,3,4,5,6, 7a,7b). Achieve natural river-level drawdown of lower Snake projects (partially dismantling Lower Granite, Little Goose, Lower Monumental, and Ice Harbor by removing the earthen portion of each dam by spring 2005) (Framework Concept Paper 5). Pass legislation to effectuate the drawdown of the four Lower Snake River Dams and John Day Dam (Framework Concept Paper 7a,7b). Operate the John Day reservoir at spillway crest (Framework Concept Papers 1,3,4,5,6; Tribal Vision). Implement hydropower actions under time-line requirements of ESA, and drawdown feasibility studies of John Day Dam (Framework Concept Paper 6).

Breach the four lower Snake River dams and draw down John Day Reservoir to spillway crest. Restore normative river conditions and reduce reliance on the short-term technological fixes such as the federal juvenile fish transportation program and additional water from upstream storage reservoirs in Montana and Idaho (Framework Concept Paper 5).

Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of

sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).

Restore natural river levels to the lower Snake River (below Hells Canyon complex) and draw down John Day dam to spillway crest level; and restore natural river ecosystem components throughout the basin. Keep water levels in Libby, Roosevelt, Dworshak, and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Restore normative river habitat conditions by breaching the four lower Snake River dams and drawing down John Day Reservoir to spillway crest (Framework Concept Paper 5).

Set up a systematic process whereby other dams (irrigation, navigation, flood control, etc.) in the Columbia River Basin and the impacts of such projects on ecological processes are identified, quantified, and addressed (Framework Concept Paper 5).

Pass legislation to effectuate the drawdown of the four Lower Snake River Dams and John Day Dam. Strictly enforce the Clean Water Act throughout the Columbia River Basin (Framework Concept Papers 7A,7B).

The incremental drawdown strategy should incrementally invoke drawdown. That is, drawdown two dams and evaluate (for some pre-determined period of time with some pre-determined incremental objectives), then drawdown the next group of dams if monitoring results meet expectation. So long as evaluation meets interim goals, proceed with rest of dam breaching approach. This incremental approach would be used for all actions taken (Framework Concept Paper 7B).

To insure that proposed hydro system changes are focused on documented sources of fish mortality the entire hydropower system will undergo a detailed fish mortality audit. This audit will document the major sources of mortality for both adults and juvenile salmon and steelhead as they move through the system. Changes in system configuration and operation will be designed to rectify the highest sources of fish mortality with the goal of improving the overall cumulative survival rates with priority given to adults over juveniles because of their biological significance to the propagation of future generations of salmon and steelhead (Framework Concept Paper 14).

This alternative consists of breaching the four [Lower Snake] dams and creating a free-flowing 140-mile stretch of river. This would involve removing the earthen embankment section of each dam and eliminating the reservoirs behind the dams. Under this alternative, all facilities for transporting fish would cease to operate. A free-flowing river can be achieved by removing only the embankment. The powerhouses, spillways, and navigation locks would not be removed, but would no longer be functional, eliminating power production and commercial navigation (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).

Experiment with limited drawdown of the reservoir behind McNary Dam (Framework Alternative 4,5).

Capital improvements at the mainstem dams designed to approximate natural conditions (e.g., surface bypass). (Framework Alternative 5). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

Remove existing extended length turbine intake screens; halt construction of new screens; consider removing existing standard length screens (*to avoid injury and mortality of lamprey and salmonids associated with collection and barging program*) (Tribal Vision).

The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

Some mainstem and run-of river FCRPS reservoirs on the lower Snake River and John Day Reservoir would be lowered during the spring and summer migration periods to increase water velocity. Three of the lower Snake projects (Little Goose, LM, IH) would be operated within one foot of MOP from April 3 until adult fall chinook begin to enter the Snake River, as determined in season by the TMT. Lower Granite Dam would be operated within one foot of MOP from April 3 to November 15 each year. After November 15, all four reservoirs would be operated within their normal 5-foot operating ranges. McNary, The Dalles, and Bonneville dams would be operated within their normal ranges. From April 20 to September 30 each year, John Day would be operated within a 1.5-foot range above elevation 262.5 feet as long as irrigation withdrawal was unaffected and if additional space was not needed for flood control. The pool elevation would be raised if irrigation pumping problems occurred. During the fall and winter months, all four lower Columbia River projects would be operated within their normal operating range, with the exception of temporary flood control storage at John Day, if needed (Draft Biological Opinion, July 2000).

The Corps and BPA, through the annual planning process, shall develop and implement 1- and 5-year operations and maintenance (O&M) plans and budgets that enhance the capability to operate and maintain fish facilities at FCRPS

projects for listed salmonid stocks (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By March 1, 2002, BOR shall install screens meeting NMFS' screen criteria at the canal intakes to the Burbank No. 2 and Burbank No. 3 pump plants. BOR shall connect the Burbank No. 3 intake canal to Burbank Slough to provide juvenile fish egress. BOR shall coordinate with NMFS on each of the actions identified above (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development and 2001 prototype testing of upper turbine intake occlusion devices at The Dalles, with a goal of increased non-turbine passage rates through either the sluiceway or the spillway. The Corps shall install occlusion devices across the entire powerhouse, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development of a prototype RSW and extended deflector for testing at John Day in 2002. The Corps should synthesize evaluation results, determine the fish survival benefits of one or more RSWs or a skeleton bay surface bypass, and install the units as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall continue John Day prototype development and investigations of extended submerged intake screens, gatewell vertical barrier screens, and, if necessary, orifices to optimize guidance and safe passage through the system, including a gatewell debris cleaning plan. This work shall include an assessment of fry passage. The Corps shall design and construct new screen systems for safe passage of juvenile salmonids, as warranted. Juvenile bypass outfall survival investigations shall also be conducted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue evaluations to assess the need for improvements of the existing intake screens, gatewell vertical barrier screen cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at McNary to determine where improvements are necessary to reduce problems experienced during the 1996 flood, increase fish survival, and resolve holding and loading facility problems, including raceway jumping by juvenile salmon and steelhead and debris plugging of bypass lines. Additionally, the Corps shall evaluate whether the existing juvenile bypass system outfall should be relocated (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue high-flow outfall investigations to determine whether it is appropriate to modify bypass outfall criteria in the context of high-discharge bypass discharges (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems with interrogation sites, including McNary, John Day, and Bonneville dams. The Corps and BPA shall also assess providing a similar detection capability for the Ice Harbor juvenile bypass system (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall investigate hydraulic and behavioral aspects of turbine passage by juvenile steelhead and salmon through turbines to develop biologically based turbine design and operating criteria. The Corps shall submit a report to NMFS stating the findings of the first phase of the Turbine Passage Survival Program by October 2001. Annual progress reports will be provided after this date (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall remove all unnecessary obstructions in the higher velocity areas of the intake-to-draft tube sections of the turbine units (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future

program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen system-wide letter report and implement recommended improvements (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By January 2002, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of an extended-length, intake screen bypass system, a surface-collection bypass system, and hybrid alternatives at Bonneville First Powerhouse. Through the annual planning process, the Corps shall determine which of these configurations to implement (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By January 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the John Day Dam powerhouse to surface collection at one or more skeleton or spillway bays. Through the annual planning process, the Action Agencies shall then determine the need for, and the implementation priority of, these configuration alternatives (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement an automated monitoring and alarm system at appropriate FCRPS projects, as determined in the NMFS Regional Forum, to monitor changes in head differential remotely between the primary auxiliary water supply conduits/channels and the adult collection channels and to minimize diffuser damage due to excessive differentials. The Corps shall ensure that diffuser gratings for all auxiliary water supply systems are securely fastened. The Corps shall work through FPOM to develop a monitoring program for inspecting diffuser gratings and grating fasteners (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall design the spillway Number 1 (end bay) deflector at John Day Dam, and implement as warranted, in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised (NMFS Biological Opinion 2000 Action Table Dec. 2000).

As set out in Action 50 (Section 9.6.1.3.4), BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from the 2001 juvenile outmigration. These adult PIT-tag detectors shall be used as needed for calculating transport benefits, conversion rates, and SARs for listed salmon and steelhead (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

Fund full COE capital and O&M programs (Final All-H Paper Dec. 2000).

#### 4-2 Hydro Operation

To avoid jeopardy to the Snake River ESUs, the Action Agencies must improve FCRPS-project configurations and operations to the extent practical in the immediate five year term, while also laying the groundwork for and seeking Congressional authority in 2006 to drawdown projects in the Snake River. At the same time, they should experiment with and begin to implement measures outside the FCRPS that may be required in addition to drawdown or which may be sufficient, without drawdown, to ensure long-term survival...of all listed ESUs in the basin (Draft Biological Opinion, July 2000).

This alternative consists of breaching the four [Lower Snake] dams and creating a free-flowing 140-mile stretch of river. This would involve removing the earthen embankment section of each dam and eliminating the reservoirs behind the dams. Under this alternative, all facilities for transporting fish would cease to operate. A free-flowing river can be achieved by removing only the embankment. The powerhouses, spillways, and navigation locks would not be removed, but would no longer be functional, eliminating power production and commercial navigation (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).

Operate the John Day reservoir at spillway crest (Framework Concept Papers 1). Drawdown John Day reservoir to MOP immediately, and to spillway crest or natural river on a year-round basis in the near term (Tribal Vision). On the lower Columbia, operate John Day at minimum irrigation pool (MIP) year-round while JDA studies are completed. Although changes at JDA (MOP, spillway crest, etc.) may be desired in the future, it appears that operation of JDA below MIP in BPA's next rate period (2002-2006) is constrained by incomplete studies and NEPA processes. Accordingly, complete JDA studies while implementing and assessing configuration changes on the lower Snake (Framework Concept Paper 5).

Prioritize research funding to document project-specific effects on anadromous fish, and effects of operational changes. Make decisions based on best available quantification of effects of operational changes (Framework Concept Paper 26).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve inriver juvenile salmon survival; avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

Manage attraction flows, spill, and ladder entrances and exits and in-ladder conditions to minimize adult migrational delay and maximize adult passage survival (Framework Alternative 1,2,3).

Manage the river to return seasonal flow pattern for salmon and steelhead while also protecting upriver populations that don't migrate to the ocean (Framework Alternative 1,2,3).

#### 4-3 Spill

*[Implement]* more aggressive operational measures for flow and spill. The federal agencies would seek increased flow augmentation from Canadian reservoirs and improved water quantity and quality from the upper Snake River. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

The Corps and BPA shall continue (pending results of the McNary Transport Evaluation) to bypass juvenile spring migrants collected at McNary Dam and shall provide the spring spill levels described for that project (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall evaluate adult fallback and juvenile fish passage under daytime spill to the gas cap at Bonneville Dam in 2002 and 2003, after deflector optimization improvements allow for increased spill above current levels. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of additional changes in spill to further improve fish survival (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall continue spill and passage survival studies at The Dalles Dam in 2001. Research results shall be considered, in consultation with NMFS through the annual planning process, to assess the need for additional changes in spill to further improve fish survival by 2002, if possible, but no later than 2005 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall continue investigation of 24-hour spill at John Day Dam in 2001. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of daytime spill to further improve juvenile fish survival as needed for its contribution to the performance standard (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall provide at least 10,000 cfs of increased release capacity at Libby Dam in two increments of at least 5,000 cfs each under the following conditions, sequence, and schedule (FWS Biological Opinion Dec.

2000):

- a) [Test] spillway in 2001 to reliably estimate the maximum spillway flow dilution capability and compliance with the state water quality standard of 110 percent gas saturation. Possible changes in dissolved gas concentrations throughout the Kootenai River shall be evaluated [and] effects of the spill on bull trout and other fish in the Kootenai River [shall be monitored]. Investigate and restore, if necessary, Kootenai River channel capacity to accommodate the increased release capacities at Libby Dam (35,000 cfs). By spring 2002, the Action Agencies will begin routine use of the existing spillway for sturgeon flow augmentation. This spillway option shall only be considered a viable long term conservation measure if VarQ, or a comparable flood control/storage procedure, is in effect which assures the reservoir surface routinely exceeds the spillway elevation by the time sturgeon flows are needed. The timing of spillway use shall be determined in part by the ability to maintain 10 degrees Celsius at Bonners Ferry with the selective withdrawal facilities at Libby Dam. If, by December 30, 2001, it is determined that at least 5,000 cfs can not be routinely passed over the spillway within the total dissolved gas criteria of 110%, or VarQ or some other flood control/storage procedure has not been adopted, the Action Agencies shall immediately begin preparation of NEPA documentation and seek funding for installation of one turbine or spillway flow deflectors, which are to be operational by spring 2004.
- b) By spring 2007, the Action Agencies will seek means and be prepared to release an additional 5,000 cfs (total of at least 10,000 cfs) at Libby Dam for sturgeon conservation.

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

#### 4-4 Flow

Meet all established flow targets every year established under the Endangered Species Act by securing additional water from storage in the upper Snake and Columbia systems until [*Snake River dams*] are removed (Framework Concept Paper 1). After dams are bypassed, eliminate Snake River flow augmentation. Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 2).

Establish, or modify minimum flows (including Columbia River flows) to meet instream fish and wildlife needs. Evaluate the cumulative impact of all proposed water withdrawals, diversions, or instream structures to ensure that established minimum flows are maintained (LCREP). Provide daily and seasonal flow patterns to prevent stranding of juvenile fish and to ensure successful salmonid spawning and hatching (Framework Alternative 1). Rebuild Mid-Columbia spring/summer chinook, sockeye, and summer steelhead by improving smolt survival in the mainstem portion of the Columbia Plateau ERU, using flow augmentation from the upper Columbia and a normalized hydrograph (Framework Concept Paper 5). From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration (Framework Concept Paper 2).

Continue current flow programs, with some protection for upstream reservoirs. Secure use of water from Canadian storage reservoirs to meet flow needs (Framework Alternative 5,6). More water from the Snake River Basin and possibly Canada would be left in the river for fish (Framework Alternative 4).

In the Columbia, the development of normative flow conditions with flow augmentation from the Upper Columbia and IRCs at storage projects (would) create a more natural hydrograph (Framework Concept Paper 5). Rebuild Mid-Columbia spring/summer chinook, sockeye, and summer steelhead by improving smolt survival in the mainstem portion of the Columbia Plateau ERU, using flow augmentation from the upper Columbia and a normalized hydrograph (Framework Concept Paper 5). Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 5).

Evaluate flow augmentation components of options (e.g., A3 vs. A5; B1 vs. B2) (Framework Concept Paper 6).

Direct management actions include restoring free-flowing river reaches and associated riparian habitats, and reducing existing conflicts of flow augmentation between resident and anadromous fish. Indirect benefits to freshwater ecosystems would accrue from management to restore anadromous populations (Framework Concept Paper 6).

Objectives: The water management strategy for fish should be restructured to improve biological benefits and reduce societal cost measures. Water management must be consistent with state authority over water rights. New strategies of water management are promoted that have an anticipated beneficial impact for threatened fish stocks, including river watershed projects and water transfer programs (Framework Concept Paper 27).

Snake River summer flow targets must be analyzed to determine if there are tangible biological benefits (Framework Concept Paper 27).

Establish adequate instream flow conditions for salmon by using, for example, the Instream Flow Incremental Methodology (Framework Concept Paper 28).

There would be a reduction in the fluctuation of flows from Priest Rapids to reduce fry stranding and stabilize

riparian areas. federal agencies would continue to use the existing volume of water for management of flows for the benefit of various fish stocks and species of concern (Draft All-H Paper Hydro Option 1, Dec. 1999).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS to provide flows to support chum salmon spawning in the Ives Island area below Bonneville Dam (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall operate the FCRPS to provide access for chum salmon spawning in Hamilton and Hardy creeks (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improved Flows: improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

The Action Agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation

stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Koocanusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000). [Note: This action favors sturgeon over Columbia River Listed salmonids migrating in the summer.]

The Action Agencies have proposed to seek funding to conduct biological studies, in consultation with FWS, to both determine the effectiveness of increased flows in improving sturgeon recruitment and to determine any adverse effects to bull trout in the Kootenai River below Libby Dam. If, as a result of these increased releases, in any year during the 10-year life of this biological opinion, a new year class of at least 20 naturally recruited yearling or older sturgeon is documented, the Action Agencies shall reinitiate consultation with FWS before proceeding with any additional facilities or improvements at Libby Dam for sturgeon flow augmentation (FWS Biological Opinion Dec. 2000). By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

If Koocanusa Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Koocanusa Reservoir and estimates of monthly discharge from Libby Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Koocanusa Reservoir and hourly spill and releases at Libby Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Hungry Horse Reservoir and estimates of monthly discharge from Hungry Horse Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Hungry Horse Reservoir and hourly spill and releases at Hungry Horse Dam (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

As U.S. representatives on the Kootenay lake board of control, and operators of Libby Dam, it is recommended that

the Action Agencies seek opportunity to provide low flows in the Kootenai River during January or February for burbot migration and spawning (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

#### 4-5 Reservoir Levels

*Use the system to manage flows to a natural regime for weak stock streams (Sample Action). Reservoir rule curves give priority to the needs of listed species (Sample Action).*

Reduce the amount of water stored for hydropower production to provide for more natural flows, including periodic flooding and droughts to restore native plants (Framework Alternative 1). Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8).

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of “Variable Q” flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H Paper Hydro Option 2, Dec. 1999).

Implement the IRCs at all storage projects incorporating the Libby Dam approach of tiered flows and careful use of the VARQ flood control strategy. Reduce reservoir drawdown and improve reservoir refill probability to assure a sustainable basin-wide operation for all native species and their prey in the Columbia River watershed. Replace static flow targets in the lower Columbia with attainable normative-type flow targets resulting from basin-wide application of IRCs (Framework Concept Paper 8).

Reservoir drafting to 10 feet from full pool during summer for anadromous fish recovery is shaped to achieve a gradual drawdown from the spring peak and to eliminate flow fluctuation in the rivers downstream. This reduces the width of the varial zone and enhances riverine productivity. Environmental conditions in storage reservoirs and downstream river reaches improve biological productivity and complement mitigation efforts. Site-specific environmental concerns are addressed by fine-tuning the overall system plan (Framework Concept Paper 8).

Move away from an emphasis on minimum flows toward a regime that would include periodic flooding and droughts between years and smooth ramping to and away from the spring freshet within a year. Provide daily and seasonal flow patterns to prevent stranding of juvenile fish and to ensure successful salmonid spawning and hatching (Draft Framework Alternative 2,3).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall operate the lower Snake River reservoirs within 1 foot of MOP from approximately April 3 until small numbers of juvenile migrants are present and shall operate the John Day pool within a 1½-foot range of the minimum level that provides irrigation pumping from April 10 to September 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood

control at Libby (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Koocanusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000). [Note: This action favors sturgeon over Columbia River Listed salmonids migrating in the summer.]

If Koocanusa Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (FWS Biological Opinion Dec. 2000).

The Action Agencies shall continue the lake winter elevation/kokanee egg-to-fry survival study on Lake Pend Oreille for the next six years. The study shall begin in 2001 by drafting the lake to fall/winter water levels of elevation 2051 feet. This is intended to allow winter storms to improve the condition of spawning gravel along the shore of Lake Pend Oreille. During the fall/winter of 2002, maintain the Lake Pend Oreille at elevation 2055 until fry emerge from shoreline gravels. By September 2003 FWS will secure independent scientific review relative to the appropriate duration (one to three years) of maintaining winter lake elevations at 2055 feet and provide written recommendations to the Action Agencies for fall/winter operations for 2003 through 2006. During this six year period, the Action Agencies, in coordination with FWS and IDFG, shall evaluate the effects of varying winter lake level elevations on all life stages of kokanee in Lake Pend Oreille, and predator/prey dynamics. If, in September 2007, it is determined that this action is effective in significantly improving kokanee production as bull trout forage, FWS will provide written recommendations on the frequency of varying Lake Pend Oreille winter lake elevations for the remainder of this biological opinion. The Action Agencies, FWS, and IDFG shall meet annually to evaluate Lake Pend Oreille kokanee monitoring results and make necessary adjustments through subsequent in-season management (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Experiment with limited drawdown of the reservoir behind McNary Dam (Framework Alternative 4).

The Action Agencies shall evaluate potential benefits to adult Snake River steelhead and fall chinook salmon passage by drafting Dworshak Reservoir to elevation 1,500 feet in September. An evaluation of the temperature effects and adult migration behavior should accompany a draft of Dworshak Reservoir substantially below elevation 1,520 feet (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

#### 4-6 Water Quality

*Avoid or correct both point and non-point source water pollution in weak stock spawning streams and migratory routes (Sample Action).*

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision).

Manage spill at dams to keep dissolved gas levels within federal clean water guidelines (orig. Framework Alternative 2,3).

Establish a temperature standard that is not limiting to salmonid adults, juveniles, and eggs (Framework Concept Paper 10).

Implement physical measures and operational actions to optimize water quality conditions (temperature and dissolved gas) where consistent with overall objectives and other strategies (Draft All-H paper Dec. 1999). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season (NMFS Biological Opinion 2000 Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the system-wide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG levels associated with system spill (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with FWS, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall evaluate and report to FWS on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with FWS, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

The Corps shall work through the regional forum process to identify and implement measures to address juvenile fish mortality associated with high summer temperatures at McNary Dam. As a starting point, the Corps shall assemble and analyze the temperature data that have been recorded in the McNary forebay, collection channel, and juvenile facilities. The Corps shall examine relationships among juvenile mortality, temperatures, river flow rates, and unit operations in detail. The Corps shall investigate the feasibility of developing a hydrothermal computational fluid dynamics model of the McNary forebay to evaluate the potential to determine optimal powerhouse operations or structural modifications for minimizing thermal stress of juvenile salmon collected in the summer and to conduct a modeling program, if warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving wastewater from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion Action able Dec. 2000).

#### 4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). Transport juvenile salmon from mainstem collector projects when conditions in the river are judged to be adverse due to low flow, high temperatures, high spill or other conditions (orig. Framework Alternative 5).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1).

Eliminate the federal juvenile fish transportation program except where necessary- until breaching and drawdown occurs- during extremely low flows or as dictated by other deleterious conditions caused by existing FCRPS operations (Framework Concept Paper 5).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 5).

[A]id juvenile salmon migration by drawing down reservoirs at four lower Snake River projects, permitting the lowering of reservoirs approximately 100 feet to near original riverbed levels (SOR FEIS Alternative 5c).

The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By the end of 2001, the Corps shall develop, in coordination with NMFS and the other federal, state, and tribal salmon managers, a McNary Dam transportation evaluation study plan specifically focusing on the response of UCR spring chinook and steelhead to transportation. Approved research should begin by 2002, if feasible (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with NMFS through the annual planning process, shall evaluate transport to inriver return ratios for wild SR yearling chinook salmon and steelhead. In addition, the Corps and BPA shall also evaluate the effects of transportation on summer-migrating subyearling SR chinook salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

During all transport evaluations, the Corps and BPA, in coordination with NMFS through the annual planning process, shall include an evaluation of delayed mortality (D) of transported versus inriver migrating juvenile anadromous salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to fund and expand, as appropriate, fish marking and recapturing programs aimed at defining juvenile migrant survival for both transported and nontransported migrants and adult returns for both groups. These studies shall also compare the SARs of transported and nontransported fish to calculate the

differential delayed mortality (D), if any, of transported fish (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall extend the period of barge transportation from the lower Snake River dams and McNary to further reduce reliance on trucking (FCRPS Biological Opinion).

The Corps and BPA shall assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems with interrogation sites, including McNary, John Day, and Bonneville dams. The Corps and BPA shall also assess providing a similar detection capability for the Ice Harbor juvenile bypass system (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

If results of Snake River studies indicate that survival of juvenile salmon and steelhead collected and transported during any segment of the juvenile migration (i.e., before May 1) is no better than the survival of juvenile salmon that migrate inriver, the Corps and BPA, in coordination with NMFS through the annual planning process, shall identify and implement appropriate measures to optimize inriver passage at the collector dams during those periods (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Fish transportation: Continue "spread the risk" approach; reduce trucking; continue to study delayed mortality issue (Final All-H Paper Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for comparative evaluations of the behavior and survival of transported and downstream migrants to determine whether causes of D can be identified for the reach between Bonneville Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinitiate consultation, if necessary (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two- way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Corps shall continue to evaluate the need for improvements of the existing intake screens, gateway vertical barrier screens' cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at the four lower Snake River hydropower projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall evaluate the effects of prior transport as smolts on the homing of adults (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate strategies to enhance post-release survival of transported fish; examples of such strategies

include timing releases so that fish arrival at the estuary corresponds to minimal interactions with predators and maximum availability of forage and locating releases so as to decrease passage time through areas of high predation (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate design development and testing of extended submerged intake screens and vertical barrier screens at Lower Monumental Dam and construct units as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate and implement structural and operational alternatives to improve juvenile transportation at the collector dams (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

The Corps shall record the occurrence of bull trout in the smolt monitoring facilities at the Lower Columbia River dams (FWS Biological Opinion Dec. 2000).

#### 4-8 Adult Fish Passage

Provide a variety of passage routes at the remaining mainstem dams...including surface bypass, submerged screens and spill (Framework Alternative 1,2,3). Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1). Enforce existing federal laws that provide for protection of fish, wildlife and their habitats (e.g., The Fort Bridger Treaty, Clean Water Act, Clean Air Act, Endangered Species Act, National Pollution Discharge Emissions System, wild and scenic river designations, wilderness areas, etc.) (Framework Concept Paper 4).

Minimize the impact of the hydro system on fish and wildlife populations, including passage of anadromous fish downstream and upstream (Framework Concept Paper 20).

The Corps shall continue biological and engineering investigations and design of a composite ice and trash sluiceway outfall relocation and adult ladder auxiliary water system at The Dalles Dam and shall construct such devices as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate a way to increase entry rates of fish approaching surface bypass/collector entrances (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive evaluation to investigate the causes of headburn in adult

salmonids and shall implement corrective measures, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an adult steelhead downstream migrant (kelt) assessment program to determine the magnitude of passage, the contribution to population diversity and growth, and potential actions to provide safe passage. The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement it, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate and enumerate fallback of upstream migrant salmonids through turbine intakes at all lower Snake and lower Columbia River dams. The Corps shall implement corrective measures to reduce turbine mortality, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall examine existing fish-ladder water temperature and adult radio-telemetry data to determine whether observed temperature differences in fishways adversely affect fish passage time and holding behavior. If non-uniform temperatures are found to cause delay, means for supplying cooler water to identified areas of warmer temperatures should be developed and implemented in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate adult fish delay and fallback at ladder junction pools and implement remedies to reduce this problem, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all projects to either minimize delay of adults or minimize counting difficulties that reduce count accuracy (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall ensure that alterations to fish ladders and adult passage facilities to accommodate Pacific lamprey passage do not adversely affect salmonid passage timing and success (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop improved operations for adult fishway main entrances at FCRPS dams so that the best possible attraction conditions are provided for adult migrants, both at the four Columbia River hydro projects and the four lower Snake hydro projects (where reservoir elevations are held near MOP). The Corps shall report the findings of fishway entrance flow-balancing investigations in a report to NMFS by the end of 2001 and shall continue to work through FPOM to evaluate and implement, as warranted, structural changes to satisfy fish passage plan fishway entrance criteria (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and maintain an auxiliary water-supply, emergency-parts inventory for all adult fishways where determined necessary, in coordination with NMFS (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and long-term performance and reliability (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs (NMFS Biological

Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an engineering study to evaluate existing limitations relating to its inability to satisfy fish passage plan operating criteria at the John Day Dam north shore ladder (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contribution to unaccounted losses (FCRPS Biological Opinion).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and long-term performance and reliability (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for comparative evaluations of the behavior and survival of transported and downstream migrants to determine whether causes of D can be identified for the reach between Bonneville Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to investigate the causes of discrepancies in adult return rates for juvenile salmonids that have different passage histories through the hydrosystem (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement as warranted (FCRPS Biological Opinion 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinstate consultation, if necessary (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two-way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

#### 4-9 Flood Control

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improved Flows: improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

Authorize system-wide flood control review (Final All-H Paper Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS

Biological Opinion Dec. 2000).

The Service recommends that the Action Agencies initiate section 7 consultation on the proposed Columbia River Treaty Flood Control Operating Plan, October 1999. Proposed changes contained in this Plan may affect sturgeon spawning/rearing habitat conditions necessary for the survival and recovery of those species (FWS Biological Opinion Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion Action Table Dec. 2000).

## COMMERCE

### 5. POWER

#### 5-1. Existing Generation

Hydropower generation is mostly eliminated in the Lower Snake and reduced in the Columbia River (Framework Alternative 1). Provide a hydropower backbone for the power system (albeit reduced from current levels) (Framework Alternative 2,3).

Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

Provide support for increased electrical costs (Framework Concept Paper 5).

Snake River dams are breached as soon as Congressional authorization and appropriation occur (Draft All-H Paper Dec. 1999).

#### 5-2. New Generation

*Invest in new sources of generation to replace hydroelectric power. Renewable and non-polluting technologies would receive first priority (i.e., wind and solar power, fuel cells); however, thermal power generation would be used to replace most of lost hydropower capacity, at least in the short term (Sample Action).*

Replace lost generation capacity through a least-cost mix of power purchases aggressive energy conservation programs, the development of cost-effective renewable power sources, and high-efficiency thermal generation. Mitigate incremental production of carbon dioxide through offsets (Framework Concept Paper 7B).

#### 5-3. Transmission Reliability

*Major changes to transmission system will be required if the Snake River dams are breached (refer to the Lower Snake Drawdown EIS). New power plants that are constructed to provide replacement power may also require transmission additions, depending upon their location (Sample Action).*

*Changes in vegetation management maintenance practices to meet habitat requirements will require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as un-maintained areas become widespread and effective monitoring becomes impractical. Public safety is a direct concern, both at individual sites and for power users that may be affected by the blackouts (Sample Action).*

*Reduced road densities on public lands could affect access to transmission facilities, which impairs the ability to perform maintenance in a timely manner, causing the potential for longer outages in emergencies (Sample Action).*

*Costs increase for routine maintenance practices are less compared to the Natural Focus Policy Direction, as fewer additional objectives are met (Sample Action).*

To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders (NMFS Biological Opinion 2000 Action Table

Dec. 2000). The Action Agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity (FWS Biological Opinion Dec. 2000).
<b>6. INDUSTRY</b>
<b>6-1. Industrial Growth</b>
<i>Some industry management changes identified and regulated through watershed assessment and jurisdictional authorities, especially in weak stock watersheds (Sample Action).</i> Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1). State water resource agencies throughout the Columbia River Basin enforce existing water laws, including those relating to the doctrine of waste, individual water right terms and conditions, measurement of existing uses, and ensuring instream water rights are protected (Framework Concept Paper 5). Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Framework Concept Paper 3).
<b>6-2. Aluminum and Chemical</b>
<i>Reduce water withdrawals and discharges that threaten weak stocks (Sample Action).</i> Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP).
<b>6-3. Mining</b>
<i>Some restoration of abandoned mining sites on public lands, new mining limited on public lands, especially in weak stock watersheds (Sample Action).</i> Improve mining discharges. Improve mining practices. Rehabilitate marginal and closed mines (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).
<b>6-4. Pulp and Paper</b>
Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP). Provide incentives for chlorine-free zero-discharge pulp mills, and modify facilities to be oxygen-based, closed-loop mills ( <a href="http://www.rfu.org/PulpPrimer.htm">http://www.rfu.org/PulpPrimer.htm</a> ).
<b>7. TRANSPORTATION</b>
<b>7-1. Navigation and Barging</b>
<i>Eliminate commercial navigation via the Lower Snake Dams, which will be removed (Sample Action).</i> Remove dikes and manage dredging and other measures to restore estuarine habitats. Manage dredging to avoid increased predation (Human Effects Analysis Appendix D) Maintain shipments from Port of Lewiston by moving to rail transportation. If rail capacity to Lewiston is inadequate, expand capacity to needed level to replace shipping capability lost through shutdown of Lower Snake barge transportation. Maintain barge transportation open through the drawdown of John Day Dam by using shallow draft vessels to the Tri-Cities area (Framework Concept Paper 7B).
<b>7-2. Trucking and Railroads</b>
<i>Upgrade infrastructure for trucking and increase railroad capacity to compensate for navigation and barging impacts of hydro modifications (Sample Action).</i> Maintain shipments from Port of Lewiston by moving to rail transportation. If rail capacity to Lewiston is

inadequate, expand capacity to needed level to replace shipping capability lost through shutdown of Lower Snake barge transportation. Maintain barge transportation open through the drawdown of John Day Dam by using shallow draft vessels to the Tri-Cities area (Framework Concept Paper 7B).

Provide support for alternative forms of transportation of agricultural and other products including improved rail service (Framework Concept Paper 5).

## 8. AGRICULTURE

*Manage public lands, which provide critical wild salmon habitat, for the benefit of salmon. Actively restore watersheds where salmon populations are in imminent danger of extirpation (Sample Action).*

Federal regulatory efforts would increase to ensure that nonfederal land and water use would not continue to degrade fish habitat. This would occur through a combination of increased ESA rule development, increased ESA enforcement and increased CWA enforcement (Draft All-H paper, Habitat Option 3, Dec. 1999).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (WA Forest & Fish model) (Final All-H Paper Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Expand on agricultural incentive programs (Final All-H Paper Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

### 8-1. Irrigation

Reduce irrigation withdrawals (Framework Concept Paper 23). Adopt strong water conservation programs and use saved water to replenish flows (Framework Concept Paper 1).

Irrigation - Provide mitigation to farmers affected by drawdown of reservoirs to extend pumps and replace diversion screens. Provide efficient, temporary mitigation to extend ground water well pumping for irrigators affected by lowered water table due to drawdown. Look for opportunities to promote water conservation and efficiencies (Framework Concept Paper 7B).

Objectives: The water management strategy for fish should be restructured to improve biological benefits and reduce societal cost measures. Water management must be consistent with state authority over water rights. New strategies of water management are promoted that have an anticipated beneficial impact for threatened fish stocks, including river watershed projects and water transfer programs (Framework Concept Paper 27).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Framework Concept Paper 3).

State water resource agencies throughout the Columbia River Basin enforce existing water laws, including those relating to the doctrine of waste, individual water right terms and conditions, measurement of existing uses, and ensuring instream water rights are protected (Framework Concept Paper 5).

Identify and use appropriate water conservation measures in accordance with state law (Framework Concept Paper 28).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where

necessary, restore soil, restore riparian vegetation and re-create wetlands (Spirit of the Salmon). Implement soil and water conservation practices that control erosion and runoff in order to reduce stream sedimentation, flooding, and bank erosion and those that help to maintain or improve base streamflows (Draft All-H paper Dec. 1999).

Habitat objectives would be accomplished by land and water lease, purchase, subsidy and similar incentives (Human Effects Analysis).

Reduce existing permits for water withdrawal. Encourage cultivation of less water-intensive crops. Agricultural water conservation. Irrigation waste water treatment. Irrigation withdrawals screening (Human Effects Analysis Appendix D).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

## 8-2. Pesticides and Agricultural Practices

Reduce the use of pesticides in agriculture to lower input to terrestrial and aquatic areas (Framework Alternative 1,2,3). Implement nutrient and pest management practices needed to limit delivery of pollutants that create eutrophic or toxic conditions for fish and other aquatic organisms (Draft All-H paper, Dec. 1999).

Lower irrigation pumps to adjust to changed river levels and provide support for increased electrical costs (Framework Concept Paper 5).

Restore damaged habitats (e.g., acquire water rights needed for sensitive and weak species; fence riparian areas, acquire conservation easements, rest lands that are over used, etc.) (Framework Concept Paper 4).

*[Encourage]* pesticide/herbicide reduction (Human Effects Analysis Appendix D).

Modify agricultural practices to benefit weak stocks through state programs (e.g., Healthy Streams Partnership [Oregon Senate Bill 1010, 1993 Or. Laws, ch. 263]). Develop Total Maximum Daily Loads (TMDLs) and Water Quality Management Area Plans (WQMAPs) in concert with the ESA (e.g., Executive Order No. EO 99-01 [The Oregon Plan For Salmon And Watersheds]).

*In weak stock watersheds, use federal and state cost-share programs to reduce the impacts of agricultural practices through water quality and habitat improvement using more risk-averse agricultural practices (Sample Action).*

## 8-3. Grazing

Manage grazing, especially on public lands to reduce riparian impacts and input of organic nutrients and pathogens into water sources (Framework Alternative 1,2,3). Install fencing to keep range animals away from stream sides (Framework Concept Paper 23). *[Encourage]* nutrient and pathogen load reduction from grazing/agriculture. Reduce grazing impacts to riparian/aquatic ecosystem (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter

<p>standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).</p> <p>Maintain grazing through use of best management practices, while imposing riparian set-asides and fencing allotments in fish-bearing streams and sensitive wildlife refugia. Provide efficient, temporary mitigation to ease transition to different land management practices (Framework Concept Paper 7B).</p> <p>Increase the geographic extent and connectivity of rangeland cover types and structural stages (terrestrial source habitats) that have declined substantially in geographic extent from the historical to the current period (ICBSDEIS, R-O21).</p>
<p>8-4. Forestry</p>
<p><i>Reduce and constrain timber harvest in weak stock habitat, especially on public lands (Sample Action).</i></p> <p>Limit clearcuts for logging to sizes that are determined to result in retention of native species and ecological functions (Draft Framework Alternative 2,3).</p> <p>Promote sustainable cut while providing for 100-foot riparian set-asides for salmonid fish-bearing streams. Provide efficient, temporary mitigation to ease transition to different land uses where economic opportunities are reduced (Framework Concept Paper 7B).</p> <p>Reduce road densities on public forested lands, on or adjacent to critical habitat (Draft Framework Alternative 2,3).</p> <p>Manage logging on public forested lands to produce normative age stands. Manage logging on private forested lands to produce normative age stands using incentives and similar means (Draft Framework Alternative 2, 3).</p> <p>Reduce forestry impacts to riparian/aquatic ecosystem. Limit size and frequency of clearcuts. Normative fire frequency. Develop normative forest age structure. Provide gradual forest ecotones. Reduce forest road density (Human Effects Analysis Appendix D).</p> <p>Particularly in weak stock watersheds, restore vegetation patches, patterns, structure, and species composition to be more consistent with the landform, climate, and biological and physical characteristics of the ecosystem, and provide the source of habitat for terrestrial species. Manage disturbances to make vegetation patterns more consistent with their location in the landscape (ICBSDEIS, R-O2).</p>
<p>9. COMMERCIAL HARVEST</p>
<p><i>Significantly reduce or eliminate commercial harvest of weak fish stocks and wildlife species (Sample Action).</i></p> <p>Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5). Implement harvest actions that protect weak stocks (Framework Concept Paper 4). Address incidental mortality (Spirit of the Salmon). Selective fisheries. Focus sport or C&amp;S fisheries. Population unit and aggregate escapement goals. Use “new” harvest techniques, and weakest aggregate harvest rate (Human Effects Analysis Appendix D).</p> <p>Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7). (Human Effects Analysis Appendix D).</p> <p>Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).</p> <p>Improve gear for selective harvests (Framework Concept Paper 27).</p> <p>Retire commercial fishing licenses through buy-outs (Framework Concept Paper 27).</p> <p>Buy selective gear for harvesters and by improving harvest enforcement (Framework Alternative 7). Expand marking and catch sampling programs for ocean and inriver fisheries where Columbia River stocks are caught. Limit fishing during the Pacific Decadal Oscillation period and stop hunting endangered species on the way to their breeding grounds (PM).<sup>4</sup></p> <p>Improve harvest data and stock information to promote better harvest management and protect weaker stocks. Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council’s 2000 Fish and Wildlife Program).</p> <p>The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a</p>

<sup>4</sup> Pasco Public Meeting

multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

OCEAN FISHERIES:

Work toward elimination of ocean salmon harvest (Framework Alternative 7). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). All other harvest impacts on listed populations would be reduced to conservation crisis levels for a period of years, after which harvest could be adjusted (Draft All-H Paper Harvest Option 3, Dec. 1999). Renegotiate international treaties to prevent overfishing, provide conservation incentives, and impose sanction on nations whose fleets illegally catch salmon and steelhead (Framework Concept Paper 1).

RIVER FISHERIES:

Implement conservation crisis levels, defined as levels similar to the 1999 harvest rates for listed spring/summer chinook (5 to 7 percent), and comparable conservation crisis levels for listed Snake River fall chinook and listed steelhead. All of these rates would be frozen until recovery goals are achieved (Draft All-H Paper Harvest Option 3, Dec. 1999).

Ban harvest in the mainstem (Framework Alternative 7).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper Dec. 2000).

Pursue conservative harvest policies (weak stock management) (Final All-H Paper Dec. 2000).

Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-

H Paper Dec. 2000).

Provide sufficient funding for managing fisheries and contributing to the transition to selective fisheries, and for the 1999 Pacific Salmon Treaty Agreement (Final All-H Paper Dec. 2000).

#### 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP). Develop floodplain management and shoreland zoning protection programs (LCREP).

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present alternatives that minimize impacts. The preferred alternative will have no adverse impacts. If impacts are unavoidable, mitigation shall take one of five forms in order of preference (LCREP):

- a) Restoration: returning a damaged habitat as closely as possible to its condition prior to damage
- b) Enhancement: making changes or improvements to habitat to replace functions or values lost or damaged
- c) Preservation: protecting habitat in adjacent areas that are equivalent to the area damaged and that might otherwise be subject to unregulated activity
- d) Creation: converting a non-functioning habitat area into one having all of the physical and biological characteristics of the area lost or damaged
- e) Cash mitigation: providing cash compensation for lost habitat to be used for habitat protection and restoration.

Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).

Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12).

#### 11. RECREATION

Focus sport fisheries on hatchery stocks and healthy stocks (Human Effects Analysis Appendix D).

Improve gear for selective harvests (Framework Concept Paper 27).

#### TRIBES

##### 12-1. Tribal Harvest

[*Advocate for*] habitat and production actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).

Conduct ceremonial, subsistence, and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 1,2,3).

Continue efforts to "put fish back in rivers" [*e.g., supplementation*] in order to move toward achievement of full treaty rights (Framework Concept Paper 3).

Decrease mixed stock commercial harvest; accept economic incentives not to fish during certain migration periods (Framework Concept Paper 27).

Mark All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Improve gear for selective harvests (Framework Concept Paper 27).

Provide financial incentives for alternative commercial and economic activity for tribes with in river fishing rights that agree to temporarily suspend or reduce commercial fishing (Framework Concept Paper 27).

Shift to terminal fisheries to allow for selective stock harvest (Framework Concept Paper 27).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Substitute resident fish and wildlife, plus enhance their habitats in blocked areas (Framework Concept Paper 13; Framework Concept Paper 8).

Support habitat protection and enhancement through land acquisitions, land trusts, conservation easements, etc. (Tribal Vision).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this

program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper Dec. 2000).

#### 12-2. Tradition, Culture, Spirituality

*Actively restore ecosystem health associated species. Improve tribal well being and the ability of tribes to exercise their respective rights and to enjoy traditional values. Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Action).*

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 (Tribal Vision).

Support marking of All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-045). Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-061). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-069).

**SAMPLE IMPLEMENTATION ACTIONS**  
**FOR THE**  
**SUSTAINABLE USE FOCUS POLICY DIRECTION**

Emphasizes *human intervention as part of the life cycle*, working to restore and maintain sustainable stocks of fish and wildlife populations to insure substantially expanded harvest opportunities.

**FISH & WILDLIFE**

**1 HABITAT**

The ecosystem recovers depleted populations to the point of self-sustainability with a very low probability of extinction in the foreseeable future (Draft Framework Alternative 2,3,4,5).

Increase the overall productivity and resilience of the Columbia River ecosystem by stopping the loss of biological diversity of fish, wildlife, and plants, especially those listed under the Endangered Species Act (Framework Alternative 2,3,5,6).

Protect, connect, and restore key habitats (Framework Alternative 3). Increase habitat connections throughout the basin (Framework Alternative 1,2,5). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

A proactive strategy that stresses prevention followed by mitigation is an effective tool that can be used to help our troubled ecosystem. The challenge lies in making sure the situation does not get worse, and moving from there to make it better (Framework Concept Paper 16).

Protect existing high quality habitat and improve degraded habitat. Actions will be judged on their ability to produce fish, reduce conflict and probability of success versus their cost. Actions that are the least expensive, but do the greatest goodwill be selected first. Apply management actions in a way that balances wildlife, anadromous and resident fish interests (Framework Concept Paper 20).

Continue protection of habitat that is already protected by local laws, such as water quality standards, discharge permits, fish and wildlife passage requirements, etc. Enforce existing federal laws that provide for protection of fish, wildlife and their habitats (e.g., The Fort Bridger Treaty, Clean Water Act, Clean Air Act, Endangered Species Act, National Pollution Discharge Emissions System, wild and scenic river designations, wilderness areas, etc.) (Framework Concept Paper 4).

Geographic areas with the highest potential for increasing numbers of naturally spawning fish will be emphasized (Framework Concept Paper 20).

Improve measurements of survival through all salmonid life stages to identify high mortality areas and reduce mortality (Framework Concept Paper 26).

Improved land management actions would be implemented on federal, state, tribal and private land to increase productivity and restore connectivity of populations. Major actions should be coordinated through the experimental management program (Framework Concept Paper 6).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem... Once these activities are listed, ...look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' we are supporting the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

The timeframe for seeing change in the ecosystem must also be defined before any mitigative measures are undertaken (Framework Concept Paper 16).

Use computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 26). Use and improve computer models to assemble existing data and relationships to predict effects on salmon and steelhead from management actions (Framework Concept Paper 26).

Goal: Restore sustainable, naturally-reproducing fish and wildlife populations to support tribal and non-tribal harvest, cultural practices, and economic benefits by restoring the biological integrity and genetic diversity of the Columbia River ecosystem (Framework Concept Paper 2).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, their habitats and provides human sustenance, and acknowledging that this must also provide for cultural and spiritual needs (Framework Concept Paper 4).

Increased regulation by the federal agencies under the CWA and ESA would be implemented if the region cannot develop a coordinated plan with state and local governments (Draft All-H paper Habitat Option 3, Dec. 1999).

A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of conservation options that it could choose to support. These choices would include: purchasing land to establish preserves, purchasing conservation easements, paying bounties for endangered species on private lands, buying conservation contracts, offering grants or low-interest loans to conservation projects, and conducting research (with a small, fixed percentage of the fund) (O'Toole 1993; Thoreau Institute).<sup>1</sup>

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the level of FCRPS funding to develop and implement a basinwide hierarchical monitoring program. This program shall be developed collaboratively with appropriate regional agencies and shall determine population and environmental status (including assessment of performance measures and standards) and allow ground-truthing of regional databases. A draft program including protocols for specific data to be collected, frequency of samples, and sampling sites shall be developed by September 2001. Implementation should begin no later than the spring of 2002 and will be fully implemented no later than 2003 (NMFS Biological Opinion Action Table Dec. 2000).

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat (Council's 2000 Fish and Wildlife Program).

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat. Where the target population has low biological potential -- for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area -- the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice (Council's 2000 Fish and Wildlife Program).

Compromised habitat: Where the habitat for a target population is absent or substantially diminished and cannot reasonably be fully restored, then the biological objective for that habitat will depend on the biological potential of the target species. Where the target species has high biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of the habitat is no longer a significant limiting factor for that population. The objective also is to restore the population of the target species up to the sustainable capacity of the restored habitat. Sustained supplementation in a limited fashion is a possible policy choice in this instance (Council's 2000 Fish and Wildlife Program).

Eliminated habitat: Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species (Council's 2000 Fish and Wildlife Program).

Research, Monitoring, and Evaluation:

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, Northwest Power Planning Council, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000). Use research and monitoring data to improve computer models to assemble existing data and relationships to predict effects on salmon and steelhead from

<sup>1</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:

<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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management actions (Framework Concept Paper 25).

#### 1-1 Anadromous Fish

Provide habitat capable of: (1) supporting viable populations of plant and animal species, (2) contributing to recovery of listed species, and (3) supporting productive and diverse plant and animal populations and communities to meet social needs (ICBSDEIS, B-O43). Maintain and restore aquatic and terrestrial habitat quality and quantity to support harvestable plants, fisheries, and aquatic and terrestrial species (ICBSDEIS, B-O44).

Reclaim the anadromous fish resource and the environment on which it depends for future generations... Restore anadromous fishes to historical abundance in perpetuity (Framework Concept Paper 3).

The Forest Service and BLM propose to develop and implement a coordinated, scientifically sound, broad-scale, ecosystem-based management strategy for lands they administer in the ICBEMP project area (ICBSDEIS). The action alternatives focus "on restoring and maintaining ecosystems across the project area and providing for the social and economic needs of people while reducing short- and long-term risks to natural resources from human and natural disturbances."

Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3). Closely and continuously monitor tributary production and escapement to improve management (Tribal Vision).

Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Restore and maintain flow regimes sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient and wood routing (ICBSDEIS, R-O7). Restore and maintain the timing, variability, and duration of floodplain inundation and water table elevation (ICBSDEIS, R-O8). Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

Protecting and recovering salmonids and other aquatic species requires protecting land on and around fish-bearing streams. Building upon successes elsewhere, we endorse creation of salmon sanctuaries that protect key aquatic habitats and related uplands through voluntary conservation easements, leases, land purchases, and tax-incentive donations. The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish (Governors' Recommendations, July 2000).

For the mainstem Columbia and Snake rivers, we must focus not only on currently accessible habitat, but also look for opportunities to increase the current level of habitat access with all dams remaining in place. A recent study by the Battelle Pacific Northwest National Laboratory and the U.S. Geological Survey (USGS) found a substantial percentage of the historic mainstem riverine habitat for Snake River fall chinook still remains unimpounded upstream of the Hells Canyon complex. Although there is still riverine environment where fall chinook historically spawned, it may not be capable of supporting fish today because of degraded quality. It must be better understood whether the present quality of the historic habitat is capable of supporting a self-sustaining population of fall chinook above the Hells Canyon complex. The feasibility of reintroduction, including an evaluation of the existing habitat, is being investigated as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Hells Canyon complex (Governors' Recommendations, July 2000).

In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000).

Manage federal lands to protect fish through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM). Implement seven watershed restoration initiatives targeting core populations most at risk (USFS, BLM).

Support BPA offsite mitigation strategy (Final All-H Paper Dec. 2000).

Through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM) (All-H Paper Dec. 2000).

Accelerate land acquisition, using LWCF [*Land and Water Conservation Funds*] prioritizing fish habitat (USFS, BLM) (All-H Paper Dec. 2000).

Protect existing high quality habitat and accelerate restoration in high priority subbasins (USFS, BLM) (All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

Implement multiple-scale assessments and data management systems (USFS, BLM) (All-H Paper Dec. 2000).

1-2 Resident Fish

Restore ecosystem components that were represented by healthy anadromous fish runs to benefit native resident and wildlife by increasing the prey base and nutrient cycling, and reducing constraints on resident fish management actions through more normative management actions for anadromous fish (Framework Concept Paper 6).

In areas below storage projects, protect, mitigate and enhance resident fish that are affected by altered annual flow regimes, daily load following, temperature modifications and nutrient trapping (Framework Concept Paper 13).

Protect, mitigate and enhance resident fish populations to the extent they were or are affected by construction and operation of dams (Framework Concept Paper 13).

Determine the characteristics of the resident fish food sources in terms of abundance, survival, ability to support proposed resident fish populations, and potential to maintain or increase in the future (Framework Concept Paper 12).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Maintain noxious-weed-free plant communities (cover types) or restore plant communities with noxious weed infestations through use of broad-scale integrated weed management strategies (ICBSDEIS, B-O11). Recognize native plant communities as traditional resources that are important to tribes and as an essential component to treaty-reserves gathering rights (ICBSDEIS, B-O45). Restore the native grass, forb, and shrub composition within the sagebrush and shrub steppe cover types (ICBSDEIS, R-O10). Manage land uses and reduce the extent of biological crust (microbiotic crust) development where potential for biological crust development is high (ICBSDEIS, R-O11).

Control nonnative, introduced (exotic) fish and wildlife species through state programs (e.g., Oregon's Wildlife Integrity Rules for importation, possession, confinement, transportation and sale of nonnative wildlife [OAR 635-056-0000]).

1-4 Wildlife

Restore sustainable, naturally reproducing fish and wildlife populations to support tribal and non-tribal harvest, cultural practices, and economic benefits by restoring the biological integrity and genetic diversity of the Columbia River ecosystem (Framework Concept Paper 2).

Manage for native species, protecting existing range, expanding migratory corridors and providing habitat linkages to promote genetic diversity and provide for human use and enjoyment. Change the overall wildlife management strategy from one of quantitative habitat restoration to one of qualitative habitat creation and restoration and quantitative wildlife population restoration and enhancement. Implement the same protocols for use of non-native wildlife species as used in non-native fish species above (Framework Concept Paper 7B).

Determine problem areas for wildlife (blocked migration corridors, staging areas, etc); mitigate for displaced wildlife and their habitat (Tribal Vision). Watershed improvements for salmon and steelhead and resident fish will benefit other aquatic, wildlife and plant species as well (Draft All-H paper Dec. 1999).

Manage for native species, protecting existing range, expanding migratory corridors and providing habitat linkages to promote genetic diversity and provide for human use and enjoyment (Framework Concept Paper 7).

Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24). Maintain and/or recruit adequate numbers, species and sizes of snags and levels of downed wood to meet the needs of wildlife (ICBSDEIS, B-O31). Manage species composition (diversity), structure and age class, cover, density and surface litter on native rangeland plant communities (ICBSDEIS, B-33). In the short term, maintain and secure terrestrial source habitats that have declined substantially in geographic extent from the historical to the current period and source habitats that have old-

forest characteristics (ICBSDEIS, T-O1).

Increase the abundance and range of existing populations and habitats. Expand and connect existing habitat pockets to facilitate development of normative population structures for aquatic communities. Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 1). Implement vegetative practices that provide suitable cover to control erosion and runoff as well as provide food and shelter for wildlife (Draft All-H paper Dec. 1999).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

*Research, Monitoring, and Evaluation:*

Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects (Council's 2000 Fish and Wildlife Program).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

1-5 Predators of Anadromous Fish

Improve predator control (including developing a sea bird management plan) (COE, NMFS, FWS) (Final All-H Paper Dec. 2000). Reduce predator populations in the mainstem and the estuary (Framework Concept Paper 25). Create and maintain sufficient activity on Rice Island to discourage occupation by Caspian terns and cormorants that prey on smolts, and if necessary make changes to the island that discourage avian predator habitat (Framework Concept Paper 27; PM<sup>2</sup>). Remove Rice Island (PM<sup>2</sup>).

Take direct action to control marine mammals and Northern pikeminnow that prey on salmon (Framework Alternative 7). Immediately authorize expanded predator controls (MMPA) (Final All-H Paper Dec. 2000). *[Change]* existing sport fishing restrictions to concentrate on species that prey on, and compete with, salmon for food, including northern pikeminnow. Sport fishing regulation changes also should strive to minimize effects of exotic species on native species. The region could experience short-term benefits from increased fishing opportunities for these competitor species (Governors' Recommendations, July 2000).

Increase amount of riparian vegetation to provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1).

The Corps shall conduct a post-construction evaluation of the new debris containment boom at Little Goose to monitor populations and behavior of aquatic predators when debris accumulates at the log boom (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish (NMFS Biological Opinion Action Table Dec. 2000).

The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g., water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses at Bonneville Dam. The Corps shall work with NMFS, FPOM, USDA Wildlife Services, and USFWS on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with the Caspian Tern Working Group, shall continue to conduct studies (including migrational behavior) to evaluate avian predation of juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these predators (NMFS Biological Opinion

<sup>2</sup> Pasco Public Meeting

<sup>3</sup> Pasco Public Meeting

<sup>4</sup> Pasco Public Meeting

Action Table Dec. 2000).

The Action Agencies shall quantify the extent of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. A study plan shall be submitted to NMFS by September 30, 2001, detailing the study objectives, methods, and schedule. Based on study findings, and in consultation with USFWS and NMFS, the Action Agencies shall develop recommendations and, if appropriate, an implementation plan (NMFS Biological Opinion Action Table Dec. 2000).

*Research, Monitoring, and Evaluation:*

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS, shall investigate marine mammal predation in the tailrace of Bonneville Dam. A study plan shall be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule (NMFS Biological Opinion Action Table Dec. 2000).

1-6 Watersheds

Actively restore watersheds where salmon are in imminent danger of extirpation (Framework Concept Paper 3; and Spirit of the Salmon).

Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8). Land and water users and managers should meet specified habitat conditions associated with targeted salmon survival rates (Framework Concept Paper 3).

Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

Support watershed improvements and processes in the Oregon and Washington Plans (Framework Concept Paper 27).

Management actions should sustain hydrologic processes characteristic of the geoclimatic settings. Hydrologic processes critical for balanced landscapes/ecosystems include, but are not limited to, streamflows and sediments in channels (ICBSDEIS, B-08).

Employ voluntary, multi-stakeholder collaborative approaches to protect, restore and monitor natural resources and to resolve natural resource conflicts. These approaches should be open and inclusive, based on existing laws, and conducted within a framework of natural systems--watershed, ecosystems, bioregions or other defining landforms--using the best available science. This recommendation is patterned after successful approaches used all across the country. It is intended to provide impetus for stakeholders and communities to work together in searching for common goals, resolving conflicts, becoming aware of and using best available science, meeting legal requirements for protecting the environment, monitoring natural resources and redeeming collective responsibility for conditions and trends of resources (Spirit of the Salmon).

If necessary, initiate land management designed to return a watershed to a natural hydrologic regime, e.g., re-vegetation of areas adversely affected by past land-disturbing activities (Spirit of the Salmon).

BPA shall work with the NPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for a program to acquire and digitize aerial or satellite imagery of the entire Columbia River basin once every 3 to 5 years (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

[Encourage] non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

### 1-7 Tributaries

Protect, connect, and restore habitat on the tributaries throughout the basin (Framework Alternative 1). To protect and recover tributary habitat, land and water users and managers must meet a series of habitat conditions associated with survival rates (Framework Concept Paper 3).

Management Actions: The best available technology would be used to improve stream quality at a random selection of replicate streams in a watershed or ecosystem. Remediation actions may include such corrective actions as fencing to keep range animals away from stream sides, retaining stream flow and reducing irrigation withdraw, enhancing riffle zones and gravel beds, and returning nutrients in the form of fish carcasses to the streams. Response variables would be measured annually with annual assessments comparing treated and nontreated/control streams. Decision rules and time frames would be established a priori to determine success of remediation actions. Different subsets of streams would receive different remediation actions to compare strategies and identify cost-effective approaches to stream-wide recovery (Framework Concept Paper 23).

Re-establish sources of large woody debris for each stream adequate to maintain long term supply and to meet the structure and nutrient needs of the stream (Framework Concept Paper 10).

Segregate habitat into "nature preserve" tributaries and "production/supplementation" (hatchery) tributaries to allow increased hatchery production (Framework Concept Paper 26).

Rationale: All plans for recovery of fisheries in the Columbia River Basin identify water quantity as a critical factor, including streamflows in the small streams and tributaries that provide significant habitat for anadromous and resident fish and serve as integral portions of the region's ecosystem. Water quantity is directly related to water quality as well, a relationship that is receiving increasing attention in meeting requirements of the Endangered Species Act and the Clean Water Act. While there is no easy "fit" between state water laws and federal requirements, recent modifications to state water laws have provided new mechanisms for reallocating some water resources to instream use, providing opportunities to restore and protect instream flows (Framework Concept Paper 17).

Objective: Stream-wide recovery measured by improvements in adult salmon return numbers, spawner-recruit ratios, and fingerling-to-adult ratios would be the objective of adaptive management strategies. These measures of recovery provide integrated responses of survival and fecundity useful in monitoring environmental quality. The purpose of field trials would be to assess whether remediation actions enhance responses over yet nontreated control streams. Advantageous treatments would then be applied to new sets of streams for further comparison with prior treatments. A stair-step design would be implemented where adaptive management would test progressively better strategies for stream remediation based on prior field trial results. Strategy: The stair-step strategy to field testing progressively better remediation actions is motivated by large numbers of candidate streams and annual resources to address only some fraction each year. The experimental prerequisites of replication and randomization can be used to establish cause-and-effect linkages between remediation actions and improvements in survival and fecundity responses of salmonids. Environmental covariates concerning water quality, biotic responses of invertebrate populations, and habitat quality would be systematically measured to interpret variation in stream responses to remediation actions (Framework Concept Paper 23).

Maintain and improve egg-to-smolt survival in natal tributaries (Framework Concept Paper 2). Closely monitor tributary production and escapement to improve management (Spirit of the Salmon).

Maintain and improve physical integrity of aquatic ecosystems, including shorelines, banks and bottom configurations (ICBSDEIS, B-O37). Maintain and improve riparian and wetland vegetation to (ICBSDEIS, B-O38):

- a. Provide an amount and distribution of woody debris sufficient to sustain physical and biological complexity characteristics of natural aquatic and riparian ecosystems
- b. Provide adequate summer and winter thermal regulation within riparian and aquatic zones,
- c. Help achieve rates of surface erosion, bank erosion and channel migration characteristics off those under which plant communities developed, and
- d. Provide appropriate amounts and distributions of source habitats for riparian or wetland-dependent species.

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

Work with states to secure and protect minimum flows with federal nexus (FS, BLM) (Final All-H Paper Dec. 2000).

With the Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000).

Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

Fix flow, screening and passage problems in priority subbasins, beginning in 2001 in the Methow, Upper John Day and Lemhi (Final All-H Paper Dec. 2000).

Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000). Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

*Research, Monitoring, and Evaluation:*

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to determine the movements of bull trout from the Hood River and other tributaries into Bonneville Dam reservoir (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, and the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate re-establishment of fluvial bull trout in the Klickitat River (FWS Biological Opinion Dec. 2000).

1-8 Mainstem Columbia

Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP).

Mainstem habitat must be returned to natural conditions, which are linked to a 71% downstream passage survival rate, closer to those that existed prior to construction of the dams. This can be done by providing additional spill and water flows, among other measures. Begin restoration of mainstem habitat, including provisions to address toxic pollution as well as provisions for additional spill and water flows (Spirit of the Salmon).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000). Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures; add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper Dec. 1999). Designate Hanford Reach under the Federal Wild and Scenic Rivers Act; re-establish normative river conditions there (Tribal Vision).

Recolonize extinct populations once habitat conditions and connectivity improve. Therefore, if protected, areas such as the Hanford Reach of the mainstem Columbia River for fall chinook, and portions of the Clearwater and Salmon River subbasins in Idaho for westslope cutthroat trout, will serve as a foundation from which natural population and metapopulation structure can be re-established (Framework Concept Paper 5).

Set aside the Hanford Reach as an ecological preserve (FWS, DOE) (Final All-H Paper Dec. 2000; Framework Alternative 5). Enhance Mid-Columbia fall chinook by preserving existing habitat in the Hanford Reach, and implementing a normalized annual hydrograph below Priest Rapids (Framework Concept Paper 2).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Evaluate opportunities to improve spawning habitat in the Ives Island area (Final All-H Paper Dec. 2000).

Provide adequate spawning and rearing flows under Vernita Bar Agreement (FERC) (Final All-H Paper Dec. 2000).

*Research, Monitoring, and Evaluation:*

BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be

reported annually (NMFS Biological Opinion Action Table Dec. 2000).

#### 1-9 Reservoirs

Operate reservoirs and modify water diversions to provide optimum instream flows needed by salmon and other native aquatic species (Framework Concept Paper 1). Provide instream and reservoir environmental conditions necessary to provide adequate survival of resident fish and other aquatic species. Explore ways to stabilize reservoir levels (Draft All-H paper Dec. 1999).

MANAGEMENT ACTION FOR STRATEGY #3: To minimize trial expense, again choose the shortest reservoir on the Columbia. Try out various ways (gravel cleaning barges, etc.) to provide the spawning conditions along the edges of reservoirs which, together with the newly induced accelerated movement of water along the river edges, will mimic the original river conditions for spawning (and possibly even improve on them) (Framework Concept Paper 18).

MANAGEMENT ACTION FOR STRATEGY #3: To minimize trial expense, again choose the shortest reservoir on the Columbia. Try out various ways (gravel cleaning barges, etc.) to provide the spawning conditions along the edges of reservoirs which, together with the newly induced accelerated movement of water along the river edges, will mimic the original river conditions for spawning (and possibly even improve on them) (Framework Concept Paper 18).

Mitigation for impacts to natural lakes should be given a high priority within the Councils Program (Framework Concept Paper 22).

Protect, mitigate and enhance resident fish in hydropower system storage projects to the fullest extent practicable from negative impacts associated with water releases (Framework Concept Paper 13).

Survey reservoir habitat for extant spawning locations and focus on expanding areas with existing populations (Framework Concept Paper 26).

Manage water resource to more closely mimic natural historic hydrograph (e.g., Canadian storage basin irrigation), but maintain to the extent practicable, full, stable, water levels in Lakes Roosevelt, Libby & Hungry Horse according to IRCs and Council's Fish and Wildlife Program (Tribal Vision).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

#### 1-10 Estuary and Ocean

*Limit development and use to preserve or restore natural conditions in estuaries. Provide flows to benefit estuaries in reservoir rule curves. Improve water quality. Control Caspian terns and other predators (Sample Actions).*

Protect critical estuary habitat and restore former estuary habitat (Tribal Vision). Increase the use of the estuary to allow transported smolts to mature and acclimate to fresh water conditions. Use mobile pens to hold smolts in the lower Columbia and estuary (Framework Concept Paper 27).

Selectively decrease commercial harvest of Columbia River salmon in the ocean by negotiating agreements with commercial fishing interests that provide economic incentives not to fish during return periods for designated stocks (Framework Concept Paper 27).

Restore 3,000 acres of tidal wetlands along the lower 46 river miles to return tidal wetlands to 50 percent of the 1948 level (LCREP). Restore 13,000 acres of tidal wetlands in the lower 46 miles of river and adjoining tributaries (CEQ). Take additional actions based on recommendations of Lower Columbia River Estuary Program, EPA Estuary Program and Corps study (to be conducted) (CEQ).

*Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Naturally restore estuarine habitats from shore to deep-water (Sample Action).*

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action

Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion Action Table Dec. 2000).

Between 2001 and 2010, the Corps and BPA shall fund a monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts (Management Plan Action 28) to address the estuary objectives of this biological opinion (NMFS Biological Opinion Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

Facilitate Lower Columbia River Estuary Program implementation (LCREP, EPA) (Final All-H Paper Dec. 2000).

Prioritize habitats for protection and restoration (2001)(LCREP) (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); Establish Greenway Habitat Protection Fund to protect 10,000 acres of wetlands; 3,000 acres of upland (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

1. Habitat mapping and priorities for protection or restoration
2. Habitat acquisition/protection
3. COE habitat restoration
4. Monitoring
5. Public education and outreach.

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

1-11 Water Quality

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Emphasize a substantial and explicit tie between water quality compliance efforts (already under court orders in three states) and salmon recovery (FC Habitat Option 2). Determine water quality standards for fish habitat -- for example, water temperatures can be no higher than 60°F. If standards are

not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon). Remove toxic pollution sources and other contaminants. At a minimum, meet applicable water quality criteria (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1). Limit the amount of sediment in spawning habitat and in streams generally (Spirit of the Salmon). Monitor existing water withdrawals; enforce existing regulations (Tribal Vision). Acquire in-stream water rights/conservation easements to improve stream flows (Tribal Vision). Maximize irrigation efficiency; protect riparian vegetation via fencing or other methods; change land use activities/practices that degrade water quality (Tribal Vision). Restrict new dredging and improve existing dredging practices (Tribal Vision).

Maximize the available spawning habitat of the target species by manipulation of water levels during the crucial periods of time of egg laying, incubation, and emergence of free swimming fry. Post emergence water levels must be monitored and controlled, if need be, to prevent stranding of fry and to maintain appropriate temperatures (Framework Concept Paper 12).

Maintain water quality and hydrologic processes necessary to support beneficial uses including healthy riparian, aquatic and wetland ecosystems. Water quality and hydrologic processes should be within the range of variability representative of the inherent capability of the watershed area that supports beneficial use (ICBSDEIS, B-O40). Strive to develop water quality restoration plans that apply to an entire watershed or subbasin (ICBSDEIS, B-O41). Use existing MOUs with state water quality agencies to develop partnerships that include other federal, state, local and tribal organizations, watershed councils, private citizens, and non-federal landowners, to maximize the benefits of existing efforts for water quality protection and restoration (ICBSDEIS, B-O42). Restore water quality, water quantity and hydrologic processes necessary to support healthy riparian, aquatic, and wetland ecosystems (ICBSDEIS, R-O31). Develop and implement water quality restoration plans for all impaired water bodies on Forest Service and BLM-administered lands by scheduling and implementing the 303(d) protocol (ICBSDEIS, R-O32).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program (NMFS Biological Opinion Action Table Dec. 2000).

Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1). Enforce existing pollution control laws and meet the standards of the Clean Water Act (Framework Concept Paper 1). Implement increased regulation by the federal agencies under the CWA and ESA (Draft All-H paper Habitat Option 2, Dec. 1999). Establish a transboundary board in coordination with the International Joint Commission to improve water quantity and quality (Tribal Vision).

Research, Monitoring, and Evaluation:

Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP).

## 2 HARVEST

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1). In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as abundance increases (Draft All-H paper Harvest Option 1, Dec. 1999).

Shift fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

Demonstrate the advantages to the other economic benefits as the salmon recovery reaches the regional goal

(Framework Concept Paper 15).

Manage for escapement to spawning grounds (Framework Concept Paper 27).

Secure and continue to provide harvest opportunities that meet treaty and cultural needs (Framework Concept Paper 4).

Reform the region's harvest policies to prohibit mixed stock harvest. This can be accomplished by shifting to live capture and release in areas where natural and hatchery stocks are intermingled and by emphasizing terminal fisheries where harvest can occur on known strong or hatchery stocks (Framework Concept Paper 14).

Use supplemented stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

Increase recreational and commercial harvests (Framework Alternative 2,3,4,5).

Provide ceremonial, subsistence and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 2,3).

Re-establish traditional tribal fisheries at all usual and accustomed fishing stations and sites (Spirit of the Salmon; Tribal Vision).

"Put fish back in the rivers" [*e.g., supplement using hatchery techniques*] in order to move toward full treaty rights (Framework Concept Paper 3).

Artificially produced fish created for harvest should not be produced unless they can be effectively harvested in a fishery (Council's 2000 Fish and Wildlife Program).

Integrate harvest management to assure that conservation efforts made in one fishery can be passed through subsequent fisheries. Revise harvest management to more adequately spread the risk of imprecision and error in predicted run size. Enact more conservative harvest limits on fisheries farthest from the spawning grounds, for which information is less adequate. Develop adequate escapement, catch and age data on important natural spawning populations. Establish in-season management protocols that can better estimate abundance and stock composition (Council's 2000 Fish and Wildlife Program).

(P)reserve, protect, and perpetuate such wildlife and provide for the citizens of this state and as by law permitted to others, continued supplies of such wildlife for hunting, fishing, and trapping (Title 36 Idaho Code).<sup>5</sup>

Opportunities for increased harvest: Each subbasin plan and hatchery management plan should identify (a) where there is an opportunity for a terminal fishery and (b) any instance in which increased harvest is possible but will not occur under the existing harvest regime, and the changes that would be necessary to allow the harvest to occur (Council's 2000 Fish and Wildlife Program).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

## 2-1 Anadromous Fish

Reclaim the anadromous fish resource and the environment on which it depends for future generation. Restore anadromous fishes to historical abundance in perpetuity (Framework Concept Paper 3).

Within 7 years, halt the declining trends in salmon, sturgeon, and lamprey populations originating upstream of Bonneville Dam. Within 25 years, increase the total adult salmon returns of stocks originating above Bonneville Dam to 4 million annually and in a manner that sustains natural production to support tribal commercial as well as ceremonial and subsistence harvests. Within 25 years, increase sturgeon and lamprey populations to naturally sustainable levels that also support tribal harvest opportunities (Framework Concept Paper 3).

Establish Alaskan and Canadian ocean fisheries based on chinook abundance. Address incidental mortality (Spirit of the Salmon). Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1). Impose sanctions on nations that illegally catch salmon and steelhead (Framework Concept Paper 1). Decrease mixed stock harvest; accept economic incentives not to fish during certain migration periods (Framework Concept Paper 27).

<sup>5</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

<b>2-2 Resident Fish</b>
<p><i>Development of a stable Upper Columbia River producing sustainable resident fish populations and harvest, equal to the level of historical (pre-dam) conditions (Sample Action).</i></p> <p>Recover fisheries within dammed natural lakes to within 75% of their historic levels prior to impoundment (Framework Concept Paper 22).</p> <p>Establish Alaskan and Canadian ocean fisheries based on chinook abundance (Framework Concept Paper 3).</p> <p>Increase the use of Youngs Bay for producing commercial and sport harvest (Framework Concept Paper 27).</p> <p>Manage harvest to protect treaty rights, and focus on meeting the needs of Zone 6 tribal fishery (Framework Concept Paper 27).</p> <p>Re-introduce anadromous salmon and steelhead above Chief Joseph and Grand Coulee dams to restore anadromous and resident fish abundance and harvest to historical levels through mitigation program or fish passage capability (Framework Concept Paper 13).</p> <p>Introduced game fish...provide sport fisheries where habitat conditions are unsuitable for native species and also provide a diversity of angling opportunity (Idaho DFG).<sup>6</sup></p>
<b>2-3 Wildlife</b>
<p><i>Support target species, especially game species, to expand hunting opportunities. Develop potential for making additional game species available for harvest. Implement and enforce state game management and hunting programs (Sample Actions).</i></p> <p>Continue monitoring wildlife populations to determine success of measures; establish post-enhancement recovery goals and limits on harvest (Tribal Vision).</p>
<b>3 HATCHERIES</b>
<p><i>Under this Policy Direction, hatchery production would be used to boost populations to sustain increased harvest. Ultimately, the goal would be to have naturally spawning populations large enough to sustain desired levels of harvest over the long term. Hatchery fish would not be marked, and the distinction between hatchery fish and wild fish would be abandoned (Sample Action).</i></p> <p>Increase reliance on careful use of hatcheries and other artificial methods of supplementation (Framework Alternative 2). Use hatcheries to make up for lost habitat (Framework Alternative 4). Use significantly more hatcheries to replace lost spawning areas (Framework Alternative 5).</p> <p>Evaluate flow augmentation components of options. Experimentally manipulate hatchery releases. In a reverse staircase, hatchery releases would be initially reduced, and then increased, to provide contrast to treatments (Framework Concept Paper 5).</p> <p>Use central entity to serve as clearinghouse for successful approaches to artificial production, such as spawning channels and egg boxes (Framework Concept Paper 26).</p> <p>Increase production of indigenous fish and wildlife species to full natural productivity (Framework Concept Paper 4).</p> <p>Artificial production should emphasize the protection and recovery of native stocks by using conservation management actions, such as supplementation to provide eggs and fish for out-planting (concrete to gravel to gravel) (Framework Concept Paper 4).</p> <p>Supplement under seeded natural spawning areas with hatchery production (Framework Concept Paper 27).</p> <p>Use low-cost, low technology hatchery techniques for supplementation actions (Framework Concept Paper 27).</p> <p>Use innovative release strategies to provide fishing opportunities (Framework Concept Paper 27).</p> <p>Abandon efforts to protect existing wild stocks in tributaries where there is already significant hatchery influence (Framework Alternative 7).</p> <p>Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).</p>

<sup>6</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

Except for wild salmon refuges or areas where the habitat is blocked or eliminated, supplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs, although the decision of whether to employ supplementation for this purpose is one that should be made locally, as part of the subbasin plan. The object of such supplementation is to restore and maintain a healthy fish population that eventually, after appropriate habitat improvements, will become self-sustaining. In areas where sufficient fish habitat exists but natural production is insufficient to meet demands, fish stocks may be rebuilt through supplementation. Appropriate wild stocks will be evaluated and utilized wherever possible (Council's 2000 Fish and Wildlife Program).

Use artificial production with an emphasis on protection and recovery of native fish, employing appropriate conservation management actions such as supplementation to provide eggs and juveniles for outplanting (Tribal Vision, Framework Concept Paper 4). Emphasize supplementation and captive brood programs to help maintain weak naturally spawning populations (Framework Concept Paper 27).

Discontinue current hatchery rearing and release methods. Use supplementation to help rebuild salmon populations at high demographic risk of extirpation. Use supplementation to reintroduce salmon to watersheds from which they have been extirpated (Spirit of the Salmon).

Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14).

Naturally selected populations should provide the model for successfully artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics (Council's 2000 Fish and Wildlife Program). The entities authorizing or managing an artificial production facility should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some other combination of those purposes for each population of fish addressed (Council's 2000 Fish and Wildlife Program).

Over the next three years, every artificial production program and facility in the basin, federal and non-federal, should undergo a review to determine its consistency with these strategies, scientific principles, and policies. After five years, the Council, other regional decision-makers and Congress should assess whether existing review, funding and planning processes are successful in implementing needed reforms in artificial production practices (Council's 2000 Fish and Wildlife Program).

Develop new hatchery production in the John Day pool to mitigate for lost habitat (Framework Alternative 2).

Enhance production of harvestable populations of salmon resources to the extent they can be harvested by means that do not interfere with quantitative stream escapement goals for naturally spawning salmon populations (Framework Concept Paper 14).

It is time to recognize that hatcheries are used for multiple purposes, primarily producing fish for harvest but also for rebuilding naturally spawning populations through the technique of supplementation and for captive broodstock experiments. Careful thought must be given to how these techniques could maximize the efficiency of fish production to provide treaty, sport and commercial harvest opportunities while also protecting and rebuilding unique fish populations and complying with existing laws and legal processes, such as the *U.S. v. Oregon* litigation (Governors' Recommendations, July 2000).

Fully implement CRFMP (*Columbia River Fish Management Plan*) in terms of production provisions by calling upon the Policy Committee to initiate comprehensive production planning and an implementation process. The CRFMP contains authoritative provisions for production planning from both a policy and technical standpoint and includes detailed measures for dispute resolution. Because fisheries on the abundant runs produced from hatcheries are constrained by protection of weak natural stocks, and hatchery practices and funding is under attack, incentives exist to shift hatchery emphasis toward saving stocks particularly in danger of extirpation and restoring a more balanced level of production above Bonneville Dam. The tribes' technical recommendations and subbasin plans address the locations and means to accomplish this shift and the parties to *U.S. v. Oregon* are the sole parties with authority to develop comprehensive fish production plans (Spirit of the Salmon).

Reconsider the ESU interim policy on the use of propagation... While the ESU, developed in a more integrated format, may be an appropriate indicator of distinctiveness for listing purposes, it should not be used as a limitation on the recovery of a listed species in a particular habitat (Spirit of the Salmon).

Move hatcheries to tribal management, because tribes may have longer-term management focus, and will reap 50% of harvestable fish pursuant to Supreme Court Treaty interpretations, again establishing feedback loop for hatchery success (Framework Concept Paper 26). Transfer the Klickitat hatchery to the Yakama Indian Nation; the Kooskia, Clearwater, and Dworshak hatcheries to the Nez Perce Tribe; and the Lookingglass and Umatilla hatcheries to the Umatilla Tribes under authority of the Indian Self-Determination Act. Provide operation and maintenance funds for hatchery operation and for the transfer of other hatcheries as needed. Fund and implement Fish and Wildlife measures

to construct tribal production facilities. Redirect Mitchell Act propagation facility capacity and implement mitigation for John Day Dam...Because tribes retain the exclusive right to take fish on their reservations and because the hatcheries listed are located within the boundaries of their reservations or ceded areas and serve the purpose of protecting treaty fish resources, tribes are entitled to a transfer of hatchery properties along with the operation and maintenance funding to maintain them. The federal government should also transfer other hatchery facilities that may assist in restoring upper river anadromous fish populations (Spirit of the Salmon).

[F]unding of new tribal facilities required under the Fish and Wildlife Program as well as the reprogramming of the Mitchell Act and implementation of John Day mitigation are also necessary measures for restoration (Spirit of the Salmon).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

**Intact habitat:** When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing. When the biological potential of the target population is limited by external factors, such as the presence of mainstem dams or other factors, supplementation is a possible policy choice to augment natural capacity and productivity, in a limited fashion that ensures that the majority of production will be the result of natural spawning (Council's 2000 Fish and Wildlife Program).

**Restorable habitat:** Where the target population has low biological potential -- for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area -- the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

**Compromised habitat:** Where the target species has high biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of the habitat is no longer a significant limiting factor for that population. The objective also is to restore the population of the target species up to the sustainable capacity of the restored habitat. Sustained supplementation in a limited fashion is a possible policy choice in this instance. Where the target species has low biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of that habitat is no longer a significant limiting factor for that population. In this instance, a possible policy choice is expanded artificial production that utilizes the natural selection capabilities of the natural habitat to maintain fitness of both natural and artificial production (Council's 2000 Fish and Wildlife Program).

**Eliminated habitat:** Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species (Council's 2000 Fish and Wildlife Program).

Research, Monitoring, and Evaluation:

Research and design artificial propagation strategies to supplement natural lamprey production, and sturgeon production above Bonneville Dam (Spirit of the Salmon; Framework Concept Paper 3). Research, develop artificial propagation actions to supplement natural lamprey production (Tribal Vision).

3-1 Anadromous Fish

*Improve hatchery operations for better survival. Coordinate operations among hatcheries to avoid conflicts and enhance survival. Add hatcheries as practicable to increase harvest (Sample Action).*

Conduct research on Pacific lamprey and design artificial propagation strategies to supplement natural production. Develop artificial propagation and management strategies for white sturgeon populations above Bonneville Dam. (Spirit of the Salmon). Make natural spawning the top priority, stocking only in accordance with the natural carrying capacities of each watershed (Framework Concept Paper 1).

Fund applied genetics research unit to restore lost size of salmonids, improve disease resistance, and improve tolerance for warmer habitat, as well as other genetic improvements that will increase salmonid abundance (Framework Concept Paper 26).

Substitution is appropriate for lost salmon and steelhead in areas that previously had anadromous fish, but where

anadromous fish access is now permanently blocked by hydropower development and where in-kind mitigation cannot occur. Substitution should occur in the vicinity of the salmon and steelhead losses being addressed, but substitution and mitigation measures may occur on or off-site (Framework Concept Paper 13).

Unify and standardize hatchery reporting obligations to single funding entity and require reporting concerning success in generate returning adults to applicable watersheds (Framework Concept Paper 26).

Use supplementation to help rebuild salmon populations at high demographic risk of extirpation and to reintroduce salmon to watersheds from which they have been extirpated (Framework Concept Paper 3).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

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 (Council's 2000 Fish and Wildlife Program).

[S]upplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs, although the decision of whether to employ supplementation for this purpose is one that should be made locally, as part of the subbasin plan. The object of such supplementation is to restore and maintain healthy fish populations, with sufficient genetic and life history diversity to ensure that eventually, after appropriate habitat improvements, they will become self-sustaining (Council's 2000 Fish and Wildlife Program).

### 3-2 Resident Fish

*Direct production toward most desirable game fish within limitations to maximize anadromous fish production. Maintain flexibility to alter production if consumer preferences change (Sample Action).*

Hatchery subcatchable (put-grow-and-take) and catchable (put-and-take) programs are used in other heavily-fished, public waters to provide recreational fishing opportunity, with emphasis on those areas that will allow a high proportion of hatchery-produced fish to be returned to the creel (Idaho DFG).<sup>7</sup>

Substitution: 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 (Council's 2000 Fish and Wildlife Program).

A comprehensive mitigation program of native resident fish restoration and native/non-native fish substitution; i.e., continuation and enhancement of the policies, goals and objectives documented in the Power Planning Council's 1995 Fish and Wildlife Program and the Columbia Fish & Wildlife Authority's (1997) Multi-Year Implementation Plan (Framework Concept Paper 13).

Develop adult and juvenile anadromous fish passage capabilities – exploring all possible engineering, technological, and societal means -- to circumvent the current barriers to anadromous salmon & steelhead migration at Chief Joseph and Grand Coulee dams. Concurrently re-introduce fish species and stocks that genetically and behaviorally resemble the assemblages present before the construction of the Upper Columbia River dams. Reestablishment of healthy anadromous fish populations will require artificial production facilities to establish populations while adequate habitat is filled and degraded habitat is rehabilitated (Framework Concept Paper 13).

Develop artificial propagation and management strategies for white sturgeon populations above Bonneville Dam (Framework Concept Paper 3).

For substitution purposes, resident fish may include landlocked anadromous fish (e.g., white sturgeon, kokanee and coho) as well as traditionally defined resident fish species (Framework Concept Paper 13).

Keep water levels in Libby, Roosevelt, Dworshak, and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Plant significant numbers of kokanee eggs collected by IDF&G and purchased from outside agencies in incubation protection systems throughout the southern parts of lake Pend Oreille until the gas saturation problem is corrected and

<sup>7</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

then concentrate on restoring wild spawning in the northern part of the lake with similar strategies (Framework Concept Paper 12).

Purchase 10 million kokanee eggs from outside agencies each year until the recovery goal is reached. This would augment the Idaho Department of Fish and Game egg collection at Sullivan Springs. These eggs would increase the hatchery production of fry and provide for protected incubation planting of eggs (Framework Concept Paper 12).

Resident Fish (Non-Native) – Maintain and enhance populations in areas where native populations have been extirpated or reduced to such an extent that native species restoration is biologically or economically infeasible. Use of non-native populations as a substitute fishery serves only as a mitigative response to economic and social concerns over the uncompensable loss of native species (Framework Concept Paper 7B).

Restore native resident fish abundance and diversity by promoting a wide array of life history characteristics, maintaining, restoring and reestablishing the necessary resilience and persistence that allows human use and enjoyment of native resident populations in the face of natural environmental fluctuations and human induced sources of mortality. Restoration of native resident fish abundance occurs through (Framework Concept Paper 7B):

- Restoring depressed populations to sustainable, harvestable levels and enhancing healthy native resident fish stocks
- Reintroducing and reestablishing stocks in their traditional range, where biologically feasible and economically justifiable.

Revise the planting of fry from the Cabinet Gorge hatchery from release in the Clark Fork river to planting in the southern part of Lake Pend Oreille until the gas saturation problem that exists in the lower Clark Fork river is overcome (Framework Concept Paper 12).

Supplement wild incubation by the use of artificial protection devices [Vibrant boxes for example] to increase the egg to fry survival from normal wild survival percentages of less than 10% to over 80% survival of protected eggs to fry (Framework Concept Paper 12).

Supplement the quantity of target species eggs needed by hatcheries by purchasing eggs from other agencies. These eggs would be used in augmenting the number of emerging fry that would be expected to be produced from planting of hatchery fry and from the deposit of eggs in protected natural incubation environments. About 10 million eggs per year would need to be purchased (Framework Concept Paper 12).

Transport fry ready for release from the Cabinet Gorge hatchery to the southern parts of lake Pend Oreille whenever gas saturation in the Clark Fork river is over 100% including release at Sullivan Springs (Framework Concept Paper 12).

Protect, mitigate, enhance resident fish populations affected by construction and operation of dams. Mitigate hydrosystem effects through native fish restoration and native/non-native fish substitution (per MYIP) (Tribal Vision).

The Action Agencies shall continue to maintain the preservation stocking program [of Kootenai River white sturgeon] operated by the Kootenai Tribe of Idaho, and associated rearing facilities operated by B.C. Ministry of Environment, Lands and Parks (FWS Biological Opinion Dec. 2000)

#### Research, Monitoring, and Evaluation:

The Action Agencies shall maintain the current level(s) of monitoring associated with all stages of natural recruitment, and the preservation stocking program (FWS Biological Opinion Dec. 2000). Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species (Council's 2000 Fish and Wildlife Program). Conduct research on Pacific lamprey and design artificial propagation strategies to supplement natural production (Framework Concept Paper 3).

## 4 HYDRO

*Breach dams only if other measures fail to recover stocks to levels desired for harvest (Sample Action).*

The federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival. This option would also include more aggressive operational measures for flow and spill (Draft All-H paper Hydro Option 2, Dec. 1999).

Apply management actions in a way that balances wildlife, anadromous and resident fish interests (Framework Concept Paper 20).

Consider all fish populations together when considering changes to hydropower system. Avoid benefiting one at the detriment of another. Fisheries must be viewed as an integrated whole, similar to the way flood control is viewed (Framework Concept Paper 22).

Our vision of the future includes the cost-effective generation of electricity in an environmentally responsible manner (Framework Concept Paper 20).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve in-river juvenile salmon survival; avoid fluctuations caused by power peaking operations (Spirit of the Salmon). The federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival (Draft All-H Paper Hydro Option 2, Dec. 1999). [Implement] more aggressive operational measures for flow and spill. The federal agencies would seek increased flow augmentation from Canadian reservoirs and improved water quantity and quality from the upper Snake River. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

The Action Agencies shall coordinate with NMFS, USFWS, and the states and tribes in preseason planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2) (NMFS Biological Opinion Action Table Dec. 2000).

Use relicensing and ESA consultation to improve flows, passage, etc. at non-federal dams on the Deschutes, Lewis, Cowlitz, and other basins (FERC) (Final All-H Paper Dec. 2000).

#### 4-1 Dam Modifications and Facilities

At the time of the SOR, the Corps' System Configuration Study (SCS) was evaluating major structural modifications to some of the 14 federal projects in response to the NPPC's Phase 2 and Phase 3 amendments to its regional Fish and Wildlife Program. Structural measures were suggested for study during the SOR, but were not pursued because they were part of the SCS or otherwise considered beyond the scope of the SOR. These measures included:

- Modifying adult ladder entrances and exits to improve adult passage survival
- Installing juvenile bypasses at all major dams with high fish mortality rates
- Installing fish screens at dams and over irrigation diversion outlets
- Developing fish byways to divert and rejoin rivers
- Constructing a smolt canal paralleling the Snake and Columbia Rivers from the mouth of the Clearwater to just below Bonneville Dam
- Developing new facilities and equipment to improve the juvenile fish transportation program
- Installing locks at additional dams to expand the navigation system.

Modifying recreational facilities to allow their use over a wider range of operating conditions (SOR FEIS at Chapter 4 (Detailed Fish Operating Plan (DFOP) -- SOS 9a)).

Capital improvements at the mainstem dams designed to approximate natural conditions (e.g., surface bypass) (Framework Alternative 5). Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

To insure that proposed hydro system changes are focused on documented sources of fish mortality the entire hydropower system will undergo a detailed fish mortality audit. This audit will document the major sources of mortality for both adults and juvenile salmon and steelhead as they move through the system. Changes in system configuration and operation will be designed to rectify the highest sources of fish mortality with the goal of improving the overall cumulative survival rates with priority given to adults over juveniles because of their biological significance to the propagation of future generations of salmon and steelhead (Framework Concept Paper 14).

Install irrigated spawning channels below dam tailraces and elsewhere to increase mainstem spawning habitat (Framework Concept Paper 26).

Remove existing extended length turbine intake screens [at mainstem dams to reduce injury and mortality to salmonids and lamprey associated with handling, collection, barging, etc.]; halt construction of new screens; consider removing existing standard length screens (Tribal Vision). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

[Further modify] 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 (Governors' Recommendations, July 2000).

Each state commits, by October 1 this year (2000) and annually thereafter, to provide a list of priority fish passage projects to the Council for proposed funding. The list could include such things as screening diversions and replacing culverts, as well as removal of, or passage at, tributary dams, as is being done at Condit, Wapatox and Marmot dams (Governors' Recommendations, July 2000).

The Action Agencies, in coordination with the Regional Forum, shall determine the appropriate operating range of turbines equipped with minimum gap runners (MGRs) to increase survival of juvenile migrants passing through these new turbine designs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete Bonneville First Powerhouse prototype evaluations of extended submerged intake and gatewell vertical barrier screens, including an assessment of fry passage (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the investigation of minimum gap runners at the Bonneville First Powerhouse (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete Bonneville Second Powerhouse post-construction evaluation of the new juvenile fish bypass outfall and address design and operational refinements as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue Bonneville Second Powerhouse investigations of measures to improve intake screen fish guidance efficiency and safe passage through the gatewell environment. This work shall include an assessment of fry passage (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue design development and 2001 prototype testing of upper turbine intake occlusion devices at The Dalles, with a goal of increased non-turbine passage rates through either the sluiceway or the spillway. The Corps shall install occlusion devices across the entire powerhouse, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue design development of a prototype RSW and extended deflector for testing at John Day in 2002. The Corps should synthesize evaluation results, determine the fish survival benefits of one or more RSWs or a skeleton bay surface bypass, and install the units as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue John Day prototype development and investigations of extended submerged intake screens, gatewell vertical barrier screens, and, if necessary, orifices to optimize guidance and safe passage through the system, including a gatewell debris cleaning plan. This work shall include an assessment of fry passage. The Corps shall design and construct new screen systems for safe passage of juvenile salmonids, as warranted. Juvenile bypass outfall survival investigations shall also be conducted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue evaluations to assess the need for improvements of the existing intake screens, gatewell vertical barrier screen cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at McNary to determine where improvements are necessary to reduce problems experienced during the 1996 flood, increase fish survival, and resolve holding and loading facility problems, including raceway jumping by juvenile salmon and steelhead and debris plugging of bypass lines. Additionally, the Corps shall evaluate whether the existing juvenile bypass system outfall should be relocated (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate surface bypass (e.g., RSW) at Lower Monumental Dam, based on prototype results at other locations, and install in multiple spillway bays, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall initiate design development and testing of extended submerged intake screens and vertical barrier screens at Lower Monumental Dam and construct units as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the design development, fabrication/deployment, and testing of a prototype RSW at Lower Granite, in conjunction with the existing prototype powerhouse occlusion devices, including the forebay behavioral guidance structure (BGS) and upper turbine intake occlusion devices. As warranted by prototype test results, the Corps shall install one or more permanent RSWs and occlusion devices at appropriate lower Snake hydro projects, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete design for new juvenile bypass facilities at Lower Granite Dam, including enlarged orifices and bypass gallery, open-channel flow bypass, improved separator for juvenile separation by size, and improved fish distribution flumes and barge-loading facilities and shall proceed to construction, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue high-flow outfall investigations to determine whether it is appropriate to modify bypass outfall criteria in the context of high-discharge bypass discharges (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of

juvenile and adult salmonids (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall investigate hydraulic and behavioral aspects of turbine passage by juvenile steelhead and salmon through turbines to develop biologically based turbine design and operating criteria. The Corps shall submit a report to NMFS stating the findings of the first phase of the Turbine Passage Survival Program by October 2001. Annual progress reports will be provided after this date (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall remove all unnecessary obstructions in the higher velocity areas of the intake-to-draft tube sections of the turbine units (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to evaluate the need for improvements of the existing intake screens, gatewell vertical barrier screens' cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at the four lower Snake River hydropower projects (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen systemwide letter report and implement recommended improvements (NMFS Biological Opinion Action Table Dec. 2000).

By January 2002, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of an extended-length, intake screen bypass system, a surface-collection bypass system, and hybrid alternatives at Bonneville First Powerhouse. Through the annual planning process, the Corps shall determine which of these configurations to implement (NMFS Biological Opinion Action Table Dec. 2000).

By January 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the John Day Dam powerhouse to surface collection at one or more skeleton or spillway bays. Through the annual planning process, the Action Agencies shall then determine the need for, and the implementation priority of, these configuration alternatives (NMFS Biological Opinion Action Table Dec. 2000).

By January, 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the Lower Monumental Dam powerhouse turbines to a removable RSW surface bypass system (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate ways to provide egress to adult fish that have fallen back into juvenile collection galleries and primary dewatering facilities at Ice Harbor and McNary dams. The Corps shall either install structural, or implement operational, remedies to minimize delay and injury of fish that fall back, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement an automated monitoring and alarm system at appropriate FCRPS projects, as determined in the NMFS Regional Forum, to monitor changes in head differential remotely between the primary auxiliary water supply conduits/channels and the adult collection channels and to minimize diffuser damage due to excessive differentials. The Corps shall ensure that diffuser gratings for all auxiliary water supply systems are securely fastened. The Corps shall work through FPOM to develop a monitoring program for inspecting diffuser gratings and grating fasteners (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall design the spillway Number 1 (end bay) deflector at John Day Dam, and implement as warranted, in

coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete the ongoing prototype powerhouse system surface collection evaluations at Bonneville First Powerhouse in 2000. The Corps shall compare the prototype with screened bypass systems and, if warranted, design and construct permanent facilities after full consideration and resolution of biological and engineering uncertainties, especially high-flow outfall investigations (NMFS Biological Opinion Action Table Dec. 2000).

Aggressive passage improvements, including specific passage upgrades for juvenile fish at individual dams. Improvements vary by location, including relocation of bypass outfalls, refined screens and bypass facilities, development of surface bypass, spillway modifications and more effective spill, improved turbine operations and design, predator management, mainstem and estuarine habitat (Final All-H Paper Dec. 2000).

Fund full COE capital and O&M programs (Final All-H Paper Dec. 2000).

The Corps shall continue design development and construction of a Bonneville Second Powerhouse permanent corner collector at the existing sluice chute, pending results of high-flow outfall investigations. The Corps shall construct new facilities if, and as soon as, evaluations confirm the optimum design configuration and survival benefits (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions (NMFS Biological Opinion Action Table Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with FWS, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

#### 4-2 Hydro Operation

Maximize in-river juvenile survival via reservoir operations established in Council's 1994 Fish and Wildlife Program (Tribal Vision). Use flow, spill, drawdowns, peak efficiency turbine operations, new turbine technology and predator control to improve juvenile salmon survival. Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

[P]rovide increased velocities for anadromous fish by establishing flow targets during the migration period (SOR FEIS Alternative 9c).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

*[Implement]* more aggressive operational measures for flow and spill. The federal agencies would seek increased flow augmentation from Canadian reservoirs and improved water quantity and quality from the upper Snake River. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

#### 4-3 Spill

*Use spill as appropriate to improve survival. Increase emphasis on transport (Sample Action).*

*[Implement]* more aggressive operational measures for flow and spill. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve in-river juvenile salmon survival.; avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

View the cost of fishery recovery as an investment to an economic benefit for the entire regional population rather than a cost or loss of benefits of the hydroelectric projects (Framework Concept Paper 15).

Manage spill at dams to keep dissolved gas levels within federal clean water guidelines (Draft Framework Alternative 1).

Spill and/or surface bypass to achieve 80% FPE or better through non-powerhouse routes (Tribal Vision).

Specific spill percentages are established at run-of-river projects to achieve no higher than 120 percent daily average total dissolved gas (SOR FEIS Alternative 9a).

Spill is recognized as a highly effective means of passing juvenile salmon downstream, reducing the mortality associated with passage through many turbine sets and in most bypass systems. The use of spill should be improved -- in duration, timing and quantity -- at all the federal hydropower projects. Experiments testing spill benefits at different levels and times of year should be expanded, and the impacts on juvenile fish survival from these alternative spill operations, including summer spill, should be carefully monitored and evaluated (Governors' Recommendations, July 2000).

The Corps and BPA shall continue (pending results of the McNary Transport Evaluation) to bypass juvenile spring migrants collected at McNary Dam and shall provide the spring spill levels described for that project (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall evaluate adult fallback and juvenile fish passage under daytime spill to the gas cap at Bonneville Dam in 2002 and 2003, after deflector optimization improvements allow for increased spill above current levels. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of additional changes in spill to further improve fish survival (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall continue spill and passage survival studies at The Dalles Dam in 2001. Research results shall be considered, in consultation with NMFS through the annual planning process, to assess the need for additional changes in spill to further improve fish survival by 2002, if possible, but no later than 2005 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall continue investigation of 24-hour spill at John Day Dam in 2001. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of daytime spill to further improve juvenile fish survival as needed for its contribution to the performance standard (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate, design, and construct, as warranted, a new juvenile bypass outfall at Lower Monumental Dam. Investigations shall be conducted in conjunction with spillway deflector and spill pattern optimization studies (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS through the annual planning process, shall investigate the spillway passage survival of juvenile salmonids at appropriate FCRPS dams. These investigations shall assess the effect of spill

patterns and per-bay spill volumes on fish survival, across a range of flow conditions. The Action Agencies shall develop a phased approach (including costs and schedules) and set priorities, in consultation with NMFS in the annual planning process, to continue spillway passage survival studies in 2001 and future years (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS through the annual planning process, shall evaluate the effect of spill duration and volume on spillway effectiveness (percent of total project passage via spill), spill efficiency (fish per unit flow), forebay residence time, and total project and system survival of juvenile steelhead and salmon passing FCRPS dams. Studies shall include both collector and non-collector projects. Adult passage considerations and potential adult fallback shall also be considered in study designs. Little Goose and Lower Granite dams shall be specifically considered for daytime spill studies. An overall phased study approach for spill evaluations will be determined in the 1- and 5-year implementation plans (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall provide at least 10,000 cfs of increased release capacity at Libby Dam in two increments of at least 5,000 cfs each under the following conditions, sequence, and schedule (FWS Biological Opinion Dec. 2000):

- a) [Test] spillway in 2001 to reliably estimate the maximum spillway flow dilution capability and compliance with the state water quality standard of 110 percent gas saturation. Possible changes in dissolved gas concentrations throughout the Kootenai River shall be evaluated [and] effects of the spill on bull trout and other fish in the Kootenai River [shall be monitored]. Investigate and restore, if necessary, Kootenai River channel capacity to accommodate the increased release capacities at Libby Dam (35,000 cfs). By spring 2002, the Action Agencies will begin routine use of the existing spillway for sturgeon flow augmentation. This spillway option shall only be considered a viable long term conservation measure if VarQ, or a comparable flood control/storage procedure, is in effect which assures the reservoir surface routinely exceeds the spillway elevation by the time sturgeon flows are needed. The timing of spillway use shall be determined in part by the ability to maintain 10 degrees Celsius at Bonners Ferry with the selective withdrawal facilities at Libby Dam. If, by December 30, 2001, it is determined that at least 5,000 cfs can not be routinely passed over the spillway within the total dissolved gas criteria of 110%, or VarQ or some other flood control/storage procedure has not been adopted, the Action Agencies shall immediately begin preparation of NEPA documentation and seek funding for installation of one turbine or spillway flow deflectors, which are to be operational by spring 2004.
- b) By spring 2007, the Action Agencies will seek means and be prepared to release an additional 5,000 cfs (total of at least 10,000 cfs) at Libby Dam for sturgeon conservation.

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

#### 4-4 Flow

Manage the river to return seasonal flow patterns for salmon and steelhead while also protecting upriver fish that don't migrate to the ocean (Framework Alternative 2). Establish, or modify minimum flows (including Columbia River flows) to meet instream fish and wildlife needs. Evaluate the cumulative impact of all proposed water withdrawals, diversions, or instream structures to ensure that established minimum flows are maintained (LCREP).

Continue current flow programs, with some protection for upstream reservoirs. Secure use of water from Canadian storage reservoirs to meet flow needs (Framework Alternative 5).

Flow augmentation should not impair resident fish program objectives in upper river system (Framework Concept Paper 27).

*[Implement]* more aggressive operational measures for flow and spill. The federal agencies would seek increased flow augmentation from Canadian reservoirs and improved water quantity and quality from the upper Snake River (Draft All-H Paper Hydro Option 2, Dec. 1999).

Alternative 9a establishes flow targets at The Dalles based upon the previous year's end-of-year storage content (SOR FEIS Alternative 9a).

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 (Council's 2000 Fish and Wildlife Program).

Flow management in the Columbia and Snake mainstems should continue as part of the mainstem strategy. Flow augmentation pursuant to state law, a key component of flow management, remains controversial. But there are ways

to reduce the controversy in the future. First, federal agencies must document the benefits of flow augmentation and the precise attributes of flow that may make it beneficial. Second, where the benefits of flow augmentation have been documented, migrating fish should be left in the river to benefit from it. Third, the region should review off-river storage for additional water if flow augmentation is going to continue to be a key strategy. Fourth, flow management should be designed to integrate all water-related statutory mandates, including not only the Endangered Species Act but also the Clean Water Act, and should consider impacts to non-anadromous listed and unlisted species. Fifth, implementation of flow management should fully account for actual water conditions so that, for example, if cool water is provided for temperature benefits, the benefits are not negated by simultaneous releases of warmer water from other sources. Sixth, additional water may be available for flow augmentation if flood control operations can be prudently altered. The Corps and NMFS should work with the region on a study to determine whether flood control rule curves can be reconfigured to allow shaping of flows to improve survival of migrating salmon and steelhead. Finally, the region should explore whether salmon benefits could be achieved through cooperative agreements regarding power peaking operations, such as those currently in place for the Hanford Reach stocks and listed chum salmon spawning below Bonneville Dam (Governors' Recommendations, July 2000).

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of "Variable Q" flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H Paper Hydro Option 2, Dec. 1999).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS to provide flows to support chum salmon spawning in the Ives Island area below Bonneville Dam (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS to provide access for chum salmon spawning in Hamilton and Hardy creeks (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion Action Table Dec. 2000).

Improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements.

Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

The Action Agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Koocanusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000). [Note: This action favors sturgeon over Columbia River Listed salmonids migrating in the summer.]

The Action Agencies have proposed to seek funding to conduct biological studies, in consultation with FWS, to both determine the effectiveness of increased flows in improving sturgeon recruitment and to determine any adverse effects to bull trout in the Kootenai River below Libby Dam. If, as a result of these increased releases, in any year during the 10-year life of this biological opinion, a new year class of at least 20 naturally recruited yearling or older sturgeon is documented, the Action Agencies shall reinitiate consultation with FWS before proceeding with any additional facilities or improvements at Libby Dam for sturgeon flow augmentation (FWS Biological Opinion Dec. 2000). By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

If Koocanusa Reservoir elevations are below salmon guidelines (2,439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August

(FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Koocanusa Reservoir and estimates of monthly discharge from Libby Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Koocanusa Reservoir and hourly spill and releases at Libby Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Hungry Horse Reservoir and estimates of monthly discharge from Hungry Horse Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Hungry Horse Reservoir and hourly spill and releases at Hungry Horse Dam (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

As U.S. representatives on the Kootenay lake board of control, and operators of Libby Dam, it is recommended that the Action Agencies seek opportunity to provide low flows in the Kootenai River during January or February for burbot migration and spawning (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

Improve flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

#### 4-5 Reservoir Levels

*Might draft lower in spring, but refill by start of summer to maximize benefits to returning adults (storage projects full by July 1). Reservoir rule curves give priority to needs of native species (Sample Action).*

*Specific volumes of releases are made from Dworshak, Brownlee, and Upper Snake River to try to meet Lower Granite flow targets. Lower Snake River projects are drawn down to near spillway crest level for 4.5 months (Sample Action).*

Reduce the amount of water stored for hydropower production to provide for more natural flows, including periodic flooding and droughts to restore native plants (Framework Alternative 1). Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8). Restore normative flow conditions from Priest Rapids dam to the estuary, using spring and summer flow augmentation under a system operating plan that implements a normalized hydrograph. Implement Integrated Rule Curves (IRCs) at upstream projects (e.g., Libby, Hungry Horse) to benefit resident fish and wildlife, and to restore a more natural hydrograph with no loss of flood controls (Framework Concept Paper 5).

Install totalizing flow meters at major diversion points. For water withdrawn from reservoirs, install gauges that identify the water surface elevation range from full reservoir to dead pool elevation. Additionally, if the reservoir is located in-channel, install gauges upstream and downstream of the reservoir (Framework Concept Paper 28).

Restore natural river levels to the lower Snake River (below Hells Canyon complex) and draw down John Day dam to spillway crest level; and restore natural river ecosystem components throughout the basin. Keep water levels in Libby, Roosevelt, Dworshak, and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Manage water resource to more closely mimic natural historic hydrograph (e.g., Canadian storage basin irrigation), but maintain to the extent practicable, full, stable, water levels in Lakes Roosevelt, Libby & Hungry Horse according to IRCs and Council's Fish & Wildlife Program (Tribal Vision). Operate reservoirs and modify water diversions to provide optimum instream flows needed by salmon and other native aquatic species (Framework Concept Paper 1).

Keep water levels in Libby, Roosevelt, Dworshak and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Implement the IRCs at all storage projects incorporating the Libby Dam approach of tiered flows and careful use of the VARQ flood control strategy. Reduce reservoir drawdown and improve reservoir refill probability to assure a sustainable basin-wide operation for all native species and their prey in the Columbia River watershed. Replace static flow targets in the lower Columbia with attainable normative-type flow targets resulting from basin-wide application of IRCs (Framework Concept Paper 8)

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of "Variable Q" flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H paper Hydro Option 2, Dec. 1999).

Keep water levels in Libby, Roosevelt, Dworshak and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall evaluate potential benefits to adult Snake River steelhead and fall chinook salmon passage by drafting Dworshak Reservoir to elevation 1,500 feet in September. An evaluation of the temperature effects and adult migration behavior should accompany a draft of Dworshak Reservoir substantially below elevation 1,520 feet (NMFS Biological Opinion Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

If Koochanusa Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Koochanusa Reservoir and estimates of monthly discharge from Libby Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Koochanusa Reservoir and hourly spill and releases at Libby Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Hungry Horse Reservoir and estimates of monthly discharge from Hungry Horse Dam. The monthly supplement shall include a report of actual operations

over the previous month and shall include daily water surface elevation at Hungry Horse Reservoir and hourly spill and releases at Hungry Horse Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall continue the lake winter elevation/kokanee egg-to-fry survival study on Lake Pend Oreille for the next six years. The study shall begin in 2001 by drafting the lake to fall/winter water levels of elevation 2051 feet. This is intended to allow winter storms to improve the condition of spawning gravel along the shore of Lake Pend Oreille. During the fall/winter of 2002, maintain the Lake Pend Oreille at elevation 2055 until fry emerge from shoreline gravels. By September 2003 FWS will secure independent scientific review relative to the appropriate duration (one to three years) of maintaining winter lake elevations at 2055 feet and provide written recommendations to the Action Agencies for fall/winter operations for 2003 through 2006. During this six year period, the Action Agencies, in coordination with FWS and IDFG, shall evaluate the effects of varying winter lake level elevations on all life stages of kokanee in Lake Pend Oreille, and predator/prey dynamics. If, in September 2007, it is determined that this action is effective in significantly improving kokanee production as bull trout forage, FWS will provide written recommendations on the frequency of varying Lake Pend Oreille winter lake elevations for the remainder of this biological opinion. The Action Agencies, FWS, and IDFG shall meet annually to evaluate Lake Pend Oreille kokanee monitoring results and make necessary adjustments through subsequent in-season management (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

#### 4-6 Water Quality

*Adopt, monitor, and enforce strict water quality standards including turbidity, temperature, velocity, and pollutants (Sample Action).*

Implement physical measures and operational actions to optimize water quality conditions (temperature and dissolved gas) where consistent with overall objectives and other strategies (Draft All-H paper Dec. 1999). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

Require Washington Water Power Company to install systems on Cabinet Gorge and Noxon Rapids dams to reduce nitrogen gas saturation to 110% by the year 2001 (Framework Concept Paper 12).

Require the installation of devices or modify dam operations that will result in the reduction of nitrogen gas saturation to a maximum of 110%. This strategy must be accompanied with a monitoring system that will verify the gas saturation does not exceed accepted levels. This must apply to all federal dams and dams that are not owned by a federal agency, but are installed on waters that fall within the definition of the Columbia river drainage basin regardless of which state or states the targeted body of water is in and the location of the dam (Framework Concept Paper 12).

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). By June 30, 2001, the Action Agencies shall develop and coordinate with the Service, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000). The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-

Columbia PUDs' monitoring programs (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season (NMFS Biological Opinion Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the systemwide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG levels associated with system spill (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of project operations (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall evaluate potential benefits to adult Snake River steelhead and fall chinook salmon passage by drafting Dworshak Reservoir to elevation 1,500 feet in September. An evaluation of the temperature effects and adult migration behavior should accompany a draft of Dworshak Reservoir substantially below elevation 1,520 feet (NMFS Biological Opinion Action Table Dec. 2000).

Improve water quality while meeting fish passage objectives, and development of a Water Quality Improvement Plan for dissolved gas and temperature (Final All-H Paper Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with FWS, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall evaluate and report to FWS on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with FWS, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

#### 4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). Consistent with our preference to emphasize and build upon natural processes, we believe strategies and actions should be implemented that provide the best

possible survival for fish that migrate in the river through the reservoirs and past the dams. We recognize that in the short term there are survival benefits from continuing to use fish transportation as a transitional strategy. However, we believe that when ongoing research affirms that survival of listed salmon populations would increase from migration in an improved river environment, an increasing number of juvenile fish should then be allowed to migrate inriver. An immediate evaluation is also necessary of survival rates for fish transported by trucks compared to barges. If survival is lower in trucks and barging is an available alternative, then trucking should be discontinued (Governors' Recommendations, July 2000).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1).

Incorporate juvenile and adult salmon passage facilities on all water diversions (Framework Concept Paper 28).

Investigate the use of surface collectors and other devices to enhance guidance at dams (Framework Concept Paper 25).

**MANAGEMENT ACTION FOR STRATEGY #2:** To minimize trial expense, choose the shortest reservoir on the Columbia for testing the viability of artificially impelling a stream of water along both edges of the reservoir to simulate the movement of water that took place along the original river banks, both sweeping smolt downstream and guiding adult salmon upstream (Framework Concept Paper 18).

The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall extend the period of barge transportation from the lower Snake River dams and McNary to further reduce reliance on trucking (NMFS Biological Opinion Action Table Dec. 2000).

By the end of 2001, the Corps shall develop, in coordination with NMFS and the other federal, state, and tribal salmon managers, a McNary Dam transportation evaluation study plan specifically focusing on the response of UCR spring chinook and steelhead to transportation. Approved research should begin by 2002, if feasible (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, in coordination with NMFS through the annual planning process, shall evaluate transport to inriver return ratios for wild SR yearling chinook salmon and steelhead. In addition, the Corps and BPA shall also evaluate the effects of transportation on summer-migrating subyearling SR chinook salmon (NMFS Biological Opinion Action Table Dec. 2000).

During all transport evaluations, the Corps and BPA, in coordination with NMFS through the annual planning process, shall include an evaluation of delayed mortality (D) of transported versus inriver migrating juvenile anadromous salmonids (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall evaluate the effects of prior transport as smolts on the homing of adults (NMFS Biological Opinion Action Table Dec. 2000).

If results of Snake River studies indicate that survival of juvenile salmon and steelhead collected and transported during any segment of the juvenile migration (i.e., before May 1) is no better than the survival of juvenile salmon that migrate inriver, the Corps and BPA, in coordination with NMFS through the annual planning process, shall identify and implement appropriate measures to optimize inriver passage at the collector dams during those periods (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to fund and expand, as appropriate, fish marking and recapturing programs aimed at defining juvenile migrant survival for both transported and nontransported migrants and adult returns for both groups. These studies shall also compare the SARs of transported and nontransported fish to calculate the differential delayed mortality (D), if any, of transported fish (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to investigate a way to increase entry rates of fish approaching surface bypass/collector entrances (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-

friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion Action Table Dec. 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinitiate consultation, if necessary (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000). The Corps shall record the occurrence of bull trout in the smolt monitoring facilities at the Lower Columbia River dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two-way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

#### 4-8 Adult Fish Passage

Provide a variety of passage routes at the remaining mainstem dams... including surface bypass, submerged screens and spill (Framework Alternative 1,2,3). Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1; Framework Concept Paper 20).

Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Spirit of the Salmon). Restore salmon and steelhead passage into upper portions of the basin at Chief Joseph, Grand Coulee, and Hells Canyon dams (Framework Alternative 1).

The feasibility of reintroduction, including an evaluation of the existing habitat, is being investigated as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Hells Canyon complex. While mindful of the challenges involved, options and costs should continue to be assessed as part of the relicensing process. A similar challenge confronts reintroduction of migrating salmonids above Chief Joseph and Grand Coulee dams, particularly above Grand Coulee. Nevertheless, encourage work currently under way to assess the possibility (Governors' Recommendations, July 2000).

MANAGEMENT ACTION FOR STRATEGY #2: To minimize trial expense, choose the shortest reservoir on the Columbia for testing the viability of artificially impelling a stream of water along both edges of the reservoir to simulate the movement of water that took place along the original river banks, both sweeping smolt downstream and guiding adult salmon upstream (Framework Concept Paper 18).

Develop adult and juvenile anadromous fish passage capabilities—exploring all possible engineering, technological, and societal means—to circumvent the current barriers to anadromous salmon and steelhead migration at Chief Joseph and Grand Coulee dams. Concurrently re-introduce fish species and stocks that genetically and behaviorally resemble the assemblages present before the construction of the Upper Columbia River dams. Reestablishment of healthy anadromous fish populations will require artificial production facilities to establish populations while adequate habitat is filled and degraded habitat is rehabilitated (Framework Concept Paper 13).

Incorporate juvenile and adult salmon passage facilities on all water diversions (Framework Concept Paper 28).

MANAGEMENT ACTION FOR STRATEGY #1: To minimize trial expense, choose a low rise dam at the lower end of the Columbia for testing the viability of new kind of fish ladder which features side by side pool strings moving in opposite direction in which the weight of one string counterbalances the weight of the other to minimize the expenditure of energy needed to move adult salmon up and smolt down from reservoir to reservoir, past the dam. Once the best size/speed etc. has been found, apply it to the remaining dams on the Columbia (Framework Concept Paper 18).

Use new and existing information to expand salmon passage models to cover entire salmon lifecycle (Framework Concept Paper 26).

To benefit salmon migrants, both upstream and downstream, expedited schedules should be established to design and install passage improvements (Governors' Recommendations, July 2000).

The Corps shall ensure that alterations to fish ladders and adult passage facilities to accommodate Pacific lamprey passage do not adversely affect salmonid passage timing and success (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop improved operations for adult fishway main entrances at FCRPS dams so that the best possible attraction conditions are provided for adult migrants, both at the four Columbia River hydro projects and the four lower Snake hydro projects (where reservoir elevations are held near MOP). The Corps shall report the findings of fishway entrance flow-balancing investigations in a report to NMFS by the end of 2001 and shall continue to work through FPOM to evaluate and implement, as warranted, structural changes to satisfy fish passage plan fishway entrance criteria (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and maintain an auxiliary water-supply, emergency-parts inventory for all adult fishways where determined necessary, in coordination with NMFS (NMFS Biological Opinion Action Table Dec. 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinstate consultation, if necessary (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two-way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue biological and engineering investigations and design of a composite ice and trash sluiceway outfall relocation and adult ladder auxiliary water system at The Dalles Dam and shall construct such devices as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts) (NMFS Biological Opinion Action

Table Dec. 2000).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive evaluation to investigate the causes of headburn in adult salmonids and shall implement corrective measures, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall initiate an adult steelhead downstream migrant (kelt) assessment program to determine the magnitude of passage, the contribution to population diversity and growth, and potential actions to provide safe passage (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement it, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate and enumerate fallback of upstream migrant salmonids through turbine intakes at all lower Snake and lower Columbia River dams. The Corps shall implement corrective measures to reduce turbine mortality, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall examine existing fish-ladder water temperature and adult radio-telemetry data to determine whether observed temperature differences in fishways adversely affect fish passage time and holding behavior. If non-uniform temperatures are found to cause delay, means for supplying cooler water to identified areas of warmer temperatures should be developed and implemented in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate adult fish delay and fallback at ladder junction pools and implement remedies to reduce this problem, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all projects to either minimize delay of adults or minimize counting difficulties that reduce count accuracy (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and long-term performance and reliability (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall initiate an engineering study to evaluate existing limitations relating to its inability to satisfy fish passage plan operating criteria at the John Day Dam north shore ladder (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete adult fishway auxiliary water supply evaluations at each lower Snake River hydro project and implement corrective measures as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion Action Table Dec. 2000).

#### 4-9 Flood Control

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

Improved Flows: improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000). Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

The Service recommends that the Action Agencies initiate section 7 consultation on the proposed Columbia River Treaty Flood Control Operating Plan, October 1999. Proposed changes contained in this Plan may affect sturgeon spawning/rearing habitat conditions necessary for the survival and recovery of those species (FWS Biological Opinion Dec. 2000). Improve existing habitat and fully evaluate passage opportunities through relicensing and Section 7 consultation for Idaho Power Company dams (Final All-H Paper Dec. 2000).

#### Research, Monitoring, and Evaluation:

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

Authorize systemwide flood control review (Final All-H Paper Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in

coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, federal, tribal, and Canadian agencies in developing its analysis. Within six months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids. A final study plan shall be provided to NMFS and all interested agencies four months after submitting the draft plan for review. The Corps shall provide a draft feasibility analysis to all interested agencies, NMFS, and the peer-review panel by September 2005 (NMFS Biological Opinion Action Table Dec. 2000).

## COMMERCE

### 5. POWER

#### 5-1. Existing Generation

*Hydropower generation continues. Minimizing spill, which corresponds to maximum transport, may result in increased power generation; however, other measures implemented to aid fish may decrease power generation (Sample Action).*

Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

On the Columbia, implement normative changes in operations (as defined by the Independent Scientific Advisory Board in "Return to the River"), improving in-river migration for salmon. Secure Canadian storage on upper Columbia to augment flows in spring and summer. From Priest Rapids downstream, normative steps include meeting flow minimums and 24-hour spill during the spring migration. Implement Integrated Rule Curves (IRCs) at all storage projects and create IRCs for projects that do not presently have integrated operational rules, by modeling watershed technology. (Significant expertise is readily available from scientists in Montana and the USACE.) Refine IRCs using a team of site-specific experts. After IRCs are developed, a system model with sufficient time resolution (e.g., weekly or daily) can incorporate operating rules at various dams. Shift regional energy "peaking" or "load following" to Upper Columbia projects, primarily Grand Coulee and Chief Joseph, and to other USACE facilities. Shape the timing and volume of combined discharges from the various projects to adhere to desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to speed smolt outmigration. The more natural hydrograph enhances resident fish and wildlife in all affected waters. (OPR: NMFS/USACE) (Framework Concept Paper 2).

#### 5-2. New Generation

*New generation resources would continue to be developed to meet increasing demand. New generation sources would be subject to environmental laws including NEPA, Clean Air and Water Acts, and FERC licensing (Sample Action).*

*Research and develop energy alternatives such as photovoltaics, wind energy, biomass-derived fuels and chemicals, energy-efficient buildings, advanced vehicles, solar manufacturing, industrial processes, solar thermal systems, hydrogen fuel cells, superconductivity, geothermal and waste-to-energy technologies (e.g., National Renewable Energy Laboratories programs) (Sample Action).*

#### 5-3. Transmission Reliability

*If spill is minimized and generation increases from the status quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability. If the backstop option of dam removal were implemented, it would trigger the transmission projects listed above, plus others listed in the Natural Focus Policy Direction (Sample Action).*

*Changes in vegetation maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as unmaintained areas become widespread and effective monitoring becomes impractical. Public safety is a direct concern, both at individual sites and for power users that may be affected by the blackouts (Sample Action). Costs increase for routine maintenance practices as additional objectives are met, but less than under the Weak Stock Focus Policy Direction (Sample Action).*

To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion Action Table Dec. 2000).

BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological

Opinion Action Table Dec. 2000).

BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity (FWS Biological Opinion Dec. 2000).

Amend the Federal Power Act to require FERC to approve the formation of and oversee a private self-regulatory organization that prescribes and enforces mandatory reliability standards; to provide FERC with the authority to require transmitting utilities to turn over operational control of transmission facilities to an independent system operator; and to encourage the development of regional transmission planning and siting groups (e.g., DOE's Comprehensive Electricity Competition Plan).

## 6. INDUSTRY

### 6-1. Industrial Growth

*Incentives for clean industry, limit new development on riparian or natural lands by buying land or conservation easements (Sample Action).*

Encourage and facilitate programs for pollution credit trading (<http://www.thecarbontrader.com/news37.009.htm>).

### 6-2. Aluminum and Chemical

Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP).

Encourage and facilitate programs for pollution credit trading (<http://www.thecarbontrader.com/news37.009.htm>).

### 6-3. Mining

*Actively restore mining sites to assist fish stocks. New mining operations would be sensitive to sustainable use (Sample Action).*

### 6-4. Pulp and Paper

*Manage or eliminate discharges to assist stocks (Sample Action).*

Provide incentives to modify facilities to be oxygen-based, closed-loop pulp mills so that they are chlorine-free zero-discharge (<http://www.rfu.org/PulpPrimer.htm>).

## 7. TRANSPORTATION

### 7-1. Navigation and Barging

*Manage channel dredging to assist stocks (Sample Action).*

### 7-2. Trucking and Railroads

*Maintain and improve existing railroads and trucking facilities to complement the barging industry along the rivers. Practice environmental impact avoidance, minimization, and mitigation when expanding transportation facilities to meet increasing demand. Compensate for navigation and barging losses in the event that hydro operations need to be modified to address threatened and endangered species (Sample Actions).*

## 8. AGRICULTURE

*Protect and enhance habitat to provide management, such as connecting fragmented habitats, obtaining conservation easements on private lands, and educating the public (Sample Action).*

Implement soil and water conservation practices that control erosion and runoff in order to reduce stream sedimentation, flooding, and bank erosion and those that help to maintain or improve base streamflows (Draft All-H paper, Dec. 1999).

Halt any further impairment of wetlands. Prevent additional soil compaction. Prevent removal of riparian vegetation. Prohibit activities that would contribute to the creation or maintenance of peak flows earlier or greater than those that

would occur naturally (Spirit of the Salmon).

Implement actions to create wetlands, e.g., re-introduction of beavers. Implement actions needed to promote re-vegetation of riparian areas and de-compaction of soils where recovery is not occurring naturally. If necessary, initiate land management designed to return a watershed to a natural hydrologic regime, e.g., re-vegetation of areas adversely affected by past land-disturbing activities (Spirit of the Salmon).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000).

Provide permanent protection for riparian areas in agricultural areas by *[expanding and]* supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (e.g., Washington Forests & Fish model) (Final All-H Paper Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

#### 8-1. Irrigation

Reduce irrigation withdrawals (Framework Concept Paper 23). Adopt strong water conservation programs and use saved water to replenish flows (Framework Concept Paper 1).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Framework Concept Paper 3; Spirit of the Salmon). Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28). Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

*Emphasize preservation, fallow, management, and active restoration. Limit new irrigation, especially on lands with hydrologic connectivity. Fallow land in dry years above dewatered tributaries. Use screening, improved efficiency, and positive incentives for management. Acquire conservation easements. Perform active restoration to connect fragmented habitats (Sample Action).*

Meter groundwater and surface water withdrawals (Spirit of the Salmon).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion Action Table Dec. 2000).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

#### 8-2. Pesticides and Agricultural Practices

Reduce the use of pesticides in agriculture to lower input to terrestrial and aquatic areas (Framework Alternative 1,2,3). Nutrient and pest management practices needed to limit delivery of pollutants that create eutrophic or toxic conditions for fish and other aquatic organisms (Draft All-H paper Dec. 1999).

*Use federal and state cost-share programs to (i) provide incentives for farmers to establish riparian buffers to protect and restore stream habitat; (ii) restore farmed wetlands that will benefit salmonids; and (iii) provide a mechanism for farmers to comply with state laws [e.g., Oregon's Senate Bill 1010 (1993 Or. Laws, ch. 263)].*

### 8-3. Grazing

Manage grazing to reduce riparian impacts and input of organic nutrients and pathogens into water sources (Framework Alternative 1,2,3). Install fencing to keep range animals away from stream sides (Framework Concept Paper 23).

*Use federal and state cost-share programs to (i) provide incentives for ranchers to establish riparian buffers to protect and restore stream habitat; (ii) restore grazed wetlands that will benefit salmonids; and (iii) provide a mechanism for ranchers to comply with state laws [e.g., Oregon's Senate Bill 1010 (1993 Or. Laws, ch. 263)].*

### 8-4. Forestry

*Reduce and manage timber harvest. Acquire conservation easements to connect habitat (Sample Action).*

Implement federal and state strategies to reduce the risk of catastrophic wildfires (e.g., the Western Governor's Association's draft Ten-year Comprehensive Strategy for Restoring Health to Fire-Adapted Ecosystems).

Promote sustainable [harvest] while providing for...riparian set-asides for salmonid fish-bearing streams. Provide efficient, temporary mitigation to ease transition to different land uses where economic opportunities are reduced (Framework Concept Paper 7B).

## 9. COMMERCIAL HARVEST

In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as abundance increases (Draft All-H paper Harvest Option 1, Dec. 1999).

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

Provide financial incentives for alternative commercial and economic activity for tribes with in river fishing rights that agree to temporarily suspend or reduce commercial fishing (Framework Concept Paper 27).

Shift fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

Impose sanctions on nations that illegally catch salmon and steelhead (Framework Concept Paper 1).

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

## 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP).

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present preferred alternatives that minimize impacts. The preferred alternative will have no adverse impacts. If impacts are unavoidable, mitigation shall take one of five forms in order of preference (LCREP):

- a) Restoration: returning a damaged habitat as closely as possible to its condition prior to damage
- b) Enhancement: making changes or improvements to habitat to replace functions or values lost or damaged
- c) Preservation: protecting habitat in adjacent areas that are equivalent to the area damaged and that might otherwise be subject to unregulated activity
- d) Creation: converting a non-functioning habitat area into one having all of the physical and biological characteristics of the area lost or damaged
- e) Cash mitigation: providing cash compensation for lost habitat to be used for habitat protection and restoration.

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

## 11. RECREATION

In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as

abundance increases (Draft All-H paper Harvest Option 1, Dec. 1999).

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

Determine the relationship of the targeted resident fish species population dynamics and its predators, including sports harvest. This should include an estimation of the level of harvest that could be sustained while the population is in the recovery stages, as well as at the recovery level (Framework Concept Paper 12).

Shift fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

## TRIBES

### 12-1. Tribal Harvest

*[Advocate for] habitat [and] production actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3). Modify the existing basin-wide mechanisms of the Columbia River Fish Management Plan (CRFMP), the Fish and Wildlife Program, and FERC Orders to more fully implement treaty fishing rights to take fish at all usual and accustomed fishing places. Use the Endangered Species Act in a manner that is consistent with implementation of treaty rights to natural resources (Spirit of the Salmon).*

Conduct ceremonial, subsistence, and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 1,2,3). Continue efforts to “put fish back in rivers” (*e.g., supplementation*) in order to move toward achievement of full treaty rights (Framework Concept Paper 3).

Restore salmonid abundance and diversity to sustainable levels, allowing Columbia Basin populations to reach tribal treaty harvest objectives. Rebuild self-sustaining populations of sturgeon and lamprey throughout their historic range, if possible, to restore the cultural value of these populations (Framework Concept Paper 7B).

Provide financial incentives for alternative commercial and economic activity for tribes with in river fishing rights that agree to temporarily suspend or reduce commercial fishing (Framework Concept Paper 27).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Support habitat protection and enhancement through land acquisitions, land trusts, conservation easements, etc. (Tribal Vision).

### 12-2. Tradition, Culture, Spirituality

*Actively restore ecosystem health and associated species. Improve tribal well being and the ability of tribes to exercise their respective rights and to enjoy traditional values. Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Action).*

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 (Tribal Vision).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-O45). Support federally recognized tribes’ and tribal communities’ subsistence needs to the greatest extent practicable (ICBSDEIS, B-O61). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-O69).

**SAMPLE IMPLEMENTATION ACTIONS**  
**FOR THE**  
**STRONG STOCK FOCUS POLICY DIRECTION**

Emphasizes *human intervention to avoid declines* of healthy fish stocks and strong wildlife populations into weakened conditions requiring legal protection.

**FISH & WILDLIFE**

**1 HABITAT**

Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations [*and the healthiest habitat*] (Framework Concept Paper 4; Framework Concept Paper 20). Continue protection of habitat that is already protected by local laws, such as water quality standards, discharge permits, fish and wildlife passage requirements, etc. (Framework Concept Paper 4). The ecosystem increases currently productive fish and wildlife species (Framework Alternative 2,3,4,5). Strong salmon and steelhead runs increase in number and inhabit more of the river system (Framework Alternative 6).

The first step towards moving back to a balanced ecosystem is recognition of the fact that it cannot be allowed to get any worse. This is the essence of taking a proactive, rather than reactive stance to ecosystem management. We define this as a 'no further impact' scenario. A 'no-further impact' scenario will have certain defined parameters. These are generally described by the regulations. For example, nitrogen concentrations cannot exceed the current value of x mg/L, and impervious surface in the Basin will not exceed current levels (Framework Concept Paper 16).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' we are supporting the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

The time has come to take a proactive versus reactive approach to ecosystem management. This translates into thinking about how to prevent degradation from occurring, rather than mitigating it after the damage has been done (Framework Concept Paper 16).

Use computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 25; Framework Concept Paper 26).

The first step towards moving back to a balanced ecosystem is recognition of the fact that it cannot be allowed to get any worse...this [*is*] a 'no further impact' scenario (Framework Concept Paper 16). Where there is no recovery plan, either because one has yet to be developed, or the species status is so dire that no feasible plan can be determined, the action must avoid adverse effects to listed individuals and their habitat to the greatest extent possible and provide offsetting mitigation for those adverse effects that could not be avoided (Draft Biological Opinion).

Enhance conditions for currently productive (as opposed to solely native) fish and wildlife populations (Framework Alternative 6). Protect remaining good quality habitat throughout the Columbia Basin (Framework Concept Paper 5). Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision). Increase habitat connections throughout the basin (Framework Alternative 5). Protect existing high-quality habitats (Draft All-H paper, Dec. 1999). Prevent degradation from occurring, rather than mitigating it after the damage has been done (Framework Concept Paper 16).

Efforts to improve the status of fish and wildlife populations in the Basin should focus first on habitat that supports existing populations that are healthy and productive. Next, we should expand adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this strategy applies to the restoration of weak stocks: the restoration should focus first on the habitat where portions of that population are doing relatively well, and then extend to adjacent habitats (Council's 2000 Fish and Wildlife Program).

Moderately increase efforts to protect and restore habitat. The federal agencies would focus on federal land management, federal immediate actions and on improved coordination of federal funding for non-federal actions.

This option does not seek significant new commitments from state, tribal and local governments. However, it would build on existing watershed efforts wherever available (Draft All-H Paper Habitat Option 1, Dec. 1999).

The Forest Service and BLM propose to develop and implement a coordinated, scientifically sound, broad-scale, ecosystem-based management strategy for lands they administer in the ICBEMP project area (ICBSDEIS). The actions focus "on restoring and maintaining ecosystems across the project area and providing for the social and economic needs of people while reducing short- and long-term risks to natural resources from human and natural disturbances." Conserve current aquatic and riparian habitats that support important native fish population centers. This includes maintenance of hydrologic, riparian and instream processes and functions; water quality; connectivity; and noxious weed control (ICBSDEIS, A1-O1).

A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of conservation options that it could choose to support. These choices would include: purchasing land to establish preserves, purchasing conservation easements, paying bounties for endangered species on private lands, buying conservation contracts, offering grants or low-interest loans to conservation projects, and conducting research (with a small, fixed percentage of the fund) (O'Toole 1993; Thoreau Institute).<sup>1</sup>

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, NPPC, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the level of FCRPS funding to develop and implement a basinwide hierarchical monitoring program. This program shall be developed collaboratively with appropriate regional agencies and shall determine population and environmental status (including assessment of performance measures and standards) and allow ground-truthing of regional databases. A draft program including protocols for specific data to be collected, frequency of samples, and sampling sites shall be developed by September 2001. Implementation should begin no later than the spring of 2002 and will be fully implemented no later than 2003 (NMFS Biological Opinion Action Table Dec. 2000).

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat. When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing (Council's 2000 Fish and Wildlife Program).

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

#### 1-1 Anadromous Fish

"The truth is that there is no acceptable way that we can come into compliance with the Endangered Species Act as it relates to salmon in the entire Columbia River System. The truth is that we are simply unwilling to come to grips with the issue that we have, probably irrevocably, decided that the Columbia River is a working river harnessed to provide the cheapest electrical energy in the world—and, simply, we ain't about to give that up. The truth is that playing games with various combinations of attempts to assuage limiting factors for the salmon will not do the job—and we know it. If we frankly admit that we cannot obey the law, we are free to do the best we can to save the remnant populations. That can be done through a combination of directing money and resources to the places they will do the most good, and letting people off the hook who have nothing to do with those efforts" (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

No further hydroelectric development in habitat that supports anadromous or resident salmonids (Framework Concept Paper 5). Protect quality riverine, riparian, and upland habitat that currently sustains viable salmonid populations, and afford the highest protection to relatively undamaged habitats ("refuge" habitat) (Framework Concept Paper 5).

<sup>1</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:

<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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Protect quality riverine, riparian, and upland habitat that currently sustains viable salmonid populations (e.g., the Columbia River's Hanford Reach for fall chinook or the Clearwater and Salmon subbasins for westslope cutthroat and spring/summer chinook); afford the highest protection to pristine and relatively undamaged habitats ("refuge" habitat) whether through existing federal and state laws and regulations, or new legislation (Framework Concept Paper 5).

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 fishes 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. 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 (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

Protecting and recovering salmonids and other aquatic species requires protecting land on and around fish-bearing streams. Building upon successes elsewhere, we endorse creation of salmon sanctuaries that protect key aquatic habitats and related uplands through voluntary conservation easements, leases, land purchases, and tax-incentive donations. The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish (Governors' Recommendations, July 2000).

These policies need to be considered in the context of the natural conditions of the Columbia River Basin as it now exists. In most places, this ecosystem is significantly altered from the time when Europeans began inhabiting the basin more than 150 years ago. This means that fish populations adapted to the original "natural" conditions of the Columbia basin may not be the same as those that are now or could be naturally produced. This does not mean that habitat will not be improved to be more productive for native fish populations and species, but only that the original habitat conditions are not achievable in the foreseeable future. Therefore, when these policies speak of natural conditions, they are referring to current or foreseeable improvements in the existing, altered ecosystem (Council's Artificial Production Review, October 1999, Section II.D).

Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Restore and maintain flow regimes sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient and wood routing (ICBSDEIS, R-O7). Restore and maintain the timing, variability, and duration of floodplain inundation and water table elevation (ICBSDEIS, R-O8). Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall initiate programs in three priority subbasins (identified in the Conceptual Recovery Plan) per year over 5 years, in coordination with NMFS, USFWS, the states and others, to address all flow, passage, and screening problems in each subbasin over 10 years. The Corps shall implement demonstration projects to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. Under the NPPC program, BPA addresses passage, screening, and flow problems, where they are not the responsibility of others. BPA expects to expand on these measures in coordination with the NPPC process to complement BOR actions described in the action above (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to investigate the causes of discrepancies in adult return rates for juvenile salmonids that have different passage histories through the hydrosystem (NMFS Biological Opinion Action Table Dec. 2000).

Support BPA offsite mitigation strategy (Final All-H Paper Dec. 2000). Accelerate land acquisition, using LWCF funds prioritizing fish habitat (USFS, BLM) (Final All-H Paper Dec. 2000). Protect existing high quality habitat and accelerate restoration in high priority subbasins (Final All-H Paper Dec. 2000). Complete HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000).

1-2 Resident Fish
<p>Above the dams that block salmon and steelhead migration, tailor programs to provide resident fish and wildlife required by local conditions and management needs (Framework Alternative 2, 4, 5). Maximize the available spawning habitat of the target species by manipulation of water levels during the crucial periods of time of egg laying, incubation, and emergence of free swimming fry. Post emergence water levels must be monitored and controlled, if need be, to prevent stranding of fry and to maintain appropriate temperatures (Framework Concept Paper 12).</p> <p>Avoid further hydroelectric development in habitat that supports...resident salmonids (Framework Concept Paper 5).</p> <p>By October 1, 2004, the Action Agencies shall evaluate and report to FWS on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).</p>
1-3 Introduced Species
<p><i>If introduced species are thriving (and not threatening other healthy native species), their habitat conditions would be maintained (Sample Action).</i></p>
1-4 Wildlife
<p><i>If wildlife species are thriving (and not threatening other healthy native species), their habitat conditions would be maintained (Sample Action).</i></p> <p>Protect, mitigate, and enhance wildlife populations with continual operations and maintenance; achieve little or no risk of long-term degradation (Tribal Vision).</p> <p>Select fish and wildlife measures for implementation based on cost-effectiveness analysis to maximize the public benefit from expenditures of finite salmon recovery funds (Framework Concept Paper 25).</p> <p>Increase the abundance and range of existing populations and habitats. Expand and connect existing habitat pockets to facilitate development of normative population structures for aquatic communities. Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 1). Implement vegetative practices that provide suitable cover to control erosion and runoff as well as provide food and shelter for wildlife (Draft All-H paper Dec. 1999).</p> <p>The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).</p>
1-5 Predators of Anadromous Fish
<p>Increase the amount of riparian vegetation that will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1).</p> <p>Plant vegetation that discourages nesting of terns at Rice Island and the peninsula at the mouth of the Walla Walla River (Framework Concept Paper 11).</p> <p><u>Research, Monitoring, and Evaluation:</u></p> <p>The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).</p>
1-6 Watersheds
<p><i>Manage watersheds to improve survival success of targeted species. Actively restore watersheds where currently productive populations exist. Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species. Land and water users and managers should meet specified habitat conditions associated with salmon survival rates for targeted species (Sample Actions).</i></p> <p>Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).</p> <p>Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs</p>

covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion Action Table Dec. 2000).

BPA shall work with the NPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion Action Table Dec. 2000).

With the Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

[Encourage] non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

#### 1-7 Tributaries

*Prioritize habitat restoration and maintenance at stream reaches inhabited by healthy stocks (Sample Action).*

Efforts to improve the status of fish and wildlife populations in the basin should focus first on habitat that supports existing populations that are healthy and productive. Next ...expand adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this strategy applies to the restoration of weak stocks: the restoration should focus first on the habitat where portions of that population are doing relatively well, and then extend to adjacent habitats (Council's 2000 Fish and Wildlife Program).

For currently productive species and their associated habitats (Framework Alternative 1,4; Framework Concept Paper 2):

- Protect, connect, and restore habitat on the tributaries throughout the basin
- Test the effectiveness of restoring habitat in tributary watersheds
- Maintain and improve egg-to-smolt survival in natal tributaries.

Management Actions: Courses of action to protect instream flows in small streams and tributaries must recognize that control of these particular water resources often lies with individual water right holders, and that what the holder has a right to do is divert water from the stream. Other activities to restore streams and associated riparian and upslope conditions will have little if any effect on aquatic habitat if there is no water. Furthermore, even if such other activities result in more water in the stream, rights to divert the increased flow may be held by a prior appropriator. To meet the objectives of restoring and protecting instream flows, water right holders must take action under applicable state water laws to create instream water rights (Framework Concept Paper 17).

Declare specific tributaries (e.g., John Day River) "off-limits" to hatcheries to provide buffers against asserted genetics problems with hatchery production. Designate tributaries with extensive hatchery influence as "production/supplementation" tributaries and abandon efforts to protect existing wild stocks in such tributaries (Framework Concept Paper 26).

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to

which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control) (NMFS Biological Opinion Action Table Dec. 2000).

With the Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000).

Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

Fix flow, screening and passage problems in priority subbasins, beginning in 2001 in the Methow, Upper John Day and Lemhi (Final All-H Paper Dec. 2000).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

Fund and evaluate innovative approaches to flow restoration (BPA) (Final All-H Paper Dec. 2000). Work with states to secure and protect minimum flows with a federal nexus (FS, BLM) (Final All-H Paper Dec. 2000). Provide technical assistance to state instream flow work (USGS, USBR) (Final All-H Paper Dec. 2000). Establish in-stream flows for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

Support TMDL development and implementation (BPA) (Final All-H Paper Dec. 2000). Provide TMDL technical assistance to states (Final All-H Paper Dec. 2000). Develop and implement TMDLs for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000). Coordinate TMDL and Water Quantity planning assessments with Northwest Power Planning Council program (Final All-H Paper Dec. 2000).

Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000). Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

#### 1-8 Mainstem Columbia

Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Protect, conserve, restore, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP; Final All-H Paper Dec. 2000).

Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; mimic natural hydrographs to the extent practicable; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper, Dec. 1999).

Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5; Final All-H Paper Dec. 2000).

The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, federal, tribal, and Canadian agencies in developing its analysis. Within 6 months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids). A final study plan shall be provided to NMFS and all interested agencies 4 months after submitting the draft plan for review. The Corps shall provide a draft feasibility analysis to all interested agencies, NMFS, and the peer-review panel by September 2005 (NMFS Biological Opinion Action Table Dec. 2000).

#### 1-9 Reservoirs

*Run reservoirs seasonally to increase survival of currently productive populations (Sample Action).*

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-10 Estuary and Ocean

*Limit development. Maintain and preserve existing conditions and habitat quality in estuaries. Maintain water quality (Sample Actions).*

*Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Restore natural estuarine habitats from shore to deep-water (Sample Action).*

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite migration (NMFS Biological Opinion Action Table Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000). Prioritize habitats for protection and restoration (2001)(LCREP; Final All-H Paper Dec. 2000).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Facilitate Lower Columbia River Estuary Program implementation and strengthen Lower Columbia River Estuary Program authority (Final All-H Paper Dec. 2000).

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000). Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); Establish Greenway Habitat Protection Fund to protect...wetlands [and] uplands (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

- Habitat mapping and priorities for protection or restoration
- Habitat acquisition/protection
- COE habitat restoration

- Monitoring
- Public education and outreach.

*Research, Monitoring, and Evaluation:*

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27). Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

1-11 Water Quality

*Establish standards to protect healthy stocks. Identify and manage releases of cumulative toxins (Sample Actions).*

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Determine water quality standards for fish habitat—for example, water temperatures can be no higher than 60°F. If standards are not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP). Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1). Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon).

Limit the amount of sediment in spawning habitat and in streams generally (Spirit of the Salmon).

The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

Work with states to secure and protect minimum flows w/federal nexus (FS, BLM) (Final All-H Paper Dec. 2000).

2 HARVEST

Maintain salmonid escapements: the escapement goal is the annual number of adults, or a range of values, that the management entity intends to successfully spawn within a designated watershed (Framework Concept Paper 19). Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

“Put fish back in the rivers” (e.g., hatchery supplementation) in order to mover toward full treaty rights (Framework Concept Paper 3).

Use supplemented [salmon] stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as abundance increases (Draft All-H Paper Harvest Option 1, Dec. 1999).

Within 7 years, halt the declining trends in salmon, sturgeon and lamprey populations originating upstream of Bonneville Dam. Within 25 years, increase the total adult salmon returns of stocks originating above Bonneville Dam to 4 million annually and in a manner that sustains natural production to support tribal commercial as well as ceremonial and subsistence harvests. Within 25 years, increase sturgeon and lamprey populations to naturally sustainable levels that also support tribal harvest opportunities (Framework Concept Paper 3).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

2-1 Anadromous Fish

*Set harvest levels to sustain healthy populations at least at current levels. Let weak stocks recover as they are able to benefit from actions to maintain healthy stocks (Sample Actions).*

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

*[Manage]* Alaskan and Canadian ocean fisheries based on chinook abundance (Spirit of the Salmon). Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1). Impose sanctions on

nations that illegally catch salmon and steelhead (Framework Concept Paper 1).

Set escapement objectives for fish by population per watershed (Framework Concept Paper 20).

Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations (Framework Concept Paper 20).

Larger salmonid metapopulations will be used as the level of genetic organization to be conserved (Framework Concept Paper 20).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Provide sufficient funding for managing fisheries and contributing to the transition to selective fisheries, and for the 1999 Pacific Salmon Treaty Agreement (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion Action Table Dec. 2000).

2-2 Resident Fish

*Maintain or increase populations of economically and/or culturally significant resident fish, including introduced species (Sample Action).*

Determine the relationship of the targeted resident fish species population dynamics and its predators, including sports harvest. This should include an estimation of the level of harvest that could be sustained while the population is in the recovery stages, as well as at the recovery level (Framework Concept Paper 12).

2-3 Wildlife

*Manage wildlife to keep existing species healthy for continued sport and tribal hunting (Sample Action).*

3 HATCHERIES

*Protect and expand existing healthy core populations (Sample Action).* Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

*Protect healthy stocks to maintain or increase population. Operate hatcheries to supplement healthy populations as necessary and to serve demand for harvest (Sample Actions).*

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

Preserve or enhance existing native stock structures and genetic diversity (Framework Concept Paper 9).

The manner of use and value of artificial production must be considered in the context of the environment in which it will be used (Council's Artificial Production Review, October 1999, Section II.D; Council's 2000 Fish and Wildlife Program).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing (Council's 2000 Fish and Wildlife Program). If the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

### 3-1 Anadromous Fish

*Use hatcheries as practicable to strengthen (supplement) runs. Maintain or reduce hatcheries as necessary to supply fish for harvest without compromising healthy and potentially healthy stocks (Sample Action).*

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

Where the critical habitat is largely intact, artificial production is not currently occurring, and the fish population has good potential, then no artificial production should be used. Those populations and their associated spawning and early rearing habitat should be preserved and protected (Council's 2000 Fish and Wildlife Program).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

### 3-2 Resident Fish

*Use hatcheries as practicable to strengthen (supplement) healthy populations. Maintain hatcheries as necessary to supply fish for harvest without competing with healthy stocks (Sample Actions).*

## 4 HYDRO

### 4-1 Dam Modifications and Facilities

*Retain existing dams (Sample Action).* Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from the 2001 juvenile outmigration (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised (NMFS Biological Opinion Action Table Dec. 2000). The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

#### Research, Monitoring, and Evaluation:

The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion Action Table Dec. 2000).

4-2 Hydro Operation
<p><i>Continue existing operations, except to discontinue operations designed to aid weak stocks (Sample Action).</i></p> <p><i>SOR FEIS Alternative 1a represents operations as they existed from 1983 through 1990 to 1991 operating year, including Northwest Power Act provisions to restore and protect fish populations in the basin. Hydro operations to benefit fish and wildlife would likely be similar to those before the first fish populations in the basin were listed as endangered (i.e., prior to 1991) (Sample Action).</i></p>
4-3 Spill
<p><i>Meet current TDG standards. Spill if proved beneficial for healthy stocks (Sample Action).</i></p> <p>The Corps and BPA shall continue investigation of 24-hour spill at John Day Dam in 2001. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of daytime spill to further improve juvenile fish survival as needed for its contribution to the performance standard (NMFS Biological Opinion Action Table Dec. 2000).</p>
4-4 Flow
<p><i>Augment flows only if proved beneficial, then schedule flow augmentation to fit with migration of healthy stocks (Sample Action).</i></p> <p><i>Protect seasonal biological use, e.g., Vernita Bar (Sample Action). Provide adequate spawning and rearing flows under Vernita Bar Agreement (FERC) (Final All-H Paper Dec. 2000).</i></p> <p>Continue current flow programs, with some protection for upstream reservoirs (Framework Alternative 5, 6).</p> <p>Manage flows in the Hanford Reach to match natural seasonal and daily patterns (Framework Alternative 5).</p>
4-5 Reservoir Levels
<p>The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>By October 1, 2002, the Corps shall develop and, if feasible, implement a revised storage reservation diagram for Libby Reservoir that replaces the existing fall draft to a fixed end-of-December elevation. One option is to evaluate variable drafts based on the El Niño Southern Oscillation Index (SOI) predictions or other forecast methodologies of runoff volume. To implement this change, the Corps shall complete successful coordination with Canada under the Columbia River Treaty (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).</p>
4-6 Water Quality
<p><i>Bring water quality up to CWA standards and prevent deterioration from water meeting standards. Make changes if problems arise. Maintain or increase water quality enforcement in strong stock areas (Sample Action).</i></p> <p>Implement physical measures and operational actions to optimize water quality conditions (temperature and dissolved gas) where consistent with overall objectives and other strategies (Draft All-H paper Dec. 1999).</p> <p>The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in</p>

the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season (NMFS Biological Opinion Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the systemwide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG levels associated with system spill (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

Improve water quality while meeting fish passage objectives, and development of a Water Quality Improvement Plan for dissolved gas and temperature (Final All-H Paper Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion Action Table Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

#### 4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). The Corps shall continue to transport all non-research juvenile salmonids collected at the Snake River collector projects. The Corps and BPA shall continue to implement voluntary spill at all three Snake River collector projects when seasonal average flows are projected to meet or exceed 85 kcfs (NMFS Biological Opinion Action Table Dec. 2000).

##### Research, Monitoring, and Evaluation:

The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion Action Table Dec. 2000). The Corps shall evaluate and implement structural and operational alternatives to improve juvenile transportation at the collector dams (NMFS Biological Opinion Action Table Dec. 2000). If results of Snake River studies indicate that survival of juvenile salmon and steelhead collected and transported during any segment of the juvenile migration (i.e., before May 1) is no better than the survival of juvenile salmon that migrate inriver, the Corps and BPA, in coordination with NMFS through the annual planning process, shall identify and implement appropriate measures to optimize inriver passage at the collector dams during those periods (NMFS Biological Opinion Action Table Dec. 2000). The Corps and BPA shall evaluate the effects of prior transport as smolts on the homing of adults (NMFS Biological Opinion Action Table Dec. 2000).

#### 4-8 Adult Fish Passage

Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7).

The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall examine existing fish-ladder water temperature and adult radio-telemetry data to determine whether observed temperature differences in fishways adversely affect fish passage time and holding behavior. If non-

uniform temperatures are found to cause delay, means for supplying cooler water to identified areas of warmer temperatures should be developed and implemented in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate adult fish delay and fallback at ladder junction pools and implement remedies to reduce this problem, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all projects to either minimize delay of adults or minimize counting difficulties that reduce count accuracy (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion Action Table Dec. 2000).

#### 4-9 Flood Control

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8).

The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, federal, tribal, and Canadian agencies in developing its analysis. Within 6 months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids). A final study plan shall be provided to NMFS and all interested agencies 4 months after submitting the draft plan for review. The Corps shall provide a draft feasibility analysis to all interested agencies, NMFS, and the peer-review panel by September 2005 (NMFS Biological Opinion Action Table Dec. 2000).

Authorize systemwide flood control review (Final All-H Paper Dec. 2000).

### COMMERCE

#### 5. POWER

##### 5-1. Existing Generation

*Accept some hydropower effects for operations to sustain currently productive populations. Maintain current hydrosystems, but build no new hydro (Sample Action).*

On the Columbia, implement *normative* changes in operations (as defined by the Independent Scientific Advisory Board in “Return to the River”), improving in-river migration for salmon. Secure Canadian storage on upper Columbia to augment flows in spring and summer. From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration. Implement Integrated Rule Curves (IRCs) at all storage projects and create IRCs for projects that do not presently have integrated operational rules, by modeling watershed technology. (Significant expertise is readily available from scientists in Montana and the USACE.) Refine IRCs using a team of site-specific experts. After IRCs are developed, a system model with sufficient time resolution (e.g., weekly or daily) can incorporate operating rules at various dams. Shift regional energy “peaking” or “load following” to Upper Columbia projects, primarily Grand Coulee and Chief Joseph, and to other USACE facilities. Shape the timing and volume of combined discharges from the various projects to adhere to desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to speed smolt outmigration. The *more natural hydrograph* enhances resident fish and wildlife in all affected waters(OPR: NMFS/USACE) (Framework Concept Paper 2).

##### 5-2. New Generation

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally

sensitive (LCREP).
<b>5-3. Transmission Reliability</b>
<p><i>If spill is minimized and generation increases from the Status Quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability (Sample Action).</i></p> <p><i>Changes in vegetation maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as unmaintained areas become widespread and effective monitoring becomes impractical. Public safety is a direct concern, both at individual sites and for power users that may be affected by the blackouts (Sample Action).</i></p> <p><i>Reduced road densities on public lands could affect access to transmission facilities, which impairs the ability to perform maintenance in a timely manner, causing the potential for longer outages in emergencies (Sample Action).</i></p> <p><i>Costs increase for routine maintenance practices as additional objectives are met, but much less than for the Natural Focus direction (Sample Action).</i></p> <p>To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders (NMFS Biological Opinion Action Table Dec. 2000).</p>
<b>6. INDUSTRY</b>
<b>6-1. Industrial Growth</b>
<i>Little change required in industry. Industry might be limited near currently healthy populations (e.g., Hanford Reach) (Sample Action).</i>
<b>6-2. Aluminum and Chemical</b>
<i>Little change required. Manage industrial discharges to avoid harm to healthy stocks (Sample Action).</i>
<b>6-3. Mining</b>
<i>Limit new mining that would affect currently productive populations (Sample Action).</i>
<b>6-4. Pulp and Paper</b>
<i>Limit new pulp and paper production that would affect currently productive populations. Manage discharges to avoid harm to healthy stocks (Sample Action).</i>
<b>7. TRANSPORTATION</b>
<b>7-1. Navigation and Barging</b>
<i>No changes required in transportation (Sample Action).</i>
<b>7-2. Trucking and Railroads</b>
<i>No changes in roads and highways, except possible changes to construction practices near healthy populations (Sample Action).</i>
<b>8. AGRICULTURE</b>
<p><i>Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations. Enhance conditions for currently productive fish and wildlife populations. Prevent degradation from occurring, rather than mitigating it after damage has been done (Sample Actions).</i></p> <p>Expand on agricultural incentive programs (Final All-H Paper Dec. 2000). Provide permanent protection for riparian</p>

areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000). BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (e.g., Washington Forests & Fish model) (Final All-H Paper Dec. 2000).

#### 8-1. Irrigation

*Little change required in irrigation practices. Disincentives for new development in pristine habitat. Screening, management incentives used to reduce impacts to productive fish populations (Sample Actions).*

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion Action Table Dec. 2000).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28). Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Identify and use appropriate water conservation measures in accordance with state law (Framework Concept Paper 28).

#### 8-2. Pesticides and Agricultural Practices

*Monitor pesticides for impacts on currently productive populations, use incentives where impacts are likely (Sample Action).*

#### 8-3. Grazing

Install fencing to keep range animals away from stream sides (Framework Concept Paper 23).

*Monitor and manage grazing to reduce impacts to currently productive populations (Sample Action).*

#### 8-4. Forestry

*Monitor and manage timber harvest to reduce impacts to currently productive populations (Sample Action).*

### 9. COMMERCIAL HARVEST

*Focus harvest on currently productive populations. Set harvest rates at levels that ensure that productivity of target populations is maintained. Modify fishing practices and locations (ocean and in-river) to promote stock-based management. Increase overall harvest in the long run (Sample Actions).*

*Manage for some over-escapement and straying to promote population expansion to restored, quality habitats (Sample Action).*

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled

scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

#### 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present alternatives that minimize impacts. If impacts are unavoidable, mitigation shall take one of five forms in order of preference (LCREP):

- a) Restoration: returning a damaged habitat as closely as possible to its condition prior to damage
- b) Enhancement: making changes or improvements to habitat to replace functions or values lost or damaged
- c) Preservation: protecting habitat in adjacent areas that are equivalent to the area damaged and that might otherwise be subject to unregulated activity
- d) Creation: converting a non-functioning habitat area into one having all of the physical and biological characteristics of the area lost or damaged
- e) Cash mitigation: providing cash compensation for lost habitat to be used for habitat protection and restoration.

Protect high quality aquatic habitat on private lands while allowing restricted use. Provide: urban storm runoff control; municipal waste management; obstruction removal; and road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).

Support BPA offsite mitigation strategy (Final All-H Paper Dec. 2000). The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

#### 11. RECREATION

*Recreation harvest would be consistent with preservation of productive stocks (Sample Action).*

*Focus harvest on currently productive populations. Set harvest rates at levels that ensure that productivity of target populations is maintained. Modify fishing practices and locations (ocean and in-river) to promote stock-based management. Increase overall harvest in the long run. Manage for some over-escapement and straying to promote population expansion to restored, quality habitats (Sample Actions).*

#### TRIBES

##### 12-1. Tribal Harvest

*[Support] habitat [and] production actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).*

Provide ceremonial, subsistence, and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 1,2,3).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

Put fish back in rivers (e.g., hatchery fish supplementation) in order to move toward achievement of full treaty rights (Framework Concept Paper 3).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Substitute resident fish and wildlife, plus enhance their habitats in blocked areas (Framework Concept Paper 13; Framework Concept Paper 8).

## 12-2. Tradition, Culture, Spirituality

*Actively restore ecosystem health for currently productive fish and wildlife species. Improve tribal well being and the ability of tribes to exercise their respective rights and to enjoy traditional values. Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Actions).*

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 (Tribal Vision).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-045). Support federally recognized tribes' and communities' subsistence needs to be greatest extent practicable (ICBSDEIS, B-061). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-069).

# SAMPLE IMPLEMENTATION ACTIONS

FOR THE

## COMMERCE FOCUS POLICY DIRECTION

Emphasizes *human intervention to enhance economic value* of river uses and allocates a portion of the revenues to fund fish and wildlife mitigation.

### FISH & WILDLIFE

#### 1 HABITAT

The Columbia River Basin is managed to provide maximum sustainable economic benefits to the region (Framework Alternative 7). The Columbia River of today is a working river. The economic, social, and political realities...assure that it will remain as such (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

Make salmon programs cost-effective; save BPA Fish and Wildlife monies for programs providing the highest probability of success; avoid big-ticket spending for marginally beneficial projects; and maintain or reduce BPA direct/reimbursable spending over time, as listed stocks recover (Framework Concept Paper 2; Framework Alternative 5). Institute measures to ensure cost-effective salmon recovery, to provide certainty in Fish and Wildlife costs for BPA, and thereby maintain the region's low energy costs (Framework Concept Paper 2). Provide security for BPA, by committing to affordable steps that achieve substantive improvements for fish and wildlife, retaining the region's low cost energy (Framework Concept Paper 2). Seek the maximum use of economic incentives to implement only cost-effective strategies. Put human economic needs above changes designed to enhance the natural environment (Framework Alternative 7).

Implement a least-cost program that ensures the highest level of biological benefit for the public and ratepayer dollars spent (Framework Concept Paper 25). Those actions that have the greatest biological benefit at the lowest cost will be implemented first (Framework Concept Paper 14; Framework Concept Paper 20). If savings can be found in existing management actions, the savings will be applied to the most critical fish and wildlife activities (Framework Concept Paper 20). Quantify the benefits and costs of existing and proposed measures to protect Columbia Basin salmon and steelhead populations, taking account of adverse impacts and costs to other species of interest, if any (Framework Concept Paper 26).

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7). Provide incentives (start-up grants, tax breaks, etc.) and technical assistance to encourage local landowners, businesses, corporations, and trustee agencies to improve and protect wetland and riparian areas. Include incentives for using best management practices (BMPs) to demonstrate appropriate techniques (LCREP).<sup>1</sup> Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

Complete all subbasin plans and utilize watershed councils, Conservation Reserve Programs and other financial incentives to encourage land owners and managers to improve riparian and other habitat conditions (Framework Concept Paper 25). Use computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 25). Develop partnerships with the timber industry, irrigated agriculture, dry-land farmers, ports, tribes, municipalities and other land owners to improve habitat and water quality (Framework Concept Paper 27). Assess natural mortality levels to gain understanding of when human-induced hydrosystem and other effects are fully mitigated (Framework Concept Paper 26).

Liquidate and cap current habitat mitigation efforts funded by BPA and substitute Bonneville Environmental Foundation or other vehicle for habitat grants. Create one-time endowment of funding vehicle monies saved through mainstem operational changes. Focus habitat improvement funds on "wild reserve" rivers (Framework Concept Paper 26).

A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of

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<sup>1</sup> Lower Columbia River Estuary Project: [www.lcrep.org](http://www.lcrep.org)

conservation options that it could choose to support. These choices would include: purchasing land to establish preserves, purchasing conservation easements, paying bounties for endangered species on private lands, buying conservation contracts, offering grants or low-interest loans to conservation projects, and conducting research (with a small, fixed percentage of the fund) (O'Toole 1993; Thoreau Institute).<sup>2</sup>

Establish wild genetic preserve areas to hedge against ecological risks of engineering failures and meet human demands for wilderness and existence value of species of interest. Use wild reserve areas to address "existence values" of wild species (Draft Framework Alternative 7). Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000).

End federal, regional and state regulation of habitat restoration (Framework Alternative 7). 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. Recovery plans developed at the local level, whether through state salmon plans, federal agency actions or through the Council's process, must be complementary (Governors' Recommendations, July 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).

*Research, Monitoring, and Evaluation:*

Establish performance goals and end-points to clarify expectations and to clarify what success will look like. Those who...are paying should have a clear idea of how much is enough (Framework Concept Paper 20). Limit the amount of monitoring projects that are funded to [a percentage] of the total budget and no more than [a specified proportion] of an individual project (Framework Concept Paper 22). Ensure that significant costs would be justified by effective fish and wildlife recovery before they are incurred. This justification would be made through research and experimentation (Framework Alternative 4). Limit regional governmental role to clearinghouse for information about successful habitat restoration strategies (Framework Concept 26).

1-1 Anadromous Fish

"The truth is that there is no acceptable way that we can come into compliance with the Endangered Species Act as it relates to salmon in the entire Columbia River System. The truth is that we are simply unwilling to come to grips with the issue that we have, probably irrevocably, decided that the Columbia River is a working river harnessed to provide the cheapest electrical energy in the world—and, simply, we ain't about to give that up. The truth is that playing games with various combinations of attempts to assuage limiting factors for the salmon will not do the job—and we know it. If we frankly admit that we cannot obey the law, we are free to do the best we can to save the remnant populations. That can be done through a combination of directing money and resources to the places they will do the most good, and letting people off the hook who have nothing to do with those efforts" (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

Some watersheds will be designated prime habitat for naturally reproducing salmon and steelhead populations, other watersheds will be designated production streams to support fish harvest objectives, with still other streams designated as not suitable for salmon and steelhead production (Framework Concept Paper 14).

Abandon regional government supervision of habitat restoration. State and local entities will produce more effective efforts, particularly if improved harvest management rewards localities that invest in habitat restoration by allowing salmon and steelhead to return to the improved habitat (Framework Concept Paper 26).

Engineer spawning channels to expand natural spawning areas (Framework Alternative 7). Properly-engineered spawning channels can result in better-than-natural salmonid production through natural spawning at minimal cost

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<sup>2</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:  
<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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(Draft Framework Alternative 7). [Protect] fish and wildlife habitat to preserve hunting and fishing opportunities (PM).<sup>3</sup>

Protecting and recovering salmonids and other aquatic species' requires protecting land on and around fish-bearing streams. Building upon successes elsewhere, we endorse creation of salmon sanctuaries that protect key aquatic habitats and related uplands through voluntary conservation easements, leases, land purchases, and tax-incentive donations. The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish (Governors' Recommendations, July 2000). Complete an HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000). Support BPA offsite mitigation strategy (Final All-H Paper Dec. 2000). The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000). The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, NPPC, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000).

1-2 Resident Fish

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000). The Action Agencies shall include observations of bull trout captured in field activities under their funding (e.g., research studies and northern pikeminnow reward program fisheries) and report that information annually to the [USFWS] (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Introduce mammalian predators to control tern populations on Rice Island and elsewhere (Framework Concept Paper 26; Framework Alternative 7).

1-4 Wildlife

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7).

Fund fish and wildlife out of user fees plus federal grants. Non-game wildlife funding can come from a share of recreation fees and donations (possibly including income tax checkoffs) (Thoreau Institute).<sup>4</sup> Turn over percentage of (hunting) license revenues to habitat restoration projects (Framework Concept Paper 26).

1-5 Predators of Anadromous Fish

Create and maintain sufficient activity on Rice Island to discourage Caspian Terns and Cormorants that prey on smolts, and if necessary make changes to the island that discourage avian predator habitat (Final All-H Paper Dec. 2000; Framework Concept Paper 21; Framework Concept Paper 26; Framework Concept Paper 27). Rice Island and the peninsula at the mouth of the Walla Walla River should be planted in vegetation that discourages nesting of terns (Framework Concept Paper 11).

The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g., water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations

<sup>3</sup> Spokane Public Meeting

<sup>4</sup> State Lands and Resources; Thoreau Institute: <http://www.teleport.com/~rot/statelands.html>

where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses at Bonneville Dam. The Corps shall work with NMFS, FPOM, USDA Wildlife Services, and USFWS on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with the Caspian Tern Working Group, shall continue to conduct studies (including migrational behavior) to evaluate avian predation of juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these predators (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall quantify the extent of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. A study plan shall be submitted to NMFS by September 30, 2001, detailing the study objectives, methods, and schedule. Based on study findings, and in consultation with USFWS and NMFS, the Action Agencies shall develop recommendations and, if appropriate, an implementation plan (NMFS Biological Opinion Action Table Dec. 2000).

Take direct action to control marine mammals and Northern pikeminnow that prey on salmon [*especially in the mainstem and the estuary*] (Framework Alternative 7; Framework Concept Paper 21; Framework Concept Paper 25). [*Change*] existing sport fishing restrictions to concentrate on species that prey on, and compete with, salmon for food, including northern pikeminnow. Sport fishing regulation changes also should strive to minimize effects of exotic species on native species. The region could experience short-term benefits from increased fishing opportunities for these competitor species (Governors' Recommendations, July 2000). Allow limited hunting for marine mammals to control populations; turn over percentage of license revenues to habitat restoration projects. High percentages of returning adults show evidence of marine mammal attacks (Framework Concept 26).

The Action Agencies, in coordination with NMFS, shall investigate marine mammal predation in the tailrace of Bonneville Dam. A study plan shall be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule (NMFS Biological Opinion Action Table Dec. 2000). The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish (NMFS Biological Opinion Action Table Dec. 2000).

Immediately authorize expanded predator controls (MMPA) (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

1-6 Watersheds

Some watersheds will be designated prime habitat for naturally producing salmon or steelhead populations; other watersheds will be designated fish production streams to support fish harvest objectives, with still other streams designated as not suitable for salmon and steelhead production. Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14). Consider on a prioritized basis capital funding for new river watershed projects that would provide measurable fish benefits by improving in-stream conditions, and be of other economic benefit (Framework Concept Paper 27). Declare some tributaries off-limits to hatchery production and others as production and supplementation watersheds (Framework Alternative 7). Segregate habitat into "nature preserve" tributaries and "production/ supplementation" (hatchery) tributaries (Framework Concept Paper 25). With the...Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000; Framework Concept Paper 26).

Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

Decentralize decisionmaking concerning local-specific habitat problems through watershed councils (Framework

Concept Paper 25; Framework Concept Paper 26). There will be a great deal of bottom-up autonomy and local control over implementation plans for specific watersheds by local Watershed Councils. The regional Council will compensate people for economic losses resulting from implementation of the Plan's measures (Framework Concept Paper 14). The philosophical approach will be to create local support and ownership for watershed management through a high degree of local control over how the available funds are spent (Framework Concept Paper 14). [*Encourage*] non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

Consider on a prioritized basis capital funding for new river watershed projects that would provide measurable fish benefits by improving in stream conditions, and be of other economic benefit (Framework Concept Paper 27).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000). Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

#### 1-7 Tributaries

Seek out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows (Framework Concept Paper 17). Develop an endowed trust fund to financially support improvements by private parties and local governments and tribes on the tributaries and mainstem (Framework Concept Paper 27). Dedicate additional revenues from the sale of electricity to other forms of mitigation in the tributaries (Framework Concept Paper 27). Evaluate comparative cost effectiveness of improved habitat/wild reserve tributary production vs. production/supplementation tributary production (Framework Concept 26).

*Encourage counties to develop habitat to support recreational fishing and other commercial uses (Sample Action).* Segregate habitat into "nature preserve" tributaries and "production/supplementation" (hatchery) tributaries (Framework Concept Paper 25; Framework Concept Paper 26). Link habitat restoration and stock management to provide full seeding for "nature preserve" tributaries, and report the degree to which this is achieved annually (Framework Concept Paper 25). Designate tributaries with extensive hatchery influence as "production/supplementation" tributaries and abandon efforts to protect existing wild stocks in such tributaries (Framework Concept Paper 26).

Management actions to implement instream flow protection for small streams and tributaries throughout the region include: 1) supporting agency efforts to address small stream and tributary streamflow issues, including information gathering and analysis, and development of policies and programs; and 2) seeking out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows. Stakeholders include water right holders; watershed councils and other community groups; non-governmental organizations including land and water trusts; and federal, state and local governmental agencies and tribes (Framework Concept Paper 17).

Stream-wide recovery measured by improvements in adult salmon return numbers, spawner-recruit ratios, and fingerling-to-adult ratios would be the objective of adaptive management strategies. These measures of recovery provide integrated responses of survival and fecundity useful in monitoring environmental quality. The purpose of field trials would be to assess whether remediation actions enhance responses over yet nontreated control streams. Advantageous treatments would then be applied to new sets of streams for further comparison with prior treatments. A stair-step design would be implemented where adaptive management would test progressively better strategies for stream remediation based on prior field trial results. The stair-step strategy to field testing progressively better remediation actions is motivated by large numbers of candidate streams and annual resources to address only some fraction each year. The experimental prerequisites of replication and randomization can be used to establish cause-and-effect linkages between remediation actions and improvements in survival and fecundity responses of salmonids. Environmental covariates concerning water quality, biotic responses of invertebrate populations, and habitat quality would be systematically measured to interpret variation in stream responses to remediation actions (Framework Concept Paper 23).

The best available technology would be used to improve stream quality at a random selection of replicate streams in a watershed or ecosystem. Response variables would be measured annually with annual assessments comparing treated and nontreated/control streams. Decision rules and time frames would be established *a priori* to determine success of remediation actions. Different subsets of streams would receive different remediation actions to compare strategies and identify cost-effective approaches to stream-wide recovery (Framework Concept Paper 23).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

With the...Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000).

Because about 15 percent of the Columbia River Basin is in British Columbia, including the headwaters of the Columbia and several of its key tributaries, ecosystem restoration efforts should address transboundary stocks of fish and wildlife and transboundary habitats. 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 (Council's 2000 Fish and Wildlife Program).

1-8 Mainstem Columbia

Develop an endowed trust fund to financially support improvements by private parties and local governments and tribes on the...mainstem (Framework Concept Paper 27).

Research, Monitoring, and Evaluation:

The Action Agencies shall investigate and partition the causes of mortality below Bonneville Dam after juvenile salmonid passage through the FCRPS (NMFS Biological Opinion Action Table Dec. 2000). Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7).

1-9 Reservoirs

*Manage reservoir habitats to be similar to current regime. Emphasize commercial value of fish and wildlife species using the habitats (Sample Action).* Protect the established ecosystems that the dams have created (Framework Concept Paper 11).

Survey reservoir habitat for extant spawning locations and focus on expanding areas with existing populations (Framework Concept Paper 26).

1-10 Estuary and Ocean

*Allow channel dredging for navigation (Sample Action).*

Increase the use of the estuary to allow transported smolts to mature and acclimate to fresh water conditions. Use mobile pens to hold smolts in the lower Columbia and estuary (Framework Concept Paper 27).

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP). Establish an award program to promote successful stewardship and pollution prevention activities (LCREP). Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion Action Table Dec. 2000).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000). During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (NMFS Biological Opinion Action Table Dec. 2000). The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower Columbia River and plume.

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River Estuary and Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

NMFS should work with the region to conduct an intensive study to address the role of the ocean in fish recovery, including the relative impact on fish mortality due to ocean predation, lack of food sources, temperature problems and harvest regimes. In addition, management of fish in freshwater should reflect new information about the ocean as it is

developed. For example, it may be necessary to adjust hatchery production based on a better understanding of changes in ocean carrying capacity (Governors' Recommendations, July 2000). Between 2001 and 2010, the Corps and BPA shall fund a monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts (Management Plan Action 28) to address the estuary objectives of this biological opinion (NMFS Biological Opinion Action Table Dec. 2000).

#### 1-11 Water Quality

*Minimal investment to improve water quality unless there is direct economic return on such investments (Sample Action).*

Recent changes in state water laws that allow instream flows to be recognized and protected provide the basis for providing instream flows in small streams and tributaries. State law changes may involve: 1) providing that instream use is a beneficial use for which a water right can be issued; 2) allowing existing out-of-stream water rights to be transferred to instream water rights; and 3) encouraging efficiency in water use to reallocate saved water to instream use (Framework Concept Paper 17). [Support] voluntary exchanges to obtain needed water for fish and support the development of water markets to effect exchanges among willing buyers and sellers. This strategy has potential to contribute to fish recovery, and we are committed to support changes in state law or policies to facilitate this approach. Recognize *[that there are]* existing efforts to conserve water and support further assistance to promote conservation (Governors' Recommendations, July 2000). Develop partnerships with the timber industry, irrigated agriculture, dry-land farmers, ports, tribes, municipalities and other land owners to improve habitat and water quality (Framework Concept Paper 27).

Identify continuous features (ex. streams) that exhibit linear characteristics and assign a quality rank to stream segments based on a suit of desirable values (ex. ODFW Stream Benchmarks). Several definitions of patch boundaries and edge measures exist at differing spatial scales within a landscape. For water related questions gradients describing physical and temporal properties may be more appropriate. If, for example, a question was related to the late summer flow on a subwatershed. A possible method may analyze datasets including, hydrologic responsiveness, moisture, landform, heat, and vegetation type (Framework Concept Paper 24).

#### 2 HARVEST

*Harvest fish and wildlife to maximize long-term economic value (commercial and sport). Change target species in response to changes in economic value (Sample Action). Increase or decrease harvest in response to cost-effectiveness objectives (Sample Action).*

*[Protect]* fish and wildlife habitat to preserve hunting and fishing opportunities (Public Meeting, Spokane).<sup>5</sup> Financial incentives must be broadened beyond selective fisheries to include economic incentives to reduce impacts to listed stocks, financial assistance for developing "value-added" fishery-related industries and mitigation of economic impacts to fishing-dependent communities (Governors' Recommendations, July 2000).

#### 2-1 Anadromous Fish

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7).

If each country catches "its own" salmon, production and management costs of commercial salmon harvests will decrease, along with political friction (Framework Concept Paper 26).

Develop Youngs Bay and other tributaries as preferred options for commercial and sport fisheries (Framework Concept Paper 27). Shift to terminal fisheries to allow for selective stock harvest (Framework Concept Paper 27).

Provide financial incentives for alternative commercial and economic activity for tribes with in-river fishing rights that agree to temporarily suspend or reduce commercial fishing (Framework Concept Paper 27).

Use supplemented stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

Mark all hatchery fish, so as to facilitate selective harvest. Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Draft Framework Alternative 7). Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states

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<sup>5</sup> Spokane Public Meeting

and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1 and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Unify policing functions under *United States v. Oregon* to gain accurate harvest counts, using aerial or satellite-based estimation techniques to corroborate self-reporting by fishermen (Framework Concept 26). The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, tribal, and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

2-2 Resident Fish

*Focus efforts on both commercial (fish farm) and sport fisheries. Maintain or increase populations of economically significant resident fish, including introduced species. Manage harvest to stimulate recreational use and economic values (Sample Actions).*

Mark All-Hatchery fish... to facilitate selective harvest. Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Draft Framework Alternative 7).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop methods for crediting harvest reforms, and the survival benefits they produce, toward FCRPS offsite mitigation responsibilities. A crediting approach shall be agreed upon by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

2-3 Wildlife

*Allow hunting of economically valuable species. Institute user fees for hunting on public lands, which would be used to improve habitat for target species (Sample Actions).*

3 HATCHERIES

Make extensive use of fish hatcheries to meet fishing needs (Framework Alternative 7) and to make up for lost habitat (Framework Alternative 6). *Produce and release maximum numbers of economically valuable species in harvest areas (Sample Action).* Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Framework Alternative 7).

Abandon efforts to protect existing wild stocks in tributaries where there is already significant hatchery influence. Declare specific tributaries "off-limits" to hatcheries (e.g., John Day River) to provide buffer zones against genetic problems with wild fish (Framework Alternative 7; Framework Concept Paper 26). Transfer hatcheries to tribal management in settlement of treaty obligations (Framework Alternative 7).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial production consistent with sound conservation biology (Tribal Vision).

Restructure hatchery management to improve success in meeting fish and wildlife objectives (Framework Concept

Paper 25). Share fishing tag revenues with hatcheries that return fish to watersheds (Framework Alternative 7).

Use central entity to serve as clearinghouse for successful approaches to artificial production, such as spawning channels and egg boxes (Framework Concept Paper 26).

Close down or convert under-performing production hatcheries (Framework Concept Paper 27).

Implant hatchery releases to reduce mixed-stock fisheries (Framework Concept Paper ).

Use low-cost, low technology hatchery techniques for supplementation actions (Framework Concept Paper 27).

Mark all hatchery releases with an identifiable external mark facilitate selective harvest (Draft Framework Alternative 7; Framework Concept Paper 27).

The fundamental strategy should start with clarification of why we want fish and wildlife populations. The region needs to recognize and respect that there are different and conflicting reasons why we want healthy fish and wildlife populations. There should be distinct and separable goals, objectives, strategies and measures, where necessary, to achieve separate outcomes. As an example, the Columbia Fish and Wildlife Program should consider the similarities and differences between management of anadromous fish and management of animals that produce red meat. This includes beef and other domesticated species as well as "wild" deer, elk, moose, and buffalo. In the case of the four-footed animals, our society has developed very separate institutions. We employ feed lots, open ranges, sport hunting areas, and national parks to achieve different objectives, from high volume production to sport hunting to preserving wild animals in their "natural" environment. There are clear differences between management of anadromous fish and red meat. There are some obvious similarities, however, such as the production of some animals for human consumption and the contrasting desire to protect others so that they can live and die in their natural habitat, We therefore suggest that the overall strategy for managing anadromous and resident fish and wildlife in the Columbia Basin needs to examine whether it has sufficient management systems to achieve disparate goals and objectives (Framework Concept Paper 20).

Working through regional prioritization processes to the extent feasible and in coordination with NMFS, BPA shall collaborate with the regional, state, tribal, and federal fish managers and the Pacific States Marine Fisheries Commission to enable the development and implementation of a comprehensive marking plan. Included in this action are the following four steps (NMFS Biological Opinion Action Table Dec. 2000):

1. Develop a comprehensive marking strategy for all salmon and steelhead artificial production programs in the Columbia River basin by the end of 2001.
2. Provide funding by March 1, 2001, to begin marking all spring chinook salmon that are currently released unmarked from federal or federally funded hatcheries.
3. Provide funding, beginning in FY 2002, to implement the Action Agencies' share of the comprehensive marking plan for production not addressed in (2) above.
4. Obtain funding contributions as appropriate for additional sampling efforts and specific experiments to determine relative distribution and timing of hatchery and natural spawners.

### 3-1 Anadromous Fish

Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14). Make extensive use of fish hatcheries to meet fishing needs (Framework Alternative 7) and make up for lost habitat (Framework Alternative 6).

Transfer hatcheries to tribal management in settlement of treaty obligations (Framework Alternative 7). Implement transfers of facilities or responsibility for operation of certain production programs subject to approved HGMPs for up to four hatcheries (Final All-H Paper Dec. 2000).

Unify and standardize hatchery reporting obligations to single funding entity and require reporting concerning success in generate returning adults to applicable watersheds (Framework Concept Paper 26).

Allow hatchery operators to share revenue from salmon and steelhead tags in hatchery watersheds, to establish feedback loop for hatchery success (Framework Concept Paper 26).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

#### Research, Monitoring, and Evaluation:

Fund applied genetics research unit to restore lost size of salmonids, improve disease resistance, and improve tolerance for warmer habitat, as well as other genetic improvements that will increase salmonid abundance (Framework Concept

Paper 26).
3-2 Resident Fish
<p><i>Use hatchery production to provide offsite mitigation or for replacement above blocked areas. Provide maximum production of economically valuable species in harvest areas (Sample Actions).</i></p> <p>For areas above the dams that block salmon migration, allow hatcheries to produce native-type fish that could survive in the changed ecosystem (Framework Alternative 2).</p> <p>The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1 and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).</p>
4 HYDRO
<p><i>Maximize power, navigation, and irrigation (Sample Action).</i></p> <p>Maintain the multiple-purpose public benefits of Columbia and Snake River dams and river system. Continue to develop the economic potential of the Columbia River system (Framework Concept Paper 25).</p>
4-1 Dam Modifications and Facilities
<p><i>Dams remain in place. Curtail or abandon fish passage improvements (Sample Action). Hydropower production may be increased at existing facilities, and there is potential for new/improved facilities (Sample Action).</i></p> <p>Millions of dollars and entire economies have been developed based upon the Columbia and Snake Rivers' being multi-use rivers. That should not change (Framework Concept Paper 21). Changes in the system's configuration may occur but only when critical survival bottlenecks are identified that cannot be circumvented through other means and where the costs are justified by the probable biological benefits (Framework Concept Paper 14). Structures <i>[such as dams]</i> in the Snake and Columbia River Basins which have lost their usefulness or may no longer be economically viable to operate and maintain... could also be evaluated for removal and/or modification (Framework Concept Paper 21).</p> <p>Continue to fine tune the fish-friendly turbine prototype on Unit #4, First Powerhouse at Bonneville Dam. When testing is complete, then every Kaplan turbine on the Columbia and Snake River over 40 years old should be replaced by the new high tech turbines (Framework Alternative 7; Framework Concept Paper 11). Ensure that "fish-friendly" turbines are available in time for renovation of mainstem facilities (Framework Concept Paper 26).</p> <p>Install irrigated spawning channels below dam tailraces and elsewhere to increase mainstem spawning habitat (Framework Concept Paper 26).</p> <p>Evaluate structures in the Snake and Columbia River Basins that have lost their usefulness or may no longer be economically viable to operate and maintain. <i>[Those structures could be removed and/or modified]</i> (Framework Concept Paper 21).</p> <p>Impairing the navigability of the river, its hydro-electric capacity, and its flood control capacity are not in the public interest (Framework Concept Paper 21).</p> <p>The Action Agencies, in coordination with the Regional Forum, shall determine the appropriate operating range of turbines equipped with minimum gap runners (MGRs) to increase survival of juvenile migrants passing through these new turbine designs (NMFS Biological Opinion Action Table Dec. 2000). The Corps shall continue the investigation of minimum gap runners at the Bonneville First Powerhouse (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Corps shall complete Bonneville Second Powerhouse post-construction evaluation of the new juvenile fish bypass outfall and address design and operational refinements as warranted (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Action Agencies shall investigate hydraulic and behavioral aspects of turbine passage by juvenile steelhead and salmon through turbines to develop biologically based turbine design and operating criteria. The Corps shall submit a report to NMFS stating the findings of the first phase of the Turbine Passage Survival Program by October 2001. Annual progress reports will be provided after this date (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Action Agencies shall remove all unnecessary obstructions in the higher velocity areas of the intake-to-draft tube sections of the turbine units (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H</p>

Paper Dec. 2000).

Investigate, and in coordination with the Service, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

#### 4-2 Hydro Operation

*Operate system at pre-listing hydro operations. Maximize power generation in high value months. Maintain storage reservoir elevations for recreation and resident fish (Sample Actions).*

Maximize multiple purpose benefits of federal water projects. Increase hydropower production. Maintain flood control. Maintain navigation. Maintain irrigation (Draft Framework Alternative 7; Framework Concept Paper 26).

Research, Monitoring, and Evaluation:

Prioritize research funding to document project-specific effects on anadromous fish, and effects of operational changes. Make decisions based on best available quantification of effects of operational changes (Framework Concept Paper 26).

#### 4-3 Spill

*Spills would be driven by revenue production – PNCA critical water planning. Eliminate voluntary fish spills and minimize forced spills (Sample Actions). Reduce... flow augmentation and... spill at hydroelectric dams (Framework Concept Paper 25).*

Adjust spill on a project-by-project basis to optimize passage survival at non-collector projects (e.g., reduce spill at The Dalles and Ice Harbor), taking care to balance potential positive effects on juveniles against negative effects on adults (Framework Concept Paper 26).

Install fish-friendly turbines in all of the skeletal bays and "spill" excess water through these turbines instead of over the dams (Framework Concept Paper 11).

Assuming increased transportation, moderate spill regimes would be employed at non-collector facilities, working in combination with spill deflectors and improved turbine passage survival. For Snake River projects, a spill passage regime would be established at Ice Harbor, with minimum or non-programmatic spill at other projects. Mid Columbia River system spill passage regime established by Mid Columbia PUD's. All spill regimes would be optimized for fish passage, gas production control, and economic costs (Framework Concept Paper 27).

#### 4-4 Flow

Abandon all spring flow augmentation and real-time management of flow for fish (Framework Alternative 7; Public Meeting<sup>6</sup>). Eliminate existing spring-summer flow targets of National Marine Fisheries Service (Framework Concept Paper 27). Reduce ...flow augmentation and...spill at hydroelectric dams (Framework Concept Paper 25). Change the flow augmentation program to produce additional funds for fish and wildlife measures (Framework Alternative 6). Eliminate Snake River flow augmentation (Framework Concept Paper 5). Allow flow augmentation based on the "willing buyer, willing seller" method only (PM).<sup>8</sup> Undertake efforts to purchase or lease, from willing sellers and lessors, water rights necessary to maintain instream flows in accordance with appropriate state and federal laws (Framework Concept Paper 28).

Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

Research, Monitoring, and Evaluation:

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<sup>6</sup> Twin Falls Public meeting

<sup>7</sup> Twin Falls Public meeting

<sup>8</sup> Twin Falls Public meeting

Experiment with late summer/fall flow augmentation in low water years (Framework Concept Paper 26). BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

#### 4-5 Reservoir Levels

*Levels would be driven by revenue production – PNCA critical water planning (Sample Action). Maintain stability in levels to protect communities that depend on reservoirs for recreation and tourism income (Sample Action).*

#### 4-6 Water Quality

*Sell “pollution rights” and use proceeds to fund mitigation (Sample Action).*

Investigate, and in coordination with the Service, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

#### 4-7 Juvenile Fish Passage and Transportation

Improve and maximize fish barging of juvenile smolts (Framework Alternative 6; Framework Concept Paper 25). Maximize smolt transportation by eliminating spill at all collection facilities, and improve transportation by experimenting with release strategies (i.e., further downstream) to avoid substantial estuarine mortality (Draft Framework Alternative 7; Framework Concept Paper 26).

Develop an environmentally friendly passageway for anadromous salmonids (Framework Concept Paper 11). Investigate the use of surface collectors and other devices to enhance guidance at dams (Framework Concept Paper 25). Reactivate sluiceway passage at available projects and expand surface collector efforts (Framework Concept Paper 26).

At the Snake River projects – Lower Granite, Little Goose, and Lower Monument, pursue increased transportation actions during the juvenile migration season; conduct for spring/summer chinook, steelhead, and fall chinook. At McNary modify operations to provide expanded transportation for spring and summer migrants. Secure additional barges to enhance direct loading operations and reduce holding times. Evaluate and monitor program on an annual basis for improvements (Framework Concept Paper 27).

At Lower Granite and Little Goose finish extended length screens and surface collectors. At Lower Monument evaluate the need at for new bypass improvements. At Ice Harbor no extended length screens installed, offer little benefit in increased transportation program. At McNary install extended length screens to increase collection efficiency. At John Day develop surface bypass for existing skeletal bays. At The Dalles rely upon existing sluiceway with a moderate spill regime. At Bonneville, the use of sluiceways and spill should be relied upon for fish passage. Turbine improvements on a predetermined schedule, with priority assigned to Lower Columbia River projects, then moving up river (Framework Concept Paper 27).

*[Operate] the existing facilities to maximize the passage of fish through the existing collectors into trucks or barges for transport downriver. Voluntary spill to bypass fish would be minimized. Fish would be collected in the existing facilities and transported past the dams. Under this alternative, there would be no need to modify spillway flow deflectors, because voluntary spill would be minimized. Some juvenile fish would still pass through the dam turbines (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).*

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall evaluate strategies to enhance post-release survival of transported fish; examples of such strategies include timing releases so that fish arrival at the estuary corresponds to minimal interactions with predators and maximum availability of forage and locating releases so as to decrease passage time through areas of high predation (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from the 2001 juvenile outmigration (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall evaluate and implement structural and operational alternatives to improve juvenile transportation at the collector dams (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue evaluations to assess the need for improvements of the existing intake screens, gatewell vertical barrier screen cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at McNary to determine where improvements are necessary to reduce problems experienced during the 1996 flood, increase fish survival, and resolve holding and loading facility problems, including raceway jumping by juvenile salmon and steelhead and debris plugging of bypass lines. Additionally, the Corps shall evaluate whether the existing juvenile bypass system outfall should be relocated (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the design development, fabrication/deployment, and testing of a prototype RSW at Lower Granite, in conjunction with the existing prototype powerhouse occlusion devices, including the forebay behavioral guidance structure (BGS) and upper turbine intake occlusion devices. As warranted by prototype test results, the Corps shall install one or more permanent RSWs and occlusion devices at appropriate lower Snake hydro projects, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete design for new juvenile bypass facilities at Lower Granite Dam, including enlarged orifices and bypass gallery, open-channel flow bypass, improved separator for juvenile separation by size, and improved fish distribution flumes and barge-loading facilities and shall proceed to construction, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen systemwide letter report and implement recommended improvements (NMFS Biological Opinion Action Table Dec. 2000).

The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised (NMFS Biological Opinion Action Table Dec. 2000).

*Research, Monitoring, and Evaluation:*

Focus research efforts on identification of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Concept Paper 26). The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions (NMFS Biological Opinion Action Table Dec. 2000). The Corps shall continue to investigate a way to increase entry rates of fish approaching surface bypass/collector entrances (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams. The Corps shall record the occurrence of bull trout in the smolt monitoring facilities at the Lower Columbia River dams (FWS Biological Opinion Dec. 2000).

4-8 Adult Fish Passage

Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7; Framework Concept Paper 11). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1) (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement it, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate and enumerate fallback of upstream migrant salmonids through turbine intakes at all lower Snake and lower Columbia River dams. The Corps shall implement corrective measures to reduce turbine mortality, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate ways to provide egress to adult fish that have fallen back into juvenile collection galleries and primary dewatering facilities at Ice Harbor and McNary dams. The Corps shall either install structural, or implement operational, remedies to minimize delay and injury of fish that fall back, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations) (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete adult fishway auxiliary water supply evaluations at each lower Snake River hydro project and implement corrective measures as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

#### 4-9 Flood Control

Enhance recreational opportunities and continue to provide regional flood control benefits (Draft Framework Alternative 7; Framework Concept Paper 25). Maintain and enhance the economic benefits of our existing hydropower system: that includes navigation, irrigation, recreation, flood control and power production (Framework Concept Paper 11).

### COMMERCE

#### 5. POWER

##### 5-1. Existing Generation

Maintain or increase hydropower production (i.e., hydroelectric generation) of Columbia River dams (Framework Alternative 7; Framework Concept Paper 11; Framework Concept Paper 25).

Limit electric ratepayer funding of fish and wildlife restoration to offsetting effects of hydropower development and operation, and require other economic sectors to bear recovery costs necessitated by their activities (Framework Concept Paper 26). Increase the output of cheap, clean, renewable hydropower from the existing hydropower system (Framework Concept Paper 11).

##### 5-2. New Generation

*New generation would be dictated by supply and demand (Sample Action).*

Federal, state, and local financial incentives would be available to promote new power generation (e.g., federal solar and wind energy tax credits; Oregon Business Energy Tax Credit).

##### 5-3. Transmission Reliability

*If spill is minimized and generation increases from the Status Quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability (Sample Action). Changes in vegetation management maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability in "nature preserve" areas only (Sample Action).*

Enhance service reliability by promoting competition among independent power suppliers. Customers with competitive options will factor reliability into purchasing decisions. Power producers will not get paid unless they provide reliable power (<http://www.newgenutility.com/EnergyInfo1.htm>).

The Northwest Regional Transmission Organization would be assisted by Federal Energy Regulatory Commission to improve system reliability by: (1) improving efficiencies in transmission grid management; (2) improving grid

reliability; (3) removing the remaining opportunities for discriminatory transmission practices; (4) improving market performance; and (5) facilitating lighter handed regulation (<http://www.ferc.fed.us/electric/west.htm>).

## 6. INDUSTRY

### 6-1. Industrial Growth

*Industrial growth would be similar to Status Quo. Some restrictions on industrial development might be lifted, resulting in increased growth (Sample Action).*

### 6-2. Aluminum and Chemical

*De-emphasize government regulation, allow aluminum and chemical industries flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

### 6-3. Mining

*De-emphasize government regulation, allow mining industry flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

### 6-4. Pulp and Paper

*De-emphasize government regulation, allow pulp and paper industry flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

## 7. TRANSPORTATION

### 7-1. Navigation and Barging

Any long-term vision for the Columbia River should include its navigability...The system of inland ports and marine transportation needs to be recognized and maintained as a necessary and integral part of preserving the environment of this region (Draft Framework Alternative 7; Framework Concept Paper 11; Framework Concept Paper 21; Framework Concept Paper 25; Framework Concept Paper 26).

### 7-2. Trucking and Railroads

*Policy would have no effect on roads and highways; expand infrastructure cost-effectively as demand increases (Sample Action).*

## 8. AGRICULTURE

Sort habitat into "nature preserve" and production categories. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7). *Use positive incentives to obtain cost-effective habitat improvements on agricultural lands (Sample Action).*

Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program. Increased riparian fencing is an obvious place to start (Governors' Recommendations, July 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).

Provide permanent protection for riparian areas in agricultural areas by *[expanding and]* supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Develop partnerships with the...irrigated agriculture, dry-land farmers...to improve habitat and water quality (Framework Concept Paper 27).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

### 8-1. Irrigation

Maintain existing irrigation and allow increased consumptive use of Columbia Basin water (Framework Concept Paper 11; Framework Concept Paper 25; Framework Concept Paper 26).

*Manage irrigation on a cost-effective basis. Use existing local institutions such as ASCS and Resource Conservation Districts and positive incentives (Sample Action).*

Agricultural water conservation. Irrigation waste water treatment. Screen irrigation withdrawals (Human Effects Analysis Appendix D).

Consider water transfers and trades to promote efficient use of water, and to enhance in-stream flows for selected tributary areas (Framework Concept Paper 27). The protection of instream flows is fundamentally a "water quantity" issue. Recent changes in state water laws that allow instream flows to be recognized and protected provide the basis for strategies for providing instream flows in small streams and tributaries. State law changes may involve: 1) providing that instream use is a beneficial use for which a water right can be issued; 2) allowing existing out-of-stream water rights to be transferred to instream water rights; and 3) encouraging efficiency in water use to reallocate saved water to instream use (Framework Concept Paper 17).

Water rights have attributes of private property rights (in the sense that water rights may not be taken for public use without just compensation), and water right holders have the right to decide what to do with their property within limits of applicable state law. A water right market provides one means for water right holders (as willing "sellers") and other parties (as willing "buyers") to transfer water from out-of-stream to in-the-stream use, subject to review and approval by the state (Framework Concept Paper 17).

By March 1, 2002, BOR shall install screens meeting NMFS' screen criteria at the canal intakes to the Burbank No. 2 and Burbank No. 3 pump plants. BOR shall connect the Burbank No. 3 intake canal to Burbank Slough to provide juvenile fish egress. BOR shall coordinate with NMFS on each of the actions identified above (NMFS Biological Opinion Action Table Dec. 2000). Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

#### 8-2. Pesticides and Agricultural Practices

*Manage pesticides to the extent it is cost-effective using existing local institutions (Sample Action).*

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000).

Other programs include the NRCS's Environmental Quality Incentives Program (EQIP), the Wildlife Habitat Incentives Program (WHIP), the Wetlands Reserve Program (WRP), the Stewardship Incentives Program (SIP), and the Emergency Watershed Protection Program (EWP).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

*Monitor pesticides for impacts on currently productive fish and wildlife populations, use positive incentives where impacts are likely (Sample Action).*

#### 8-3. Grazing

*Manage grazing to the extent it is cost-effective using positive incentives and local institutions (Sample Action).*

*Emphasize private land ownership. Maintain existing grazing permits, or sell land rights to the highest bidder, with land use at owner's discretion (Sample Action).*

*De-emphasize government role in land management; encourage local management of resources. Emphasize financial incentives based on fair market value of resources (Sample Action).*

Create a series of incentives for holders of a new kind of lease to improve and maintain a high quality resource, including:

1. opportunities for investing in, or receiving financial benefits from, conserving land resources through creation of a new market for authorizing uses of our range/grassland resources;
2. long-term tenure on the land; and
3. increased flexibility in how the lands are, or are not, used and managed.

A new kind of lease would be available for the public lands range/grassland resource. This new lease would extend for 30 years and provide for flexibility in management activities. It could be used for a variety of activities, including livestock grazing, wildlife management, and endangered species conservation. There would no longer be a "grazing only" permit. The new lease would grant the holder an exclusive interest in the range/grassland resource subject to the lease, but will not convey a property interest in the public lands, and will not restrict other "multiple uses" on those lands. The lease holder's use of the public resource would be reviewed by the federal land management agency at 5 year intervals to determine if the lands are improving or being maintained in such a manner that meets public lands standards (Thoreau Institute).<sup>9</sup>

Derive social and economic benefits, promote commercial activity, and foster demand for labor and capital formation through producing a variety of goods and services from Forest Service and BLM-administered lands according to land management plan allocations and management direction (ICBSDEIS, B-O55).

#### 8-4. Forestry

*Manage forestry to the extent it is cost-effective using positive incentives and local institutions (Sample Action). Increase logging and use the revenues to mitigate for fish and wildlife impacts through enhancements (Sample Action). Use stewardship contracting on federal lands to compensate for costs of otherwise uneconomical forest improvement practices (Sample Action).*

All federal forest resources can be funded out of user fees...The best incentives are provided by funding management out of net user fees, because such funding gives managers the incentive to engage only in profitable activities—which usually means the activities with the greatest social return. In contrast, an agency funded out of a percentage of gross user fees has an incentive to cross-subsidize unprofitable activities with profitable ones to insure that it keeps its full share of the gross... (F)ocus not on the question of Who owns the forests? But on the question of What are the incentives facing forest managers? To provide the best incentives, (build) federal forest reforms around the trust concept... First, turn the federal forests into a series of forest trusts. The trusts could be individual national forests and BLM districts, or all of the forests in each state, or divided along other lines. The exact size of each trust is not important, although I suggest that a trust larger than a current Forest Service region would be unwieldy and a trust smaller than a current national forest would be susceptible to economic failure (Thoreau Institute).<sup>10</sup>

Increase forest product productivity (Draft Framework Alternative 7). Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program (Governors' Recommendations, July 2000).

Apply voluntary and incentive-based approaches to resolve aquatic resource and water quality problems. Examples include Small landowner assistance programs; Stewardship agreements (ORS ch. 527.662); The Green Permits Act (Oregon Laws 1997, ch. 553); The Forest Stewardship Act (Oregon Laws 1995, ch. 413); Healthy Streams Partnership and the Oregon Plan for Salmon and Watersheds (Oregon Laws 1997, ch. 7); Oregon DEQ's Environmental Management Systems Incentives Project; Habitat Conservation Plans adopted and approved under the federal ESA; Project XL agreements with the EPA; Pollution Prevention Partnership agreements with the EPA.

### 9. COMMERCIAL HARVEST

*Decrease mixed stock commercial harvest. Emphasize fish farming. Manage harvest through financial incentives (Sample Actions).*

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000)

Recreational fishing opportunities are maintained and promoted, consistent with escapement goals and the fulfillment of tribal treaty obligations (Draft Framework Alternative 2,3; Framework Concept Paper 27).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS). Discourage non-

<sup>9</sup> Concept paper: Redefining Range/Grassland Management on the Public Lands (Public Lands Council); Thoreau Institute: <http://www.teleport.com/~rot/rangereform.html>

<sup>10</sup> 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 1995: Thoreau Institute: <http://www.teleport.com/~rot/Testimony.html>

selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-H Paper Dec. 2000).

## 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

*Decrease regulations on development; allow developers flexibility in protecting natural resources in areas targeted for development (Sample Action).*

Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program. Increased riparian fencing is an obvious place to start. (Governors' Recommendations, July 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

## 11. RECREATION

Meet human demands for recreation in natural, undisturbed habitat with adequate supply of wild reserve areas (Draft Framework Alternative 7). Focus efforts on developing economically valuable sport fisheries (Human Effects Analysis Appendix D; Draft Framework Alternative 2,3; Framework Concept Paper 25). Develop Youngs Bay and other tributaries as preferred options for commercial and sport fisheries (Framework Concept Paper 27).

*Emphasize localized decision-making for recreation management, and set fees for various forms of recreation (Sample Action).* User fees for recreation, in the long run, may shift incentives away from selling environmentally and fiscally damaging timber, mineral and grazing leases, and toward recreation. However, this will only happen when managers who oversee both programs within a district are able to make decisions based on fair market valuation of resources and real costs.<sup>11</sup>

Develop industrial recreation: destination recreation facilities featuring mountain biking, kayaking and guided nature walks, off-road vehicle use, heavily developed RV facilities and ski areas with detailed rules spelling out where, when, and how leisure-seekers can participate. And instead of being subsidized and managed by the government, those highly organized forms of recreation -- everything from golf courses and marinas to inline skating parks and water slides -- will increasingly be run by private contractors seeking a profit (e.g., <http://www.wildwilderness.org/docs/news.htm>).

## TRIBES

### 12-1. Tribal Harvest

*Emphasize maximum sustainable harvest (Sample Action).*

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7).

Reduce mixed stock harvest; increase catch value; reduce fishery capitalization (Framework Concept Paper 27).

Accept financial incentives for alternative commercial and economic activity; temporarily suspend or reduce commercial harvest (Framework Concept Paper 27). Decrease commercial harvest; provide economic incentives not to fish during certain migration periods (Framework Concept Paper 27). Support marking All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Substitute resident fish and wildlife, plus enhance their habitats in blocked areas (Framework Concept Paper 13; Framework Concept Paper 8).

Recreational fishing opportunities are maintained and promoted, consistent with escapement goals and the fulfillment of tribal treaty obligations (Framework Concept Paper 27).

Shift to terminal [*harvest*] (Framework Concept Paper 27).

<sup>11</sup> "The BLM Recreation Fee Demo Program." Karyn Moskowitz. (posted on Thoreau Institute)  
<http://www.teleport.com/~rot/blm.html>

The Action Agencies shall work with NMFS, USFWS, tribal, and state fishery management agencies to develop methods for crediting harvest reforms, and the survival benefits they produce, toward FCRPS offsite mitigation responsibilities. A crediting approach shall be agreed upon by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

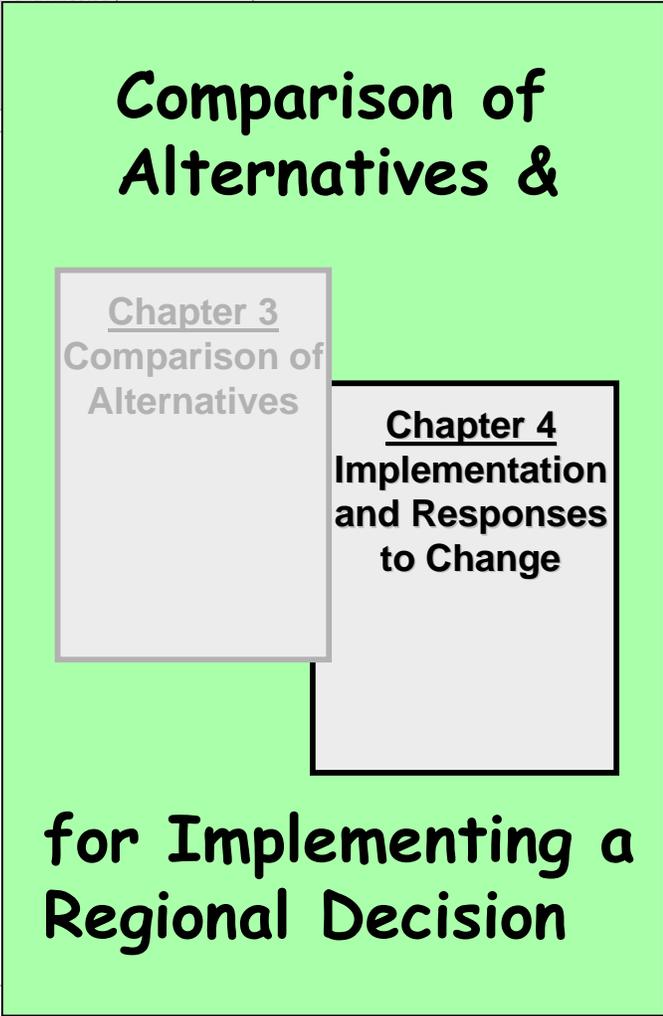
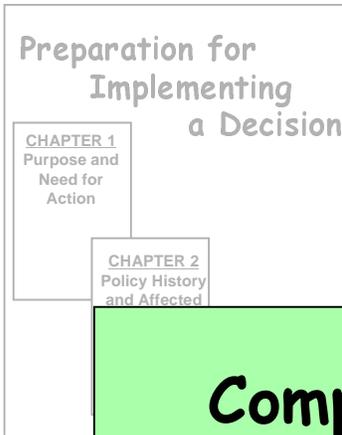
The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS). Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-H Paper Dec. 2000).

#### 12-2. Tradition, Culture, Spirituality

*De-emphasize species diversity and geographic distribution within the basin. Focus on utilizing healthy species in targeted locations. Emphasize economic values of species (Sample Actions).*

Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-O61).

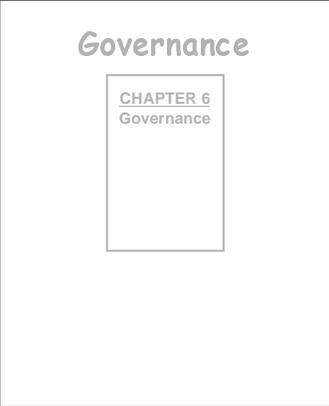
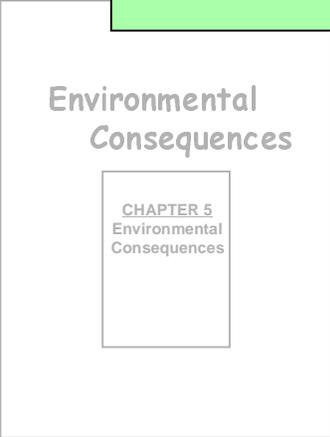


**Chapter 4**

*Factors Influencing  
Implementation*

*Responses to  
Change*

*Comparison of  
Criteria for  
Implementation  
Results, by Policy  
Direction*



## **CHAPTER 4 – IMPLEMENTATION AND RESPONSES TO CHANGE**

- 
- **Provides examples of factors** that can influence the direction of and the success in implementing each Policy Direction.
  - **Presents the options** available to assist implementation of the Policy Directions and strategies for accommodating future change.
- 

Once a Policy Direction that reflects the likely regional inclination has been selected, it will need to be implemented. Individuals, groups, or agencies will take appropriate implementing actions, such as those provided as sample implementation actions (Section 3A). Many natural, economic and social factors will strongly influence the ultimate success of these actions. If we have chosen well, fish and wildlife recovery will improve at an acceptable social 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 actions, or the Policy Direction itself. Successful recovery may mean that the region needs to modify its management of the resources differently than under a rescue mode. On the other hand, 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 recovery efforts. Federal or state officials and the actions they advocate may change, or the preferences of society may change. Regardless of the reason, eventually, the Policy Direction will likely need to be modified. This DEIS is designed to accommodate such change.

This chapter focuses on how each Policy Direction would be implemented in light of context, 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 implementing action (or even an entire Policy Direction). Some factors outside anyone's 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. New decisionmakers—from the U.S. President on down—affect implementation. The context of an action also influences its success and effects, and context changes over time. The method of implementation influences the success and effects of an action. Methods of implementation include incentives, regulation, property acquisition, or education.

BPA and other federal agencies may, through adaptive management, 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.

The existing NMFS 2000 BiOp recognized that water management actions may change due to unforeseeable power system, flood control, or other emergencies. Emergencies may include a power emergency—one based on insufficient power supply to meet demand in the Pacific Northwest. There may also be West Coast power shortages that threaten health and human safety and require an emergency response from BPA. For example, poor water conditions in the Columbia River basin, coupled with an extraordinary power market on the West Coast, are causing an unprecedented river management situation during 2001.

Any emergency actions are a last resort, and are not used in place of long-term investments—including fish and wildlife investments — necessary to allow full, uninterrupted implementation of the required reservoir operations while maintaining other project purposes, such as an adequate and reliable power system.

Such emergency operations will not alter the analysis in this DEIS because they could be taken under any of the Policy Directions, and the actions are to be of a relatively short duration—especially when considered in the context of this DEIS, which may have a life of 10 to 20 years. If the emergency actions do persist, they could signal the need to shift to a new Policy Direction. In that situation, BPA could prepare a supplement analysis or supplemental EIS and issue a new Record of Decision to change its policy and implementation plan as needed.

Table 4.1-1 shows some of the possible events that could affect any Policy Direction, or individual Policy Directions.

**Table 4.1-1. Summary of Key Factors Influencing Implementation of Policy Directions**

<b>CONDITIONS IN THE NATURAL ENVIRONMENT</b>
<ul style="list-style-type: none"> <li>▪ Natural disasters</li> </ul>
<ul style="list-style-type: none"> <li>▪ 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)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Species extinction</li> </ul>
<b>FUNDING AND FISH AND WILDLIFE POLICY</b>
<ul style="list-style-type: none"> <li>▪ Changes in policy-makers</li> </ul>
<ul style="list-style-type: none"> <li>▪ Intervention by the Legislative, Executive, or Judicial branches, resulting in a loss of regional control over fish and wildlife recovery effort planning</li> </ul>
<ul style="list-style-type: none"> <li>▪ Increased reliance on federal taxpayers and the subsequent requirements attached to federal funding</li> </ul>
<ul style="list-style-type: none"> <li>▪ Additional listing or delisting of fish and wildlife species</li> </ul>
<ul style="list-style-type: none"> <li>▪ Lack of regional commitment, financial or otherwise, to a fish and wildlife recovery effort plan and subsequent Policy Direction</li> </ul>

<b>FUNDING AND FISH AND WILDLIFE POLICY (Con't)</b>
<ul style="list-style-type: none"> <li>▪ Lack of identified BPA results and mechanism for monitoring/achieving those results</li> </ul>
<ul style="list-style-type: none"> <li>▪ Other agencies' or regional decisions on fish and wildlife mitigation and recovery efforts that affect BPA's revenue stream or increase costs</li> </ul>
<ul style="list-style-type: none"> <li>▪ Changes in laws and regulations requiring additional expenditures on fish and wildlife mitigation or prolonging implementation</li> </ul>
<ul style="list-style-type: none"> <li>▪ Perceived success or failure of fish and wildlife recovery and mitigation actions</li> </ul>
<b>ELECTRICITY MARKETS AND REGULATION</b>
<ul style="list-style-type: none"> <li>▪ A significant change in market price (perhaps altering BPA's maximum sustainable revenue (MSR) and ability to pay fish and wildlife costs)</li> </ul>
<ul style="list-style-type: none"> <li>▪ Electricity deregulation</li> </ul>
<ul style="list-style-type: none"> <li>▪ Economic recession or dramatic change</li> </ul>
<b>FACTORS SPECIFIC TO POLICY DIRECTIONS</b>
<ul style="list-style-type: none"> <li>▪ Ineffective BPA cost controls</li> </ul>
<ul style="list-style-type: none"> <li>▪ The need for changes in law</li> </ul>
<ul style="list-style-type: none"> <li>▪ Inability to affect population growth and development patterns in the region</li> </ul>
<ul style="list-style-type: none"> <li>▪ Selection of implementation options (such as acquisition, leasing, positive incentives, regulation, education, and methods) and intensity of enforcement</li> </ul>
<ul style="list-style-type: none"> <li>▪ Monitoring programs and response to monitoring efforts</li> </ul>
<ul style="list-style-type: none"> <li>▪ Inability to enforce new regulations</li> </ul>
<ul style="list-style-type: none"> <li>▪ Inability to police whatever areas and activities are restricted to humans</li> </ul>
<ul style="list-style-type: none"> <li>▪ Inability to establish successful Basin-wide Strategy practices to achieve fish and wildlife results</li> </ul>
<ul style="list-style-type: none"> <li>▪ Lack of environmental constituent support for businesses using the river, which may undermine Policy Directions, or vice versa</li> </ul>

#### **4.1.1 Factors in the Natural Environment**

The natural environment will change in ways that cannot be predicted now. Natural disasters can influence the success of a Policy Direction. For instance, ocean conditions can change for better or worse, with consequent effects on anadromous species food sources, survival, and commercial fishing. Weather conditions and climate change can similarly affect human priorities. Wildfires, volcanic eruptions, or other natural events can destroy or alter habitat. Any of these, and more, can affect fish and wildlife 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 to one or more tenets of a Policy Direction.

#### **4.1.2 Factors in the Social and Economic Environment**

Social and economic factors influence the implementation and success of a chosen Policy Direction. Many implementation actions—especially, most habitat and harvest actions—will likely require human behavioral changes that cannot be simply mandated. Rather, actions may seek to modify behavior through incentives. Human behavior depends on the options selected, and environmental effects depend on the human behavior. Examples of incentives include subsidy, acquisition, leasing, education, and regulation.

Even regulation is not necessarily 100% effective; success depends on enforcement, penalties, and other variables.

Other social and economic factors involve feedback effects with the chosen Policy Direction or its results. For example, some or many regional parties may work to block or change the chosen Policy Direction or implementation actions. The Policy Direction may have broad effects on population, regional economies, or funding that affect its implementation. The success of actions in recovering species may affect decisions on listing of more species as threatened or endangered.

Other social and economic factors that influence effects are themselves largely independent of fish and wildlife recovery efforts. These factors can range from changes in the electric utility industry such as deregulation, the formation of a regional transmission organization (RTO), or electricity or other market fluctuations; to an economic recession that turns individuals' focus more closely to immediate personal economic survival.

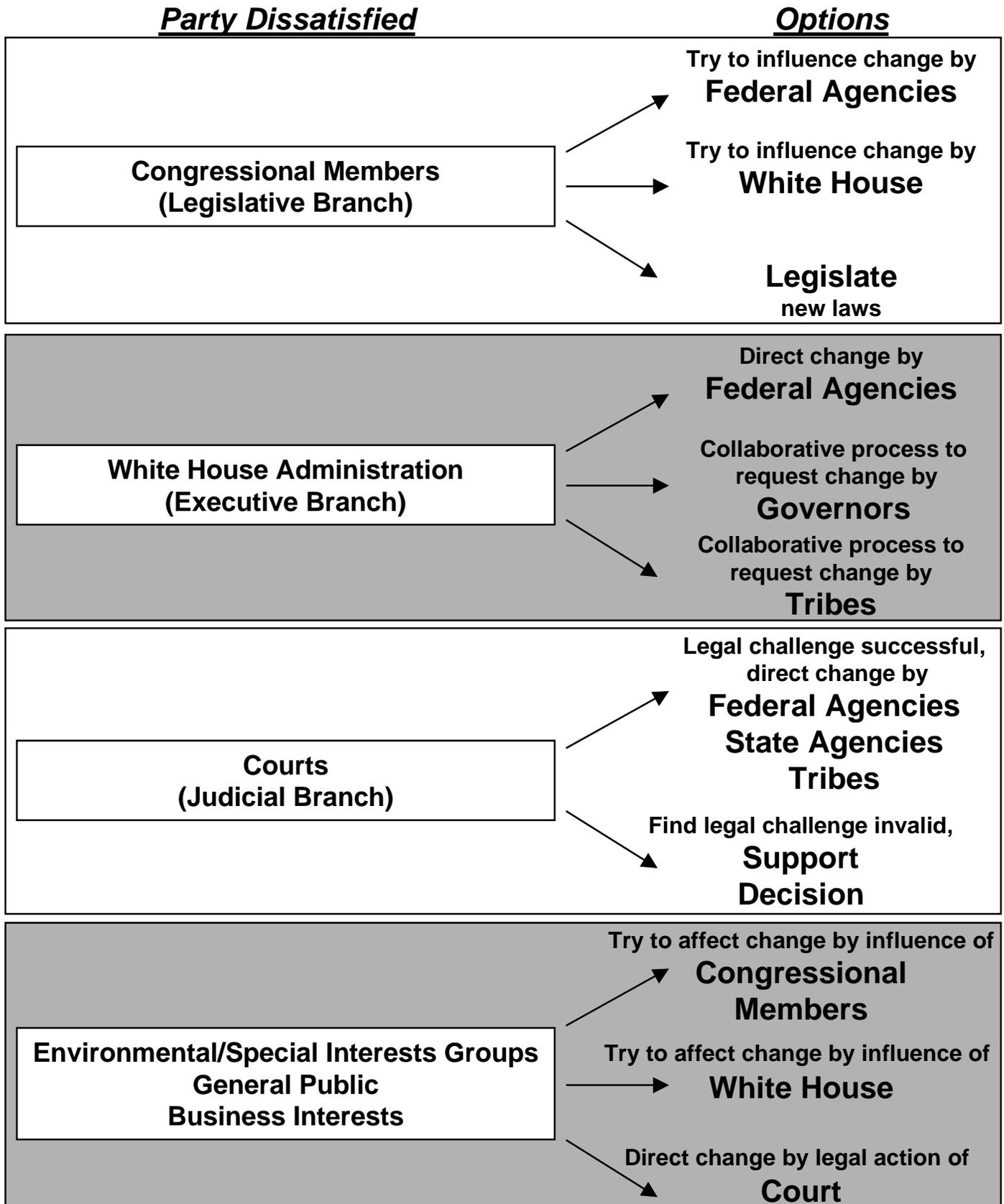
### **4.1.3 Factors in the Decisionmaking Process**

It is particularly important to understand how the interaction of public process, political intervention, and judicial review of the fish and wildlife mitigation and recovery plans may affect implementation of those plans. There are three major roles in this interaction.

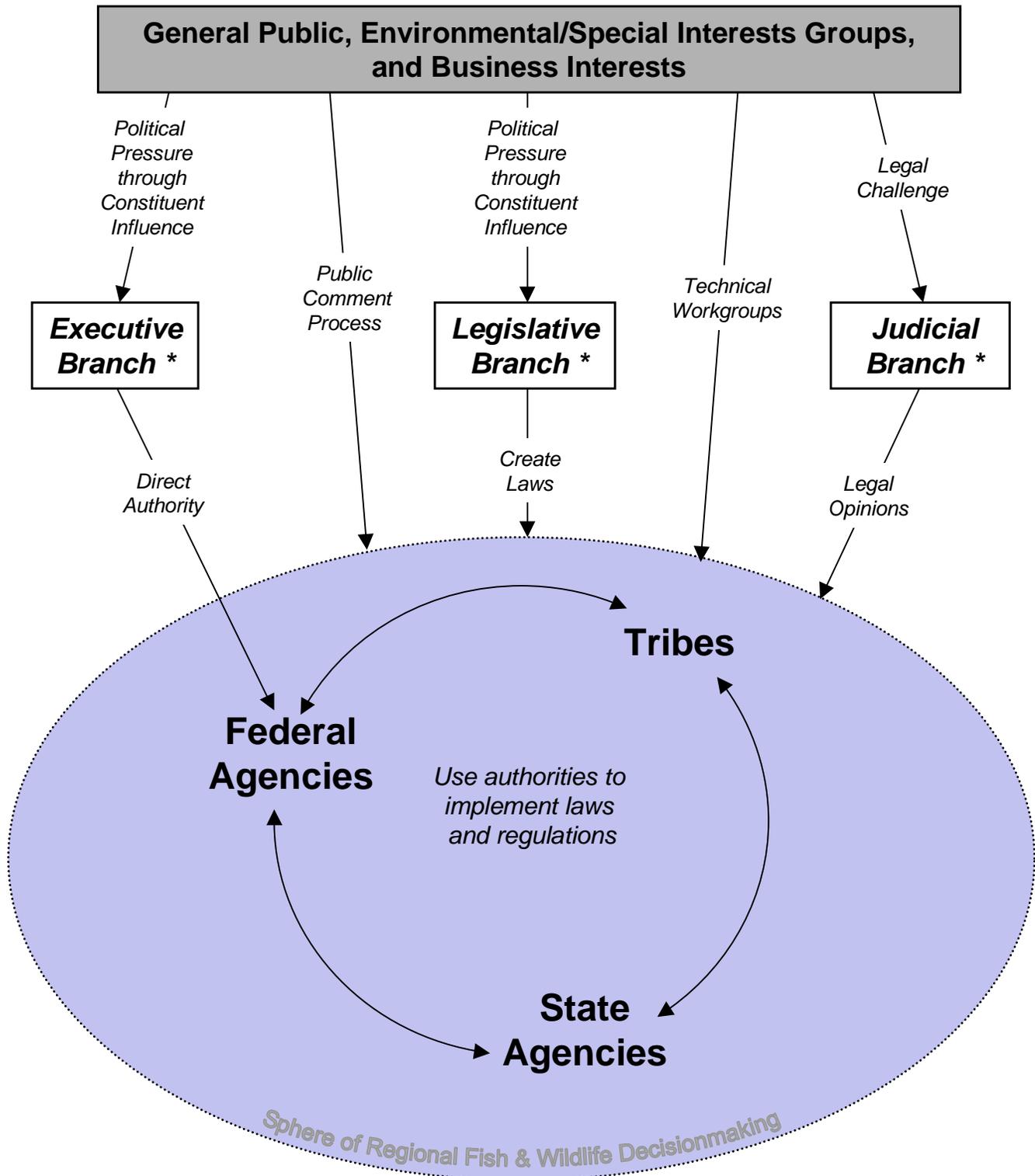
- **Decisionmaking.** The major public policy decisionmakers are the tribes, states, and federal agencies that manage and implement fish and wildlife policy. They make the key decisions, and bear the ultimate responsibility for implementing a regional fish and wildlife policy.
- **Influencing.** The general public—as an environmental or special interest group, a business group, or individual concerned citizens—may influence the decisionmaking process by voting, political influence, expressing opinions and/or by introducing information on technical/scientific developments that may bear on the decision. Effective public involvement is essential to sound decisionmaking. The public's effect varies, based on the conflict surrounding the particular policy issue. Where regional policy on fish and wildlife recovery efforts is concerned, public, scientific, and political discord is extremely high. Any individual or group dissatisfied with a process or a decision may seek direct help as described below.
- **Intervening.** A dissatisfied party may seek redress through the Executive, Legislative, or Judicial branches of the respective federal or state 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 several different ways: via technical input, political input, public input, and legal input, or by simple default due to inaction or delays in making formal policy. Figure 4-2 shows each of these influences in the development of a fish and wildlife recovery effort policy. The interrelationship among the regional decisionmakers, the public interest groups, and the various branches

Figure 4-1: Decisions by Regional Federal, State, or Tribal Policy Makers  
Possible Actions by Parties With Concerns



**Figure 4-2: The Pacific Northwest Region Decisionmaking Process Influences**



\* NOTE: The regional decisionmakers face influences from several different levels. A dissatisfied party may seek redress through:

- the **Executive Branch** - Federal: President and White House Administration; and States: Governors and their Administrations
- the **Legislative Branch** - Federal: US Congress; and States: Legislators
- the **Judicial Branch** - Federal: 9th Circuit & Supreme Courts; and States: District & Supreme Courts
- Tribes** have their own set of governing organizations (e.g., Tribal Councils, Tribal elders)

of federal, state, and tribal government is one of 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 an issue as controversial as developing a fish and wildlife recovery effort policy. The advantage, however, of the decisionmaking process outlined in Chapter 3 and above 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 act to persuade an entity with direct control over regional decisionmakers.

To reach a policy goal that will weather technical, legal, and political scrutiny, and to create a useful and long-lasting tool, we must make sure that any Policy Direction can be modified. The purpose of this DEIS is to identify, in advance, the potential environmental consequences of various Policy Directions, so that all interests can be better informed of the 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 environment. The current policy might reach its intended goal, or it might fall short in one or more critical aspects. We must leave a potential range of future implementing actions open to accommodate a reasonable range of possible future changes in the environment or in public policy. This DEIS 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 regional policy alternative and make modifications, as necessary. Three tools help to make this process possible: one tool (**response strategies**) that does not change the Policy Direction, and two (**mix and match options** after the initial decision, and **reserve options** for future modification) that do.

Some actions are more reversible than others. Policies may change, but not all actions and effects can be changed as readily. Extinction cannot be reversed. However, where natural populations were lost, new populations might be established from other stocks. Dam building may also be hard to reverse, because society becomes economically dependent on those dams. All else being equal, actions that can be reversed are preferable to actions that cannot be reversed.

### **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, 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*. Response strategies are used to

implement the fish and wildlife recovery efforts and to mitigate unforeseen or uncertain events such as changing ocean conditions or natural disasters. They represent management options within the agency's jurisdiction and have been contemplated, implicitly or explicitly, and evaluated in advance, allowing for immediate implementation.

Such response strategies can be grouped into three categories: Management and Operating Agency Activities, BPA Funding of Response Strategies, and Regional Response Strategies.

#### **4.2.1.1 Management and Operating Agency Activities**

As part of the normal course of operations, agencies must prepare for reasonably foreseeable events. When such an event occurs, a pre-designed and pre-assessed plan can be implemented 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 design of official plans. Such responses are often influenced by the White House or Congress, the general public, or specific interest groups representing a particular concern. 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. Operating responses can include specific hydro operations, vegetation management, or building and constructing physical structures, for example.

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 agencies, courts, and other entities has shaped the development and management of the water, land and fish and wildlife of the Columbia River. The table below describes those entities with the most significant role in implementing management and operating responses.

**Fish and Wildlife Implementation Plan DEIS**  
**Chapter 4: Implementation and Responses to Changes**

**Table 4.2-1 Roles and Responsibilities**

ENTITY	GENERAL REGIONAL RESPONSIBILITY
<i>Agencies with Primary Management Responsibilities</i>	
<b>Executive Branch</b>	<b>Constitutional</b> – Manages the actions of the federal agencies, certain veto powers.
<b>Judicial Branch</b>	<b>Constitutional</b> – Determines whether actions are consistent with the U.S. Constitution, and federal and state laws and regulations
<b>Congress</b>	<b>Constitutional</b> – Promulgates and amends laws as necessary to represent constituency; makes appropriations to complement laws
<b>Tribes</b>	<b>Treaty</b> – Act as independent sovereigns within the United States, acting consistent with Treaties and applicable federal statutes
<b>Northwest Power Planning Council</b>	<b>Statutory</b> – Responsible for developing Regional Power Plan and Fish and Wildlife Plan under the Regional Act
<b>National Marine Fisheries Service</b>	<b>Statutory</b> – Pursuant to the ESA, produces biological opinions on jeopardy of anadromous fisheries, regulates commercial/tribal harvest
<b>Bonneville Power Administration (power marketing)</b>	<b>Statutory</b> – Markets and transmits electric power from federal dams and implementing actions under the Regional Act (e.g., funding fish and wildlife mitigation measures.) Provides low-cost power to the region
<b>US Fish and Wildlife Service</b>	<b>Statutory</b> – Pursuant to ESA, produces BiOps on plants, wildlife, & resident fish
<b>Environmental Protection Agency</b>	<b>Statutory</b> – Over sees CWA regulations and implementation, plus general environmental oversight through NEPA
<b>Federal Energy Regulatory Commission</b>	<b>Statutory</b> – Has regulatory authority over non-federal hydroelectric projects on the Columbia River and its tributaries
<i>Agencies with Primary Operating Responsibilities</i>	
<b>Bonneville Power Administration (transmission)</b>	<b>Statutory</b> – Constructs and maintains the high-voltage transmission line system throughout the Pacific Northwest. Provides low-cost primary transmission to electric utilities, public power suppliers, electric generators, and others needing wholesale transmission to the region
<b>Bureau of Land Management</b>	<b>Statutory</b> – Manages public forest and range lands
<b>US Forest Service</b>	<b>Statutory</b> – Manages National Forest System Lands
<b>US Army Corps of Engineers</b>	<b>Statutory</b> – Operates federal dams and locks for multiple uses – navigation, flood control, recreation, irrigation, power
<b>Bureau of Reclamation</b>	<b>Statutory</b> – Operates multiple purpose federal water projects for irrigation and flood control as well as power
<b>Bureau of Indian Affairs</b>	<b>Statutory</b> – Trustee for tribal/individual Indian land & resources held in trust
<b>State Fish and Wildlife Related Agencies</b>	<b>Statutory</b> – 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**

BPA will need certain funding response strategies consistent with each Policy Direction. If events outside BPA's control appear to impair its ability to reach the Policy Direction's desired results, BPA must act to try to maintain its funding to achieve the intent of that Policy Direction. This DEIS 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 and documentation and public process would take place, possibly leading to Policy Direction changes as described in Section 4.2.2.

For example, if BPA's financial situation should change—say, a prolonged drought made it impossible for the agency to recover sufficient revenues to meet its obligations—BPA could take action to (1) increase revenues (raising rates or selling new products are two measures), or (2) decrease spending, or (3) transfer costs (e.g., by seeking cost-shares for programs or securing additional appropriations). A more detailed look at these options is available in the BPA Business Plan EIS.<sup>1</sup>

**Table 4.2-2: Potential BPA Funding Response Strategies**

<b>Increase Revenues</b>	<b>Decrease Spending</b>	<b>Transfer Costs</b>
Raise firm power rates	Eliminate power purchases	Seek 4(h)(10)(c) credit from fish & 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 & services revenues	Reduce Washington Nuclear Plan (WNP)-1, -2, & -3 spending	Reallocate FBS costs & debt between power & non-power spending
Increase sales of new products & services	Reduce conservation incentive spending	Secure appropriations for BPA's costs
Implement a stranded investment charge	Reduce generation acquisition spending	Transfer program & financial responsibility
Increase seasonal storage	Reduce pollution prevention & abatement spending	
Optimize hydro operations for net revenues	Reduce fish & wildlife spending	
Increase extraregional sales revenues	Reduce transmission construction spending	
Increase joint venture revenues	Share ownership and spending in new facilities	

<sup>1</sup> USDOE/BPA (1995).

Increase Revenues	Decrease Spending	Transfer Costs
Sell assets	Reduce operations & maintenance spending	
	Shift from revenue to debt financing	
	Seek increased Treasury borrowing limits	
	Lower probability of making Treasury payments	

*Source: BPA Business Plan EIS, 1995*

### **4.2.1.3 Regional Response Strategies**

Similarly, other federal, state, or local agencies may wish to develop administrative or operational strategies specific to their needs so that they may respond quickly to unexpected events, and still maintain the integrity of the Policy Direction. Many of these response strategies would be consistent with existing environmental documentation. Other such response strategies would typically consist of those activities under the Categorical Exclusion<sup>2</sup> designations of the various agencies, which are the product of years of typical agency responses to change. Examples of such activities are noted below.

- *Planning Activities:* Such as archeological surveys or test excavations for cultural resources investigations consistent with the Policy Direction being followed.
- *Project Implementation Activities:* Such as classifying and certifying lands or fixing minor unsatisfactory environmental conditions consistent with the Policy Direction being followed.
- *Operations and Maintenance Activities:* Such as work (being done to implement the Policy Direction being followed) 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**

The management, operating, and funding response strategies above are appropriate when relatively minor implementation adjustments need to be made to carry out an existing policy. Sometimes, however, the Policy Direction itself will require a change. This requires a more fundamental adjustment. The ability to adjust implementation to a change in Policy Direction is critical when time is a crucial factor in the recovery effort. For BPA, these adjustments are also critical to successfully competing in the electric utility marketplace.

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<sup>2</sup> "Section 1507 of the CEQ regulations directs federal agencies when establishing implementing procedures to identify those actions which experience has indicated will not have a significant environmental effect and to categorically exclude them from NEPA review." (Federal Register Vol. 48, No 146. Thursday, July 28, 1983, Rules and Regulations.) See also, 40 CFR §1507.3(b)(2)(ii).

#### **4.2.2.1 Mix and Match (Post-Selection)**

By using the "mix and match" approach outlined in Section 3.4, regional decisionmakers could revisit a Policy Direction after it has been implemented and make changes, as necessary. If a particular action or set of actions proves 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 Policy Directions, decisionmakers could make changes ranging from minor adjustments in one area or issue to creating a new Policy Direction from the actions identified in the Sample Implementation Actions. Because the mix and match approach is used to *modify a Policy Direction* (or adopt a new Policy Direction), regional discussion and public process would likely be necessary.

In using the "mix and match" approach to adjust a Policy Direction, one must keep in mind the cautions noted in Section 3.4.2: consistency, effectiveness, clarity, coordination, cause-and-effect relationships, and compatibility of changes. To review the cautions and the directions for mixing and matching alternative actions among Policy Directions, please see Appendix E.

#### **4.2.2.2 Reserve Options for Future Action**

Just as fish and wildlife policy in the Columbia Basin has evolved over time, so the chosen Policy Direction may evolve over time. Future decisionmakers and citizens may decide to revisit an entire Policy Direction. They might reconsider the underlying actions making up the implementation plan or they might completely change course. (Accommodating such a change is the primary reason that BPA uses a methodology based upon relationships [qualitative analysis].)

The specific actions being considered today are different from those 10 or 20 years ago. The specific actions of the future may be different, too. Developments in science and technology, past successes and failures, different personnel, 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. Although the specific actions may change, the underlying concepts of the action's extent and impact on the environment will not. The methodology used in this DEIS allows policies to evolve with changing circumstances. 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 future decisionmakers have the flexibility to respond to significant changes.

Reserve Options represent a variety of alternative actions. They are not currently included as part of the Policy Directions, but they are discussed below. The Reserve Options are to provide future decisionmakers with the ability to extend or intensify actions already in place. Reserve Options represent potential actions beyond today's

consideration for implementation. We discuss them in this DEIS to allow for changes in public perception about what is feasible and the possibility that extensions of current actions may be needed to respond to future conditions. Table 4.2-3 lists the extreme endpoints for future action. See also Figure 4-3.

For example, one Policy Direction (Natural Focus) may call for removing two mainstem dams and four dams on the Snake River. If this action were implemented and judged successful, future decisionmakers might want to breach additional mainstem dams. Consequently, one of the endpoints for the Reserve Options is to "breach, or remove all dams." Decisionmakers would be free to increase dam breaching incrementally—removing additional dams as desired—until the endpoint is reached and no further action is feasible. With each step toward an endpoint, environmental consequences and socioeconomic effects would become more intense and extensive, although the *kinds* of effects anticipated would remain the same. To more fully understand the anticipated effects of implementing actions along the possible range of Reserve Options, please see Chapter 5.

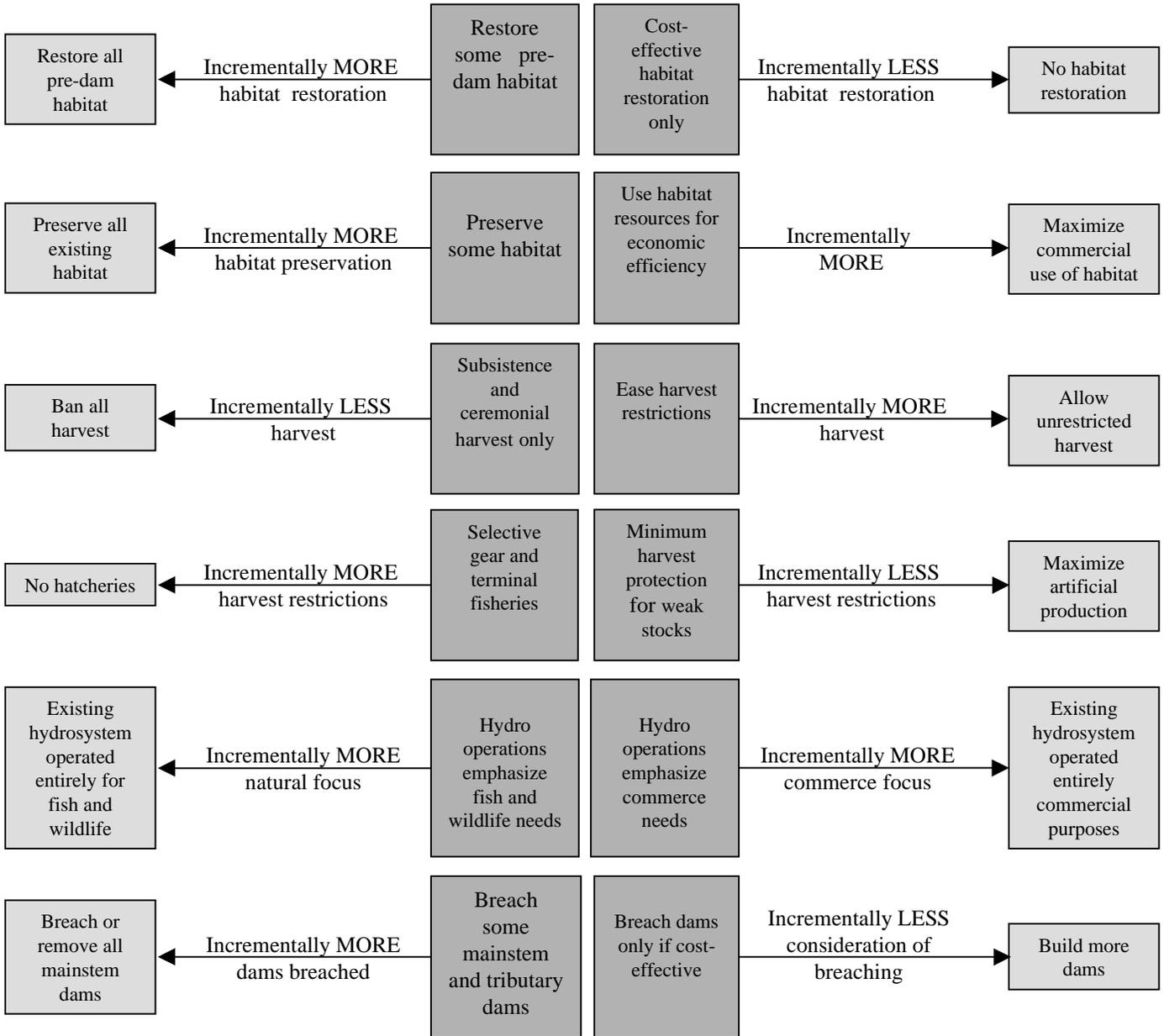
When using Reserve Options, as with the mix-and-match approach described above, decisionmakers must understand two important points:

- **Reserve Options should be compatible and consistent with a Policy Direction.** If a decisionmaker chooses a Reserve Option that is inconsistent with the theme of the current Policy Direction, he or she must revisit the choice and ask several questions. Has the region's approach to fish and wildlife recovery changed? If so, is a new Policy Direction being established? If not, will implementing a Reserve Option undermine efforts to achieve the current Policy Direction objectives?
  - **Public process will be required.** Even if the Reserve Option is consistent with the current Policy Direction, regional discussion and public process must be initiated, because Reserve Options may represent actions that are a substantial change from the time the region selected the initial Policy Direction.
- **Chapter 5 presents the environmental consequences of the different Policy Directions.**

**Table 4.2-3: Key to Reserve Options**

<b>Endpoints of the Reserve Options in the Fish and Wildlife Implementation Plan</b>					
<b>Fish and Wildlife Reserve Options</b>					
	<b>Natural Focus Endpoints</b>	<b>Example</b>		<b>Commerce Focus Endpoints</b>	<b>Example</b>
RO-1 <i>Habitat</i>	Restore pre-dam habitat	Restore impaired habitat to pre-1930's conditions.	RO-7 <i>Habitat</i>	No habitat restoration, or restore only if most cost-effective.	No active restoration, passive restoration only if no other economical use
RO-2 <i>Habitat</i>	Preserve all existing habitat	Do not allow any disturbance to existing habitat	RO-8 <i>Habitat</i>	Maximize commercial use of habitat resources	Allow any development or commercial use of existing habitat
RO-3 <i>Harvest</i>	Ban all harvest	Total closure of all commercial, tribal, and recreational harvest	RO-9 <i>Harvest</i>	Allow unrestricted harvest	Any harvest allowed. Economic factors will determine best amount of fishing
RO-4 <i>Hatchery</i>	No hatcheries	All hatchery operations cease and hatchery facilities are closed.	RO-10 <i>Hatchery</i>	Meet all mitigation requirements with production hatcheries and fish farming	Build any cost-effective hatchery
RO-5 <i>Hydro</i>	Existing hydrosystem operated entirely for fish and wildlife	Operations only consider tradeoffs between species and timing of releases; all hydropower, transportation, and flood control incidental	RO-11 <i>Hydro</i>	Existing hydrosystem operated entirely for commercial purposes	Operations consider tradeoffs between all commercial uses, fish produced only if economical or incidental to economic purposes
RO-6 <i>Hydro</i>	Breach or remove all of the mainstem dams	John Day and McNary are already considered for breach or removal in one or more Policy directions, but this module would allow for additional mainstem dams to be considered.	RO-12 <i>Hydro</i>	Build more dams	Maintain existing hydrosystem and build more dams if cost-effective

**Figure 4-3: Continuum of Reserve Options for Possible Future Action**



Preparation for  
Implementing  
a Decision

CHAPTER 1  
Purpose  
and Need  
for Action

CHAPTER 2  
Policy History  
and Affected  
Environment

Comparison of  
Alternatives

CHAPTER 3  
Comparison  
of  
Alternatives

CHAPTER 4  
Implementation  
and Responses  
to Change

For Implementing  
a Regional Decision

**Environmental  
Consequences**

**CHAPTER 5  
Environmental  
Consequences**

**Chapter 5**

*Categories of Actions  
and Effects*

*Generic Environmental  
Consequences*

*Environmental  
Consequences of Policy  
Directions*

*Environmental  
Consequences of  
Reserve Options*

Governance

CHAPTER 6  
Governance

## **CHAPTER 5 — ENVIRONMENTAL CONSEQUENCES**

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- **Briefly reviews the methodology that underlies the analysis of environmental consequences for this DEIS.**
- **Provides examples of generic effects and mitigation measures by common regional human activities.**
- **Illustrates the environmental consequences of proposed and reasonably foreseeable regional actions through providing an understanding of the relationship of human actions and their effects on natural and socioeconomic resources.**

Information in this chapter provides the technical and detailed basis for the analysis in this DEIS. For a summary of that analysis, please see Chapter 3 (Comparison of Alternatives).

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This chapter is organized to allow logical review of the environmental consequences of implementing actions consistent with each of the Policy Directions. To allow for changing conditions, this document focuses on the broad perspective at the policy level, allowing for greater flexibility at the specific action level. The description of environmental consequences is based not upon numbers, but on the broader and more general qualitative analysis built upon observable relationships among policies, people, and their environment. These basic relationships will lead to a more reliable understanding of the environmental consequences of our actions, appropriate for this level of decision-making, and without giving a false sense of precision.

This DEIS includes a full range of foreseeable Policy Directions. Some Policy Directions will implement actions that are more favorable to fish and wildlife, but less favorable to some groups of people. Other actions may be more favorable to some groups of people but less favorable to fish and wildlife. This full range of potential Policy Directions requires a full range of descriptions of the potential effects. This description must include adverse effects on fish and wildlife, as well as adverse effects on natural resource users and other commerce. This chapter includes a description of potential mitigation for adverse effects. The full range of mitigation for potential adverse effects must also cover adverse effects from the fish and wildlife perspectives as well as from human perspectives.

***Refresher:*** *The items below are summarized from Chapters 3 and 4 to provide an instant reference for the reader.*

1. *To arrive at the Policy Directions discussed in this DEIS, we studied the regional processes and proposals currently underway, the key issues identified, and the possible implementing actions. These bodies of information were grouped by theme to form the Policy Directions covering a broad range of possibilities.*

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 currently in use. The region would experience more of the effects that characterize the existing environmental conditions.*
3. *All Policy Directions assume that human population and development will continue, though each Direction can influence the rate of growth. Specifically, with increased population and development, the Status Quo increases pressure on fish and wildlife and natural ecosystems as habitat is converted and as conflicts with fish and wildlife continue.*
4. *This DEIS has been prepared to meet NEPA requirements and to explore the environmental consequences (impacts) for each Policy Direction. With this information in hand, the BPA Administrator can be prepared to assess the potential effects of a given Policy Direction and to determine how BPA will meet its obligation to fund and implement actions arising out of that Direction.*
5. *Environmental consequences fall naturally into two areas:*
  - (1) *major environmental consequences for natural resources (land, water, and fish and wildlife resources) from common human activities, and*
  - (2) *major environmental consequences for humans from actions taken to mitigate for past activities and recover fish and wildlife.*
6. *The discussions below provide more detailed and technical information to support the comparisons found in Chapter 3 (Comparison of Alternatives). Consequences are expressed not in terms of exact numbers but, rather, in qualitative terms of whether they will be moving in a better or worse direction from the existing conditions under current policy.*
7. *The Policy Directions, as defined in this DEIS and discussed in terms of consequences below, are not rigidly set. This DEIS anticipates that the public or decisionmakers may modify them. Accordingly, the tools to facilitate analysis of modified Policy Directions have been provided. These tools include "mixing and matching" components (see Chapter 3), build your own alternative (Chapter 3 and Appendix E), response strategies (Chapter 4), reserve options (Chapter 4), and political or judicial intervention (Chapter 4).*

Section 5.1 provides background on the scope of the analysis in terms of the types of actions and effects analyzed. Section 5.2 describes adverse environmental consequences of more or fewer actions for fish, wildlife, and humans, as well as the range of factors that may influence the ultimate environmental effects. Section 5.3 discusses environmental consequences as they would occur under each of the five different Policy Directions compared to Status Quo.

## **5.1 CATEGORIES OF ACTIONS AND EFFECTS**

The objective in the following section is to ensure that the BPA Administrator, as well as other decisionmakers and people in the region, understand the full scope of this DEIS. This scope involves actions taken for fish and wildlife recovery efforts as well as actions taken to reduce the costs and other adverse effects of existing fish and wildlife programs.

### **5.1.1 Categories of Actions**

Implementation actions are commonly organized by four categories:

- *habitat* (the environment in which fish and wildlife live),
- *harvest* (commercial, sport, or other take of fish and wildlife),
- *hatcheries* (artificial, human-built ways to add to the populations of fish), and
- *hydrosystem* (actions involving operations or changes to dams or other water control facilities).

This set of "Hs" has become the commonly accepted elements of fish and wildlife 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. Actions include *passive* restoration by reducing human activities and allowing natural regeneration and *active* restoration by physical modifications to land or vegetation. These two types of restoration can have very different patterns of natural and socioeconomic effects. Often, both types of actions will be used in a watershed to achieve habitat goals.

Habitat actions are also classified according to the type of habitat affected:

- *Uplands* are not hydrologically affected by downslope aquatic bodies. Habitat actions for fisheries on uplands generally seek to reduce polluted runoff to downslope aquatic systems.
- *Riparian* areas are hydrologically connected to rivers and streams by groundwater or flooding. Riparian areas are often targeted for habitat improvements because of their close physical and ecological connections to river systems and their fish and wildlife. 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* are seasonally or permanently wet. Habitat actions include wetlands creation and restoration by active and passive means.

- Habitat actions include active modifications to *river channels and streambeds* by physical means. Removal of riprap, adding woody debris or spawning gravels, and dredging management are examples.
- *Aquatic* habitat is the water environment itself. Many actions that affect aquatic habitat are classified as hydrosystem activities. <sup>1</sup>
- **Harvest.** Harvesting (taking fish or wildlife by various commercial, sport, or other means) modifies abundance, which can affect survival rates of species or their predators. Categories of harvest actions include ocean harvest reduction, shift to terminal harvest and selective harvest practices, change in harvest practices to allow more effective releases, and changes in recreational harvest including fishing and hunting regulations. <sup>2</sup> For unwanted predators of target species, actions include harassment, changes in sport harvest regulations, and incentives such as bounties.
- **Hatcheries.** Hatcheries include production facilities, supplementation hatcheries<sup>3</sup>, genetic conservation facilities, and fish farms. Categories of hatchery actions include closing hatcheries, building new ones, and changing hatchery production practices. Hatcheries modify populations of targeted species by direct changes to population recruitment at specific life stages and points in time. Hatcheries may also modify desirable populations by interactions with hatchery-produced species through competition for space, food and reproduction. <sup>4</sup>
- **Hydrosystem.** Hydrosystem actions include changes in reservoir and diversion operations, or changes in hydrosystem facilities. The main purpose of hydrosystem actions for fish and wildlife is to increase survival for targeted species by improved aquatic habitat and migration conditions. These conditions include habitat volume and area; amount and timing of flow for water velocity, temperature, and other purposes; predator control; exotic species control; operations to control water quality, fish passage, and in-reservoir storage for

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<sup>1</sup> 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' Conceptual Plan (draft "All-H" paper) and its Basin-wide Strategy" (final "all-H paper) and the accompanying Appendix on Habitat.

<sup>2</sup> 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 Basin-wide Strategy papers and the accompanying Appendices on Harvest (Federal Caucus 199b, 2000b).

<sup>3</sup> Supplementation is an artificial propagation intended to reestablish a natural population or increase its abundance (Federal Caucus, 1999b, p. 144). A conservation hatchery program, by contrast, uses artificial propagation to recover Pacific salmon by maintaining the listed species' genetic and ecological integrity (Ibid., page 131).

<sup>4</sup> For a historical perspective on regional hatcheries, an assessment of current management and alternative management strategies, please see the Federal Caucus' Conceptual Plan and Basin-wide Strategy papers and the accompanying Appendices on Hatcheries (Federal Caucus, 1999b, 2000b), as well as Brown's *Mountain in the Clouds: A Search for the Wild Salmon* (1995) and Lichatowich's *Salmon Without Rivers* (1999).

resident fish and downstream use. Hydrosystem actions can also include modifications to the physical hydrosystem such as dam breaching, modifications for passage improvements, and streambed or bank modifications for flow purposes.<sup>5</sup>

It is important to recognize there are outer limits to 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 for each "H."

- **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 operations.
- **Hydro:** removal of all dams and other human-made blockages.

(See Chapter 4, discussion of Reserve Options, for the more extreme applications of the Hs above.)

### **5.1.2 Categories of Environmental Effects**

Implementation actions are generally undertaken to directly 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 which occur nevertheless. It is important to understand the distinction between these two types of outcomes before proceeding to the discussion of environmental consequences.

**Intended effects** are those changes to the natural environment that are targeted by the implementing action, including the sequence of effects that is supposed to occur to achieve the desired effect.

- **Example:** Water may be released from one of the reservoirs to increase flow in the river to increase velocity to allow juvenile anadromous fish to move quickly toward the ocean, increasing the number that survive to adulthood. Increased flow, velocity, and survival are all intended effects.
- **Example:** Riparian reforestation (replanting along the banks of rivers and streams) is conducted to improve streambank characteristics, increase shading, and contribute to woody debris. These changes reduce erosion, moderate water temperature, and provide cover for fish in the stream. All of these are intended effects.

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<sup>5</sup> 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 Basin-wide Strategy papers and their accompanying Appendices on Hydropower. The System Operation Review EIS (USDOE/BPA, Corps, and BOR, 1995) also provides background.

**Associated environmental effects** are not part of the intended effects to reach a direct action goal. When fish and wildlife recovery effort policy actions are taken to improve conditions for one or more species, indirect effects—associated negative effects—may occur for other fish and wildlife species or for humans. These effects are often unwanted and undesirable.

- **Example:** Water is released from the dams to increase flows to help the anadromous fish migrate to the ocean. At the same time, this action may lower the reservoir level. Lower water levels may affect cultural resources, wetlands, riparian habitat and communities, waterfowl, and spawning habitats. The lowering may also have negative effects on navigation and recreational activities, and further undesirable economic effects. The increased flow may increase undesirable gas (nitrogen) supersaturation and sedimentation, including turbidity in the water downstream.

This example illustrates a fundamental principle of environmental analysis. There are many complex relationships between actions and effects. If actions taken to achieve unambiguous resource improvements had no other effects, there would be little need for environmental analysis. Actions often have many effects, however, and environmental analysis is needed because some of these many effects are undesirable for some people and some fish and/or wildlife.

Actions often have trade-offs. A given implementation action may have the effect of limiting the potential for other actions.

- **Example:** A dam is breached. The *intended* outcome might be to support improved habitat for fish. The *associated* outcome, however, is that the dam can no longer be used to control operations on the river: a hydrosystem option has 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.

The following list illustrates trade-offs among hydrosystem actions by comparing the hydrosystem actions that would be best for different types of river uses. The optimum operation of reservoirs for one resource has effects that are not optimal for another.

#### **OPTIMUM CONDITIONS FOR EACH RIVER USE<sup>6</sup>**

***Anadromous Fish*** - Streamflows as close to "natural" river conditions as possible, with mainstem reservoirs well below spillway levels.

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<sup>6</sup> Source: USDOE/BPA, Corps, and BOR, 1995, p. 4-2. How all of these effects are taken into account in making fish and wildlife policy can be reviewed in Section 2. Future site-specific projects will use this analysis of effects to determine the project's viability and provide specific details to where and how the effects will take place.

**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** - Drawdown reservoirs year-round to expose maximum acreage for long-term habitat recovery. Allow flows as close to natural conditions as possible.

## **5.2 GENERIC ENVIRONMENTAL CONSEQUENCES**

This section addresses the general nature of environmental effects in five fundamental areas: land, water, fish and wildlife, air, and socioeconomics. Each subsection provides the following:

- a summary of the types of human activities (whether carried out to further fish and wildlife or human needs) that **cause** this effect;
- a brief description of the **consequences** 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 consequences); and
- a **discussion** that provides more background information on the intended and associated effects of each activity.

"Effects" and "mitigation" are used as they appear in the CEQ Regulations definitions, 1508.8 and 1508.20 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 repairing, rehabilitating, or restoring the affected environment.*
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.*
- (e) Compensating for the impact by replacing or providing substitute resources or environments.*

### **5.2.1 Analytical Coverage**

Coverage refers to the scope of an analysis in terms of where, what, when and who. This DEIS is focused on effects within the Pacific Northwest region. For purposes here, this region is defined as any part of the United States within the Columbia River Basin or within BPA's service area; although there may also be effects in the Pacific ocean off the coasts of Oregon, Washington, British Columbia, and Alaska. Most fish and wildlife effects are expected to occur within the region. Most important social and economic concerns are within the region, although some effects might spread outside the region through imports and exports.

This DEIS is intended to have a very broad coverage: the range of foreseeable Policy Directions and actions for fish and wildlife in the region. Context and intensity, discussed below, also pertain to what is covered. The time horizon for the analysis includes short-term and long-term considerations. The short term includes effects up to 10 years from now. Long-term effects extend beyond 10 years and include the time horizon needed for ecosystems to recover to near-pristine conditions.

Analytical perspective, discussed in 5.2.1.2 below, defines who is covered by the analysis.

### **5.2.1.1 Context and Intensity**

The alternative Policy Directions in this DEIS are meant to describe general changes in policies relative to the Status Quo. Most actions taken under a given Policy Direction could be implemented within a wide range of *intensity* or *amount*.

- **Examples:** Any number of hatcheries could be built, any number of commercial fishing vessels could be retired, and habitat practices could be applied to any number of acres or stream miles.

This document does not try to define such specific quantities for each Policy Direction. Rather, the DEIS tries to provide an understanding of how larger or smaller amounts of selected activities will have a strong influence on the degree of environmental effect. However, these qualitative assessments are based upon the technical data on each subject found in the SOR FEIS (USDOE/BPA, Corps, and BOR 1995), the Lower Snake River Juvenile Salmon Migration Feasibility Report DEIS (Corps, 1999a), the Business Plan FEIS (USDOE/BPA, 1995), ICBEMP SDEIS (USDA/USFS and USDO/BLM, 2000), the Framework Report (Council, 2000a), and the Federal Caucus' Conceptual Plan paper (1999b) and Basin-wide Strategy (2000b) papers. For a more quantitative presentation, please refer to these documents, including the respective appendices. The specific references are noted throughout the qualitative analysis. The exact magnitude of effects will be determined as the specific implementing actions for the chosen Policy Direction are applied. These specific effects will be consistent with the qualitative analysis identified in this document and will be further detailed in the future tiering of decisions (Tiered RODs) carrying out the Policy Direction in play.

This chapter discusses effects in terms of *context* and *intensity*:

- **Context:** 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:** 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.<sup>7</sup>

Context and intensity in section 5.2.2 (consequences for fish and wildlife) are discussed in relation to natural resources affecting the most important parts of fish and wildlife life cycles. Context and intensity in section 5.2.3 (consequences for humans) are discussed in relation to groups of people and regional communities (e.g., tribes, people who fund fish and wildlife restoration, various industries) that may be affected by actions. The distribution of effects of fish and wildlife actions among industry subgroups—owners,

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<sup>7</sup> For more information on these terms, see Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, 40 CFR § 1508.27.

workers, and consumers—depends on the structure of the industry, market conditions, and institutional considerations, among other factors.

"Socioeconomic" consequences can cover many areas: social, economic, aesthetic, cultural, and health-related effects. Those 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.

### **5.2.1.2 Analytical Perspective**

Chapter 2 described existing environmental conditions: the natural environment as it relates today to fish and wildlife, the socioeconomic environment as it relates to humans, and the existing policy environment, including new policy initiatives. These environmental conditions were determined over time through a series of interactions between humans and the natural environment. The interactions and their results may be viewed from the perspective of humans and from that of the fish and wildlife resource.

This section reviews the environmental consequences data from both perspectives:

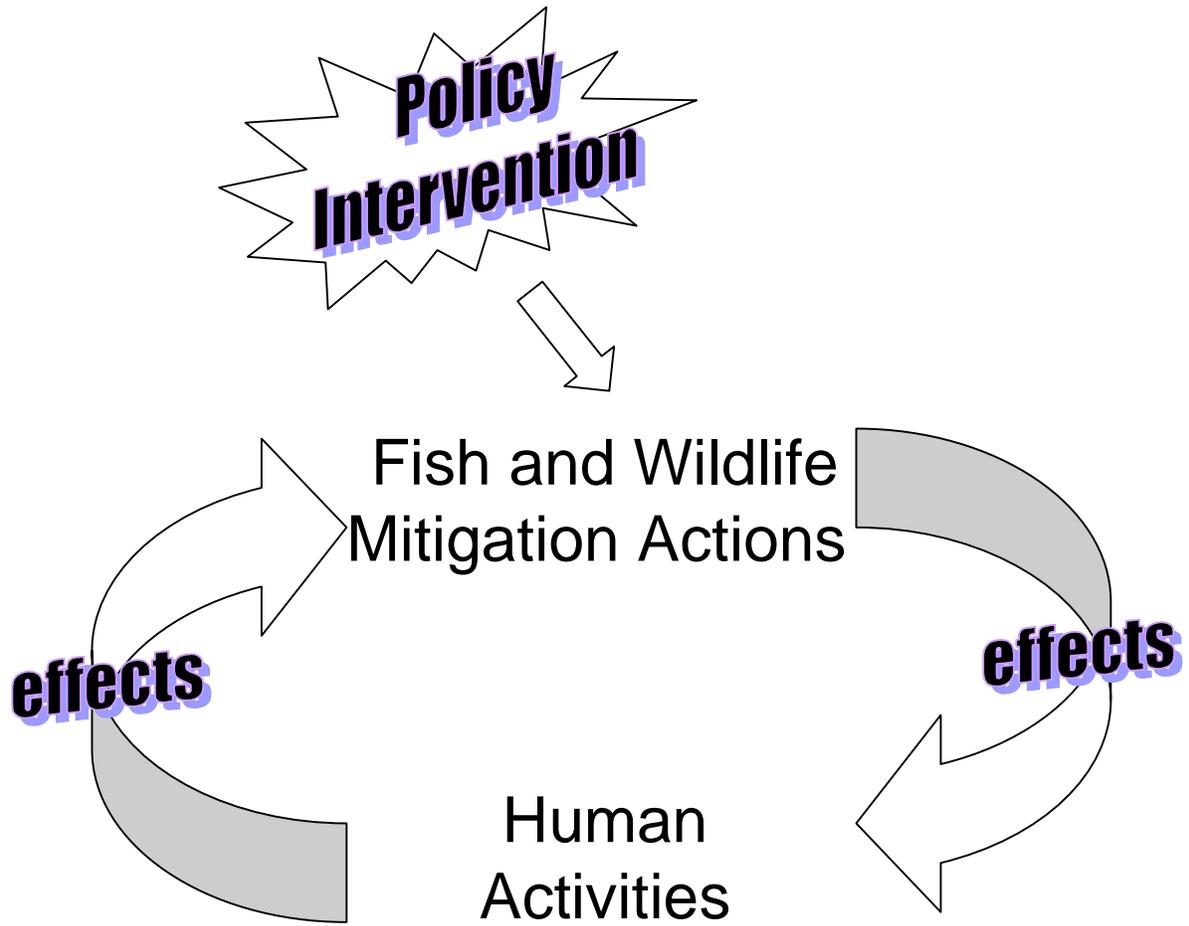
- **Generic effects for land and water are reviewed from the fish and wildlife perspective.** The fish and wildlife perspective is concerned with improvement of fish and wildlife resources. Land and water categories include the overwhelming share of direct effects on fish and wildlife. Most of the adverse effects described below result from human activities or actions that reduce fish and wildlife protections.
- **Generic effects for air and socioeconomic resources are reviewed from the human perspective.** The human perspective is concerned with human improvements, including economic and social values associated with fish and wildlife. Most of the adverse effects from the human perspective result from either (1) losses of valuable fish and wildlife, or (2) costs of actions taken to rebuild, recover or protect fish and wildlife populations.

## **5.2.2 The Major Environmental Consequences for Fish and Wildlife From Common Contributing Human Activities**

*Refresher: Effects on land and water resources encompass the overwhelming share of habitat effects, either intended or associated, on fish and wildlife. Generic effects for land and water are reviewed from the fish and wildlife perspective.*

*Below, effects are expressed in terms of the associated adverse effects of human use and development on fish and wildlife. These adverse effects would generally be associated with actions that reduce fish and wildlife protections or allow more*

Figure 5-1: Actions-Effects-Reactions Illustration



*human use and development. Potential mitigation strategies for these adverse effects are provided.*

*For actions that would intentionally reduce human use and development, a beneficial effect would generally occur from the fish and wildlife perspective. These beneficial effects have human values associated with increased numbers and size of fish and wildlife, and perceptions of an improved environment. Generally, the discussions below could be expressed oppositely to derive these beneficial environmental effects. Economic values may involve commercial fishing, recreational fishing and hunting, and aesthetic, option and existence values. These economic values are discussed in more detail in Section 5.2.3.2.*

### **5.2.2.1 Land<sup>8</sup>**

#### **Human Activities**

The types of activities that affect land use and habitat quality and quantity are as follows:

- forestry;
- agriculture, including irrigation, cropping and grazing;
- recreation;
- mining;
- urban and rural development for residential, commercial, and industrial uses; and
- utilities and transportation.

#### **Possible Adverse Effects**

There are three primary land habitat concerns:

- direct loss of, or disturbances to, fish and wildlife habitat
- land use effects on quality of aquatic and terrestrial habitat; and
- direct adverse contact with fish and wildlife.

#### **Context and Intensity**

Many factors influence the degree of effect of human activities on land habitat values. The degree of effect on land resources is a function of the types, intensity and amount of land use, and these factors are themselves a function of economic factors, technology, tastes and preferences, and other cultural factors.

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<sup>8</sup> 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 2000, and USDOE/BPA, Corps, and BOR, 1995 at 4.3.

<b>Table 5.2-1</b>	
<b>Factors that Shape Effects of Land Use and Terrestrial Habitat Values on Fish and Wildlife</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
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
State 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 can include the following:

- preservation (non-harvest) of forest lands and stream corridors to allow natural habitat development;
- modified harvest practices, tailoring of harvest methods to slope and soils, and closing or controlling access and obliteration of forest roads to control use and erosion, and that 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 of more sustainable wildlife forest 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 the following:

- management of cropland or shifting crop type to improve wildlife values; and
- land retirement and restoration of land back to native habitat.

**Livestock grazing** actions commonly used to reduce livestock effects on fish and wildlife habitat are as follows:

- fencing livestock out of sensitive areas;
- strategic placement of watering sources on uplands;

- seasonal or rotational grazing, changed grazing intensities, or deferred grazing, and
- land acquisition and retirement.

**Recreation** actions can include the following:

- changes to sport fishing and hunting regulations,
- public education,
- controlled intensity or rotational use,
- location of recreational activities away from fish and wildlife habitat, and
- improved regulations and enforcement.

**Urban and rural development** actions to reduce effects on fish and wildlife habitat include the following:

- location of urbanization away from sensitive habitats;
- acquisition and conservation easements of sensitive habitats;
- limited public access or use of habitats;
- public education;
- improved laws governing refuse;
- road reclamation;
- retention of roadless areas;
- road maintenance/improvements including fish passage, culverts; and
- “fireproofing” the rural/wildland interface.

### ***Discussion***

Many actions taken under the Policy Directions would decrease or reverse current terrestrial habitat disturbances; however, some Policy Directions might allow for increased use of existing habitat for human purposes. Human land-use activities can degrade the habitat for different species differently. In some cases, changing land use creates new or improved habitat for some species.

Common human activities that affect land include forestry, grazing, other agriculture, recreation, urban development, and urban land-use practices contributing to stormwater run-off. These activities can cause the loss of normally functioning habitat for fish and wildlife through loss of food, space, other critical needs, or pollution. Direct mortality can occur as the activity is taking place. Land-use practices have off-site effects through processes that transport materials off-site. For example, runoff transports agricultural and urban pollutants and large woody debris is moved downhill toward streams by mass wasting events. Problems associated with degraded runoff are discussed in the water use, Section 5.2.2.2, below.

**Forestry** practices can contribute to adverse effects on fish and wildlife through direct temporary loss of habitat for certain species. Wildlife can be affected through modification of cover, food sources, or roosting and breeding areas. For fish, forestry practices in riparian areas can be detrimental through modification of aquatic shading and other riparian values, and removals of large trees that reduce potential contributions of large woody debris to increase stream habitat complexity. Roads, culverts, and chemicals can also disrupt ecosystem integrity.

**Livestock grazing** can affect fish and wildlife by competition for food and space, by habitat degradation, and by directly trampling plants, or nests. Where livestock are allowed in riparian corridors, damage to riparian areas and streambanks is considered an important contributor to salmonid spawning and rearing habitat degradation. Trampling contributes to reduction of plant life, alteration of shading, loss of meanders, and loss of important streambank characteristics such as overhangs. Grazing can contribute to a reduction of important riparian plants such as willows and plants that support insects fed on by fish. Livestock sometimes walk or stand directly in streambeds, where they can disrupt salmonid nesting and degrade water quality.

**Agriculture** affects wildlife primarily by loss of native habitat. Conversion from native habitat to cropland is a near-complete loss of the original native species that occupied that land. Cropland or pastureland can sometimes provide habitat benefits (food source and open spaces), and these benefits can be increased by improved management.

**Recreational** land use can have adverse effects on fish and wildlife through loss of habitat, disruption of fish and wildlife feeding, spawning and mating, and direct mortality by coming in contact with recreational activities. Important recreational activities include sport fishing and hunting, use of vehicles, and development of recreation facilities. Direct effects can be caused where anglers wade into streams, destroying anadromous fish nests; by poaching; or where automobiles directly strike and destroy wildlife. Development may result, for example, in a loss of habitat for parking or other facilities, disruption of normal fish and wildlife activities, and deposition of trash (e.g., fishing line or food debris that is a hazard to fish and wildlife).

**Commercial and residential development** activities can contribute to fish and wildlife losses through direct losses of habitat and through activities on urban lands which directly or indirectly destroy fish and wildlife or their habitat. Urbanization may result in loss of food sources, modified habitats unsuitable for existing wildlife, or introduced toxic chemicals that can injure or kill fish and wildlife. Fish and wildlife may also be killed by automobiles, boats and the other artifacts of modern civilization.

**5.2.2.2 Water<sup>9</sup>**

**Human Activities**

The types of activities that affect water use and value for habitat are as follows:

- reservoir operations,
- point and non-point sources of water pollution, and
- diversion and consumptive use of water.

**Possible Adverse Effects**

There are six primary water concerns:

- 1) water quality and flow effects from land-use activities;
- 2) loss of riverine habitat caused by reservoir inundation;
- 3) impediments to fish passage caused by dams and other structures and the slack water behind them;
- 4) changes or disturbances to downstream flow and water quality through river and reservoir operations for multiple uses;
- 5) direct pollution of the water; and
- 6) water withdrawals reduce flow and remove organisms from aquatic systems.

In addition, the introduction of the zebra mussel, a filter feeder, alters the freshwater ecosystem by causing changes in water quality.

**Context and Intensity**

Many factors influence the degree of effect of human activities on water use, aquatic habitat and habitat values, as Table 5.2-2 illustrates.

<b>Table 5.2-2</b>	
<b>Factors that Shape Effects of Water Use on Fish and Wildlife</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Factors affecting land use. See Table 5.2-1	Land use, water induced erosion, characteristics of degraded runoff and sedimentation
Reservoir levels, inflow, spill operations, bypass facilities in place, fish transportation, flows through turbines, turbine efficiency	Fish passage survival; resident fish spawning, rearing, and foraging survival
Reservoirs built and normal operating range	Amount of riverine habitat lost

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<sup>9</sup> 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 BOR, 1995 at 4.3.

<b>Table 5.2-2</b>	
<b>Factors that Shape Effects of Water Use on Fish and Wildlife</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Operations for hydropower, flood control, irrigation, fish and wildlife, other purposes	Downstream flow, water quality and saturated gas conditions; sedimentation, riparian flood plains
Growth and types of industry, water pollution laws, pollution control technology	Amount and characteristics of point-source water pollution
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:**

**Gas supersaturation** can be reduced by:

- reduced spill;
- facility modification, such as deflectors, that reduce potential for supersaturated water;
- using juvenile bypass or transportation systems to keep fish away from areas with supersaturated water;
- dam removal;
- lowering dam/reservoir crest levels;
- constructing more reservoir storage capacity; and
- deeper flood control evacuation leading to reduced spill later.

**Sedimentation** can be reduced by:

- modern forestry best management practices;
- preservation (non-harvest) of forest lands;
- tailoring of harvest methods to slope and soils;
- closing, controlling access, or reclamation of forest roads;
- regenerating vegetation quickly following harvest;
- land retirement and restoration of land back to native habitat, or changes in farming practices to reduce or capture runoff;
- using modified cultivation practices, conservation tillage, no-till agriculture, cropping changes, and development of small ponds to retain water; and
- grazing practices that reduce grazing intensities and exclusion fencing.

**Temperature** of the water can be controlled:

- on a limited basis at dams by pool elevation adjustments (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; and
- reducing irrigation return flows, which are often warmer than receiving water, via irrigation water management or land retirement.

**Non-thermal pollution can be reduced:**

- for livestock effects on aquatic systems, by fencing out livestock and providing alternative watering sources on uplands;
- by seasonal or rotational livestock grazing, reduced grazing intensities, deferred grazing, and land acquisition and retirement;
- by strategies to avoid polluted surface water runoff from agriculture, including changes in farming practices such 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;
- for feedlots, by using best management practices to prevent off-site water quality degradation;
- via strategies to reduce degraded irrigation return flows, including irrigation land retirement, lease or purchase of irrigation water, and irrigation water conservation;
- by using wastewater and sedimentation ponds to retain and treat degraded runoff from uplands;
- by capping contaminated sediments with clean material. Contaminated sediments are rarely dredged because dredging disperses the pollutants and creates a disposal problem; and
- by filtering and/or distilling out metals and organic contaminants in water. The processes are expensive and typically sterilize the water of all living organisms.

**Water withdrawal** effects may be reduced by:

- retirement of irrigated land;
- fallow 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 of irrigation diversions to avoid direct mortality of juvenile salmonids.

### **Discussion**

Human activities on land can contribute to sedimentation and degraded quality of surface water runoff. Erosion is caused by agricultural, forestry, and urban land-use practices, and natural run-off, including flooding. Surface water 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. Forestry can contribute to stream sedimentation through construction and maintenance of roads and stream crossings, use of machinery to harvest and transport timber, and loss of vegetative cover.

Sedimentation can also be caused by pool level fluctuations. 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, can cause slumping or may cause mass wasting.

Sedimentation reduces survival of eggs and alevins, reduces primary and secondary productivity, interferes with feeding, causes behavioral avoidance and breakdown of social organization, and pool filling or addition of new large structures to channels. However, some level of sediment and resulting turbid conditions may be quite important to some species and particular parts of life history. For example, turbid conditions during spring freshets may be helpful to migrating juvenile salmon and sturgeon.

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 ground water withdrawals can lower groundwater tables, possibly affecting deep-rooting plants and streamflows.

Non-thermal pollution can enter surface water from industrial discharges, stormwater, sewers, and agricultural run-off. Septic systems also contribute to this type of pollution in some areas. The pulp and paper industry discharges include dioxins and furans. Metals originate from many places, including natural sources, construction, urban runoff, wastewater, coal combustion, mining, and smelting. Polycyclic aromatic 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. PCBs, although no longer manufactured, are very persistent and are found worldwide, even in the most remote areas. Simple grazing of cattle or other livestock near streams and rivers can introduce animal wastes that release potentially harmful chemicals and *E. coli* bacteria.

Non-thermal pollution's primary concern for fish is through ingestion of pollutants. Pollutant toxicity is difficult to describe because there are complex interactions between 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 are also carcinogenic (nickel, arsenic, cadmium, chromium, and in some cases, lead.) 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.<sup>10</sup> It is also well known that immuno-suppressed fish are more susceptible to disease and pathogenic challenges and ultimately experience an increase in mortality.<sup>11</sup>

Storage of water in reservoirs can alter the normal thermal regime of a river. Too much storage can increase temperature due to reduced flow volumes downstream of reservoirs. It can also increase 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.

Temperature extremes can harm fish and aquatic organisms. 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 trigger premature egg hatching. Water temperatures affect adult migration patterns. 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.<sup>12</sup>

During their downstream migration, juvenile anadromous fish can be harmed by the hydrosystem in several ways. Migration may be slowed due to lower water velocities and difficulty in passing dams. No correlation exists between migration speed and mortality, but hypotheses include increased predation and delayed ocean entry as potential mortality factors. Also, populations of the endemic northern pikeminnow, which preys on salmon, have increased in response to the reservoir environment. At the dam, they may pass through the hydroelectric turbines and/or pass through spillways; and they may be diverted to bypass systems directing them away from the spillway and turbines. Some are transported downstream by barge and truck. Depending on the passage route, the juveniles may be subject to increased mortality related to aging, shock, temperature, sudden pressure changes, disorientation, or increased predation downstream.

Large volumes of voluntary spill have been used as an interim passage strategy by NMFS, pending development of more effective alternatives.<sup>13</sup> In general, moderate

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<sup>10</sup> NOAA(a), NOAA (b), McCain et al. 1990, Arkoosh et al. 1991, Arkoosh et al. 1994, Stein et al. 1995.

<sup>11</sup> NOAA (a), NOAA (b).

<sup>12</sup> See: Corps (1991) and Conceptual Plan (Federal Caucus, 1999b) and Basin-wide Strategy (2000b), Habitat Appendix, pg. 134 and Hydro Appendix, pg. 39, 1/11/00)

<sup>13</sup> NMFS BiOps of 1995, 1998, 1999

levels of spill provide for increased Fish Passage Efficiency (FPE) at relatively low risk. However, as spill increases above about 30% of flow, the incremental benefits of increasing spill diminishes. At spill levels higher than 30%, 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. 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.

Spill can have the undesired effect of increasing levels of gas-supersaturation in the water, which in turn increases the risk of gas bubble disease (a condition similar to the bends in humans) to migrating salmon. Gas supersaturated water reduces survival of eggs and alevins, results in smaller size at emergence, increases physiological stress, and diminishes growth. Total dissolved gas (TDG) can be abated structurally (e.g. flow deflectors) and operationally by controlling spill by using storage, surface bypass, and baffled spillways.

Other passage methods, including mechanical bypass systems and transporting juvenile fish in trucks and barges to release sites below Bonneville Dam, are currently in use. Juvenile fish transportation was developed as a means to convey fish past multiple dams and reservoirs to reduce the cumulative effects of dam-related and reservoir-related mortality. Juvenile migrants that are guided by turbine intake screens can be collected and loaded onto trucks or barges and transported for release below Bonneville Dam. There they continue their migration to the ocean.

Currently, flow augmentation programs help restore more natural/seasonal flow patterns during the time juvenile salmon and steelhead are migrating downstream. A flow augmentation program, first called for by the NPPC and later increased under NMFS' 1995 and 1998 Biological Opinions, aims to restore more natural flow patterns during the time juvenile salmon and steelhead are migrating. The 1995 and 1998 Biological Opinions include two flow management strategies: 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 draft from storage reservoirs during the summer to increase summer flows. There is evidence that controlled releases for spring migrants provide very little survival benefit to spring chinook juveniles. Controlled releases may increase survival of fall migrants.<sup>14</sup>

The human-introduced zebra mussel is likely to have enormous impacts on the food chain upon which salmon depend. In the decade since it was first sighted in the U.S., the zebra mussel has been described as “the biggest natural threat to existing freshwater ecosystems

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<sup>14</sup> Olsen et al 1998.

of our time.”<sup>15</sup> Their presence causes a decrease in phytoplankton and zooplankton, resulting in increased water clarity. Water quality impacts include increased soluble phosphorous and inorganic nitrogen, and decreased dissolved oxygen—to the point of violating water quality standards.<sup>16</sup>

### **5.2.2.3 Fish and Wildlife**<sup>17</sup>

#### ***Human Activities***

The previous two sections explained how human use of land and water affect fish and wildlife. Fish and wildlife life cycle diagrams were created to illustrate where the 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. As can be seen in the life cycle diagrams (Figures 5-2, 5-3, 5-4, 5-5, 5-6, and 5-7), changes to land and water resources affect anadromous and resident fish and wildlife differently.

Land and water use activities are not the only human activities that affect fish and wildlife. Other human activities that affect fish and wildlife are

- commercial harvest, including tribal and non-tribal;
- fish hatcheries and other artificial production facilities; and
- introduction and spread of exotic plants and animals.

#### ***Possible Adverse Effects***

The major adverse effects are shown using the life cycle diagrams below. Many of these effects were discussed in Sections 5.2.2.1 and 5.2.2.2. Other adverse effects include the following:

- direct mortality by harvest;
- unintentional mortality to fish hooked, netted, or delayed, but not harvested;
- reduced life history and 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 with exotics for space or food, predation by exotics, or replacement of valuable food sources by exotics;

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<sup>15</sup> O’Neill, C.R., Jr. 1996. “The Zebra Mussel: Impacts and Control,” Cornell Cooperative Extension Information Bulletin 238, page 62.

<sup>16</sup> Effler, S.W., and Siegfries, C. 1994. *Zebra mussel (Dreissena polymorpha) in the Seneca River, New York: Impact on oxygen resources*. Environmental Science Technology, Volume 28, pages 2216-2221.

<sup>17</sup> 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 BOR, 1995 at 4.3.

- maintenance of unnaturally high predator populations by large influxes of juvenile hatchery and exotic fish; and
- interference with migration at fish ladders caused by introduced species.

**Context and Intensity**

Many factors influence the effects of human activities on fish and wildlife. Many of these factors work through land and water habitat quality and hydrosystem effects. These factors were explained in Tables 5.2-1 and 5.2-2, respectively. Additional factors involve harvest and hatcheries. Many natural, social, cultural and economic factors interact with harvest and hatcheries to determine their consequences for fish and wildlife.

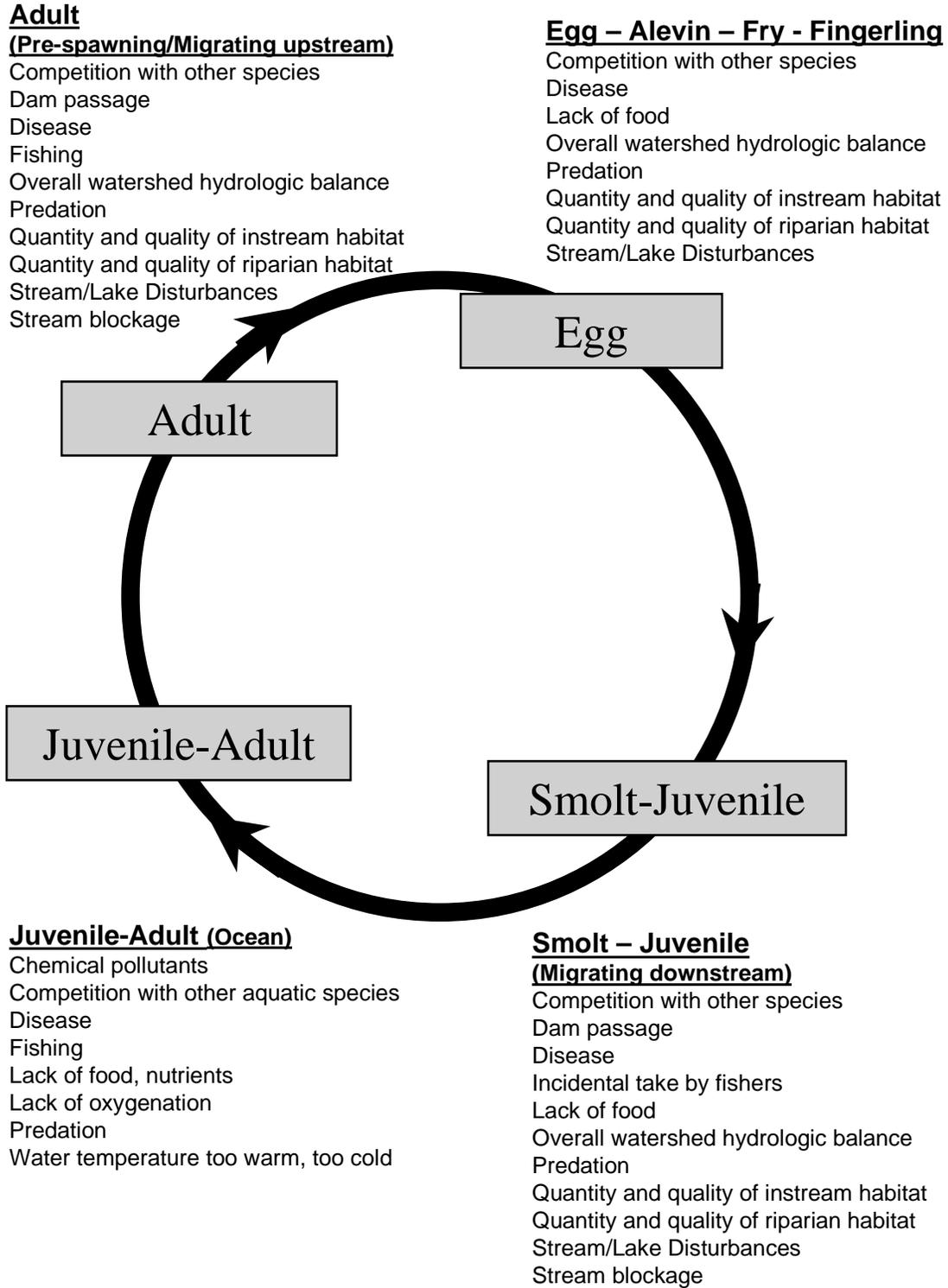
<b>Table 5.2-3</b>	
<b>Factors that Shape Effects on Fish and Wildlife</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Land use and terrestrial habitat	Amount and quality of terrestrial habitat, see table 5.2-1
Water use and aquatic habitat	Amount and quality of aquatic habitat, see table 5.2-2
Fishing seasons, regulations, economics, size of the fishing fleet	Amount of fish harvested
Size of caught fish, interactions with marine mammals, regulations	Mortality of hooked or netted fish
Number of fish produced by hatcheries, timing and location of releases. Characteristics and operations of hatcheries	Characteristics of fish competing with native stocks, extent of cross-breeding
Types, locations and densities of exotic plant and animal species	Consequences of exotics

**Possible Mitigation Measures**

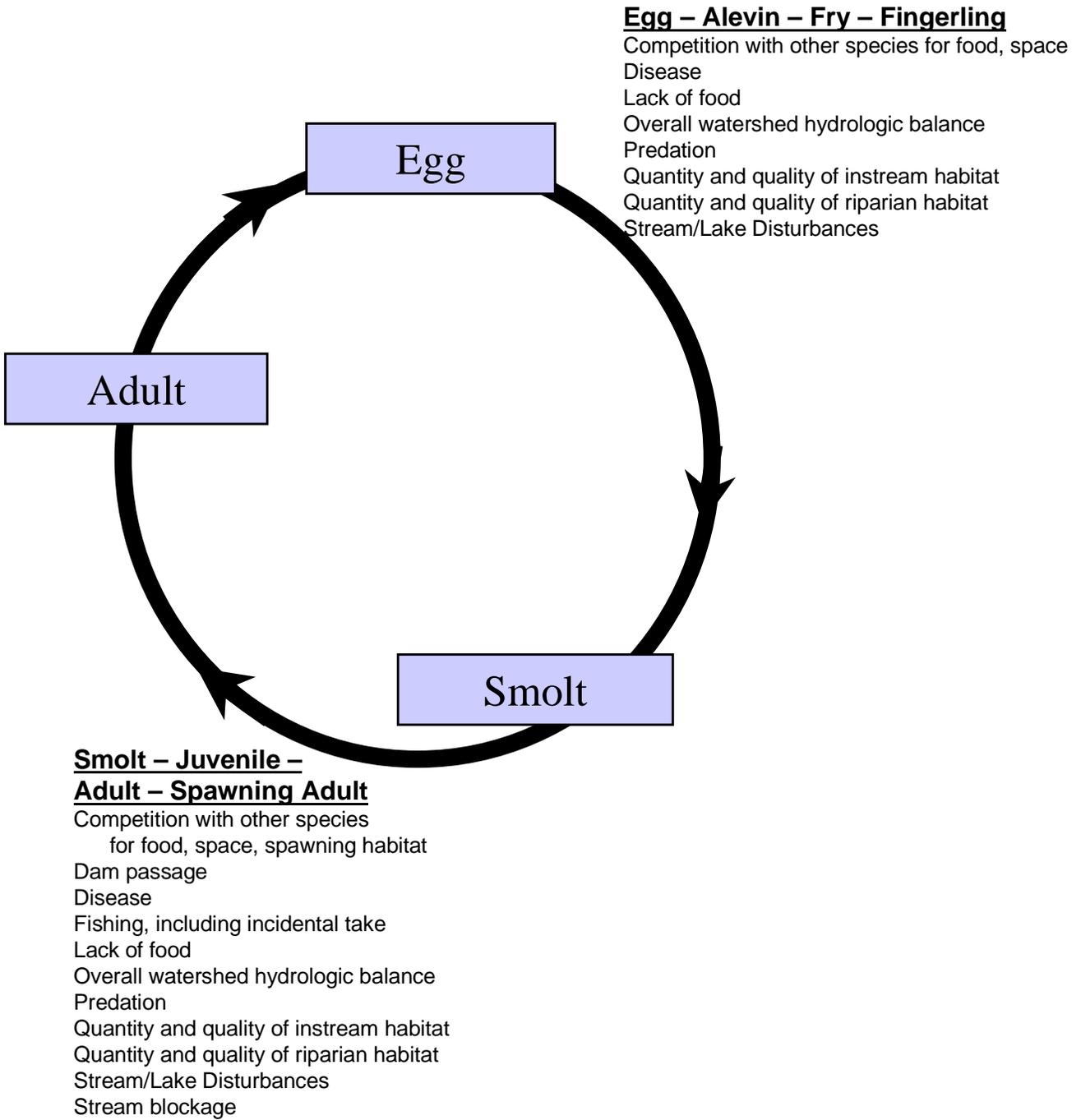
Potential mitigation strategies for adverse effects of harvest, hatcheries and exotic species on anadromous fish include the following:

- reduce fishing season,
- reduce limits,
- change fishing gear regulations,
- develop selective fishery techniques,
- buy out fishing permits,
- change international fishing treaties,
- develop terminal fisheries,
- phase out hatcheries,
- change hatchery operations to minimize effects on wild populations, and

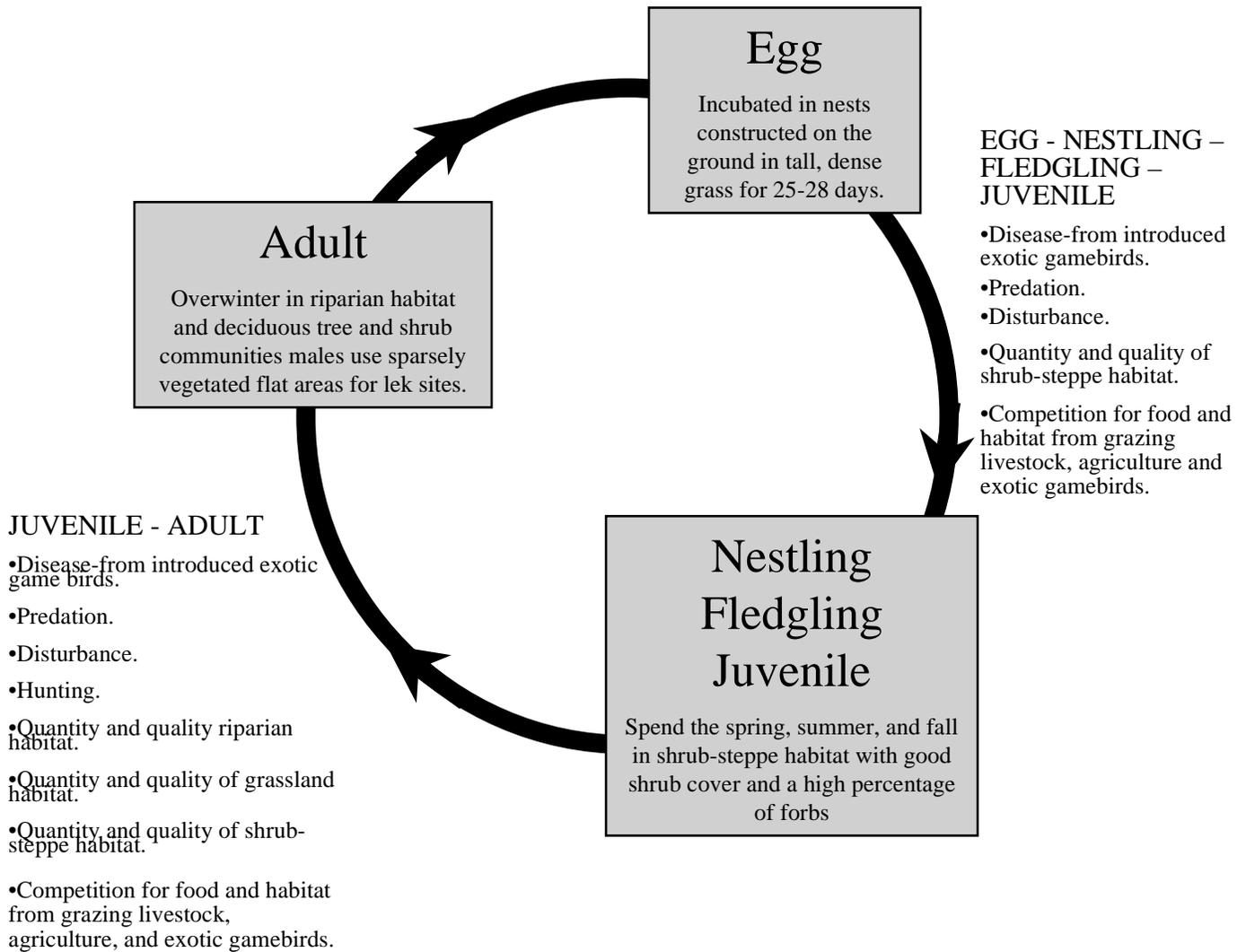
**Figure 5-2: Examples of Major Environmental Effects  
Anadromous Fish Life Cycle**



**Figure 5-3: Examples of Major Environmental Effects  
Resident Fish Life Cycle**

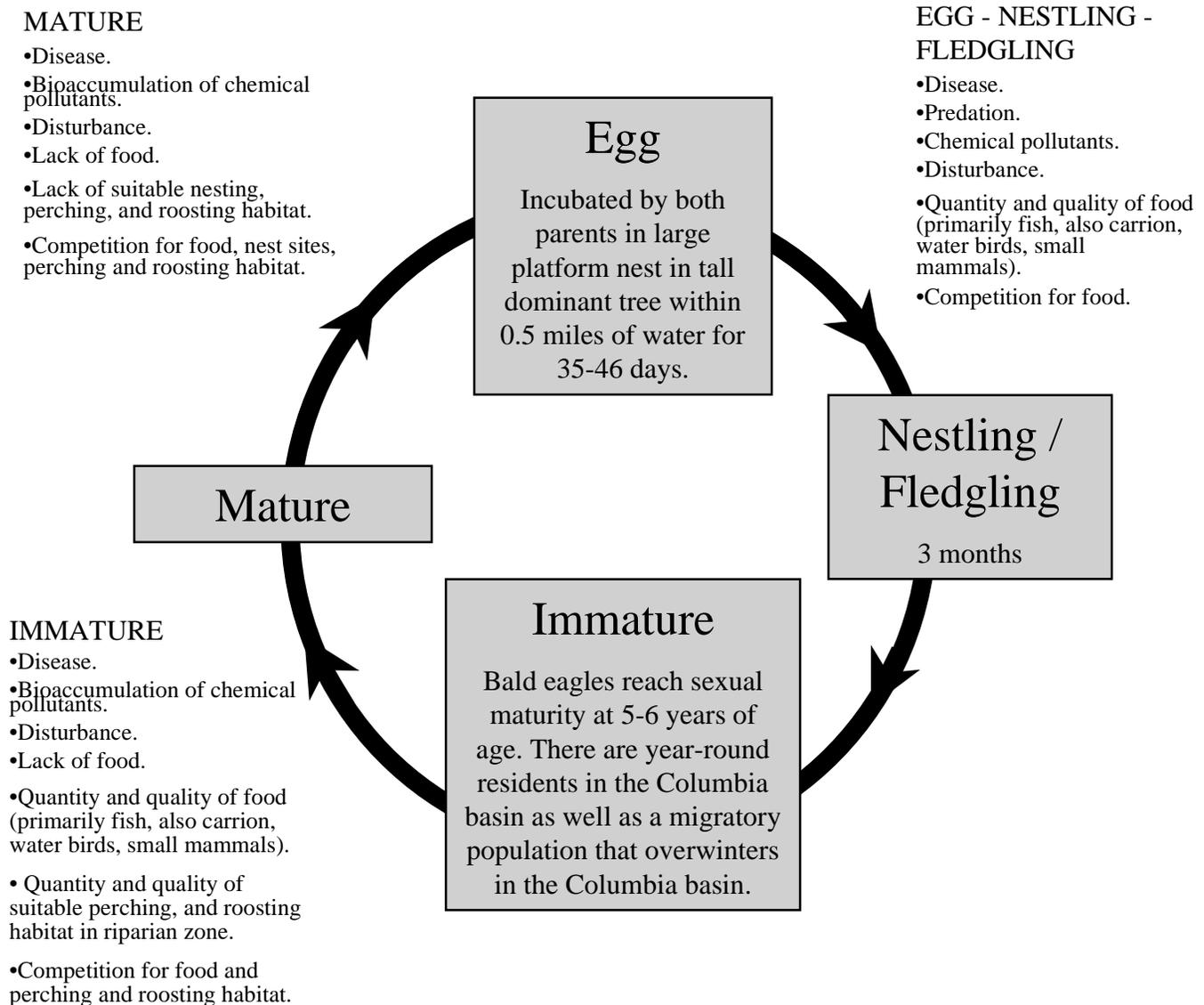


**Figure 5-4: Examples of Major Environmental Effects  
Riparian Forest and Upland Shrub-Steppe  
(Life Cycle of Sharp-tailed Grouse)**



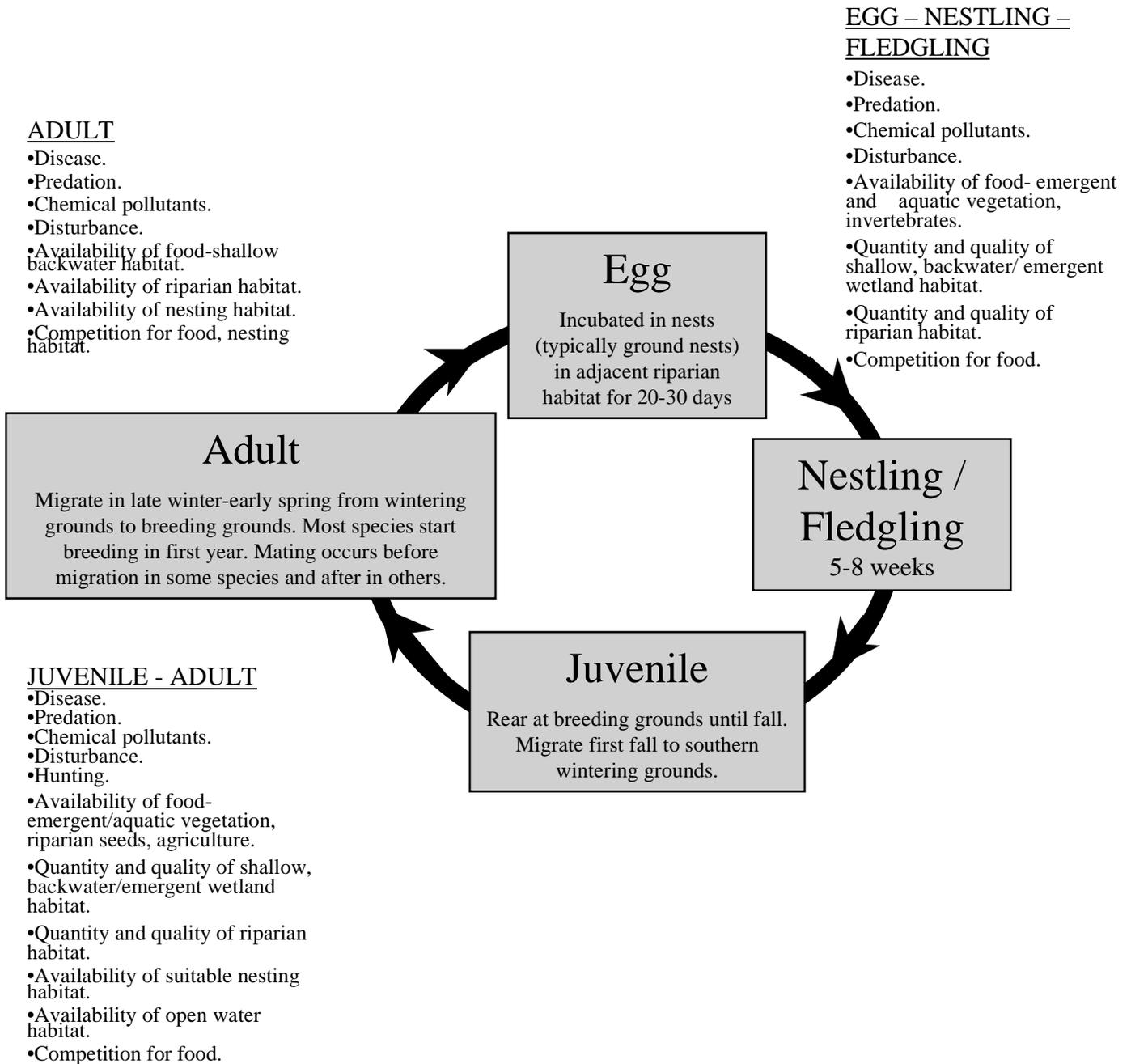
**Species that depend upon upland grassland and shrub-steeppe or riparian habitats within these upland habitat types:** Swainson’s hawk, golden eagle, prairie falcon, gray partridge, chukar, sage grouse, long-billed curlew, burrowing owl, common poorwill, Great Basin spadefoot, short-horned lizard, desert horned lizard, sagebrush lizard, western fence lizard, western skink, racer, striped whipsnake.

**Figure 5-5: Examples of Major Environmental Effects  
Mature Riparian Forest  
(Life Cycle of the Bald Eagle)**



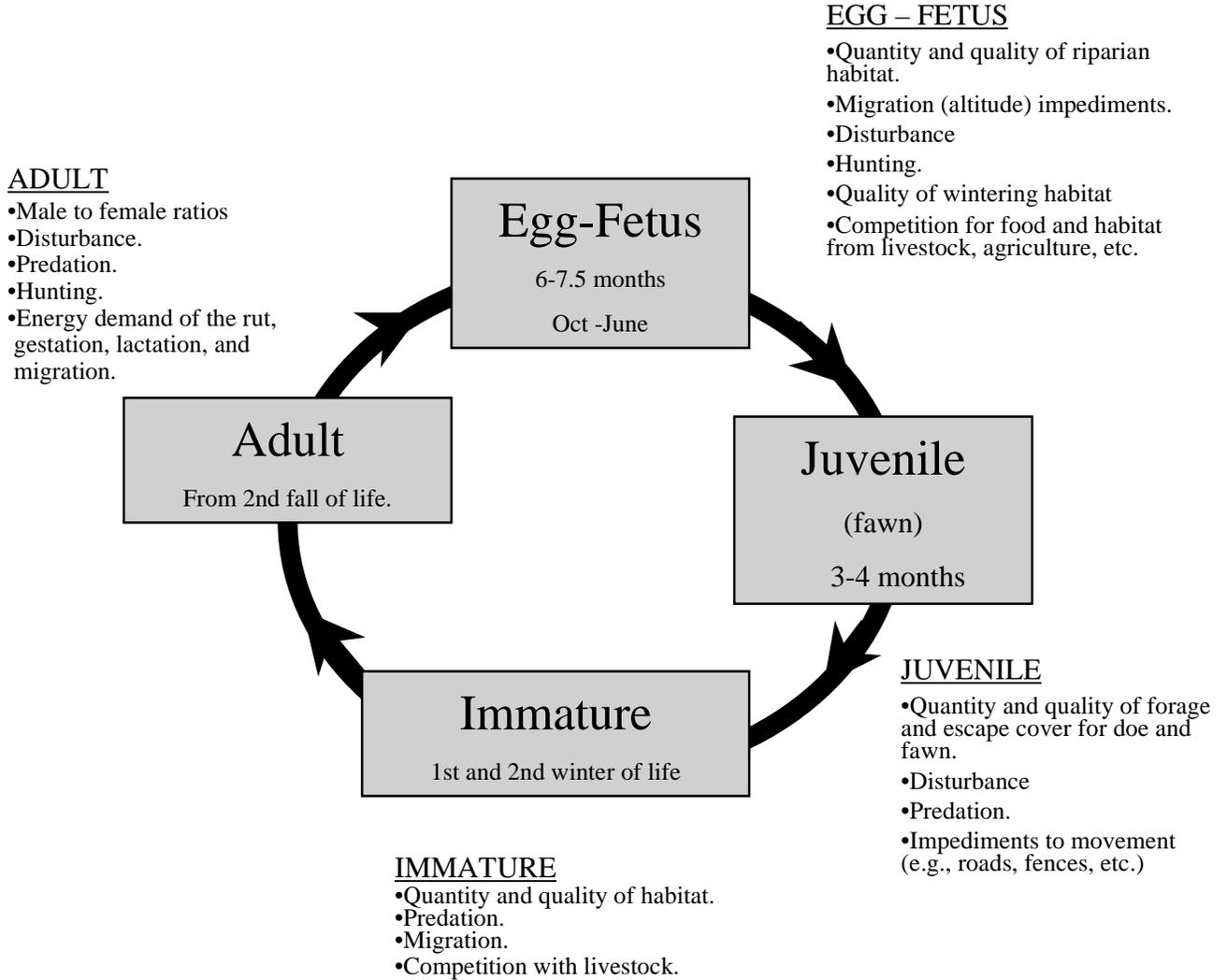
**Species that depend on mature riparian forests during some part of their life cycle include:** wood duck, Harlequin duck, hooded merganser, common merganser, osprey, ferruginous hawk, western screech owl, great-horned owl, Vaux's swift, pileated woodpecker, Lewis' woodpecker, beaver, western pond turtle, northern alligator lizard.

**Figure 5-6: Examples of Major Environmental Effects  
Shallow Water – Emergent Wetland Habitat  
(Life Cycle of Migratory Nesting Waterfowl)**



**Species that depend upon shallow backwater and emergent wetland riparian habitat during some part of their life cycle include:** mallard, American coot, green-winged teal, blue-winged teal, cinnamon teal, northern pintail, northern shoveler, wood duck, canvasback, redhead, American widgeon, ruddy duck, Canada geese, great blue heron, green heron, Virginia rail, sora, sandhill crane, American avocet, American kestrel, beaver, muskrat, mink, long-toed salamander, rough-skinned newt, Woodhouse’s toad, Pacific chorus frog, red-legged frog, northern leopard frog, painted turtle, western pond turtle, western terrestrial garter snake.

**Figure 5-7: Examples of Major Environmental Effects  
Upland and Riparian Shrub forest  
(Life Cycle of Deer and Elk)**



- reduce spread of exotics and control where necessary.

### **Discussion**

Harvest has an obvious and direct link to fish mortality. Harvest strategies to date have been focused on reducing overall effort. Strategies to implement terminal fisheries or other targeted harvest approaches are still under development. One method for terminal fisheries might be to use existing adult fish passage facilities to monitor and harvest hatchery fish or strong stocks while allowing wild fish or weak stocks to pass.

The adverse consequences of hatcheries are receiving increased attention. Hatchery fish can compete with wild fish for food and space. Conventional hatchery practices tend to promote specific runs and genetic features within runs, reducing biodiversity.

Introductions of non-native plant species have had a profound effect on the ecology of the region. Important species include freshwater bass and shad. Introductions of noxious plants contribute to reduced quality of rangelands and other habitat types; notable examples include thistles, starthistles, knapweeds, and saltcedar.

Some exotics, introduced for purposes of sport fishing, now prey on and compete with juvenile anadromous fish. Important species include the walleye, channel catfish, freshwater bass, brook trout, and shad. The adult American shad population in the Columbia River Basin now exceeds four million fish annually. Their young provide a large food base for predators throughout the late summer and fall when salmonids are not as abundant.<sup>18</sup> These exotic species, along with large influxes of juvenile hatchery fish, maintain predator populations at unnaturally high levels, increasing predation on salmon.

**Impacts of Hatchery Salmonids on Native Populations.** 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: for examples, harvesting hatchery fish may require equivalent take of wild fish, and straying hatchery fish may compete with wild fish. Also, by eliminating natural selection in the hatchery, humans induce genetic changes to the population that may further degrade wild fish when hatchery and wild fish interbreed. Therefore, when spawning occurs, a fish that may have been eliminated in the wild by natural selection is now contributing to the gene pool.<sup>19</sup> Finally, disease becomes an important issue in hatchery environments where antibiotics may create highly resistant bacteria.

Hatcheries' possible effects (positive and negative) on native populations is influenced by the management approaches. For example, a hatchery-produced fish that can be isolated from wild fish and harvested for commercial use should have little impact on native

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<sup>18</sup> 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. April 1993, Oregon Forest Industries Council, Salem, Oregon.

<sup>19</sup> USDOE/BPA (1996c).

populations. But the introduction of an entirely new genetic population into a watershed could create instant competition with the native salmon population.

Even hatcheries producing fish that are originally from a native population, intended only to supplement the fishery, 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 streams.<sup>20</sup> 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.

Another impact of hatchery-produced fish is the potential unknown effects of genetic introgression into wild fish from the hatchery strays. Some proportion of hatchery fish does 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.

However, not all aspects of hatchery programs are negative. Where there is a clear lack of juvenile rearing or adult spawning habitat, hatcheries offer the only option to provide fish to an area. Hatchery-reared fish can have positive effects on native 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.<sup>21</sup> 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 reservoirs of endangered stocks until habitats or passage to blocked habitats can be restored. Hatchery programs can be structured to support the long-term goals of the ESA wild population recovery plan and provide sustainable fisheries.<sup>22</sup>

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<sup>20</sup> Ford, M. and J. Hard. ND. Does traditional hatchery production help conserve wild salmon—a comment on the Fall Creek coho hatchery controversy.

<sup>21</sup> Federal Caucus, 2000b. Vol. I.

<sup>22</sup> ORAFS, 2000.

### **5.2.3 Major Environmental Consequences for Humans from Common Fish and Wildlife Actions**

***SUMMARY OF MAJOR POINTS:** This section focuses on the potential effects of fish and wildlife recovery efforts on a variety of human concerns, including the following:*

- *Human Health*
- *Industry Impacts*
- *Economic Costs*
- *Regional Economics*
- *Tribal Benefits*
- *Funding of Fish and Wildlife Programs.*

#### **5.2.3.1 Air Quality and Associated Health Effects**<sup>23</sup>

##### ***Human Activities***

There are three primary air quality concerns:

- reservoir breaching and dust blowing from exposed reservoir sediments, some of which may contain heavy metals and other potentially toxic materials;
- deconstruction and increased emissions from increased truck traffic; and
- air emissions from replacement of lost hydro generation.

##### ***Possible Adverse Effects***<sup>24</sup>

- Particulate matter can have adverse health effects, and particulate matter can discolor paint, corrode metal, and reduce visibility.
- Heavy metals can have adverse health effects. Some heavy metals bioaccumulate and render fish and wildlife inedible.
- Carbon monoxide can affect people and animals at low concentrations.
- Sulfur dioxide (SO<sub>2</sub>) is corrosive, a respiratory irritant, and negatively affects visibility.
- Oxides of nitrogen have effects similar to SO<sub>2</sub>, and can slow plant growth and reduce crop yield.
- Carbon dioxide absorbs heat radiated from the earth, preventing heat loss to space (global warming concept).

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<sup>23</sup> Consequences discussions are drawn directly from existing regional studies. Also see, Federal Caucus 1999b and 2000b, Council 2000a, Corps 1999a, USDA/USFS and USDOE/BLM 2000, and USDOE/BPA, Corps, and BOR, 1995 at 4.3.

<sup>24</sup> USDOE/BPA, Corps, and BOR, 1995, at 4.2.3

- Some polycyclic aromatic hydrocarbons (PAHs) have been determined to be probable human carcinogens and may cause other detrimental human health effects.

**Context and Intensity**

Most factors affect the amount, location and severity of air quality effects. The types, amount and location of new generation capacity are important. These factors are shown in Section 5.2.3.2, Table 5.2-5.

<b>Table 5.2-4</b>	
<b>Factors that Shape Effects on Air Quality</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Replacement power for lost hydro power capacity	Emission characteristics of new generation
Which reservoirs 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
Relative economic viability of rail and trucking, programs to replace lost navigation	Selection and location of new transportation mode and, therefore, mix and location of air effects
Type and timing of restoration of former reservoir bottoms, weather conditions during exposure, success of restoration	Duration of particulate air effects from exposure of reservoir bottoms

**Possible Mitigation Measures <sup>25</sup>**

Appropriate mitigation for adverse air quality effects vary according to the source of the air emission. The mitigation can include the following:

- for particulate matter from exposed sediments, mitigation may include reseeded as soon as practical, land contouring and management to reduce wind erosion, or watering to reduce wind erosion;
- for products of combustion turbines, adverse effects may be minimized by power facility location, by use of modern air pollution control facilities; and
- for increased air pollution from transportation, mitigation may include use of efficient transportation practices, use of rail instead of trucks where possible, and highway improvements to accommodate increased traffic.

**Discussion**

Changes in river operations could decrease the amount of hydroelectric power generated at least on a seasonal basis, and require replacement generation from thermal plants. Additional thermal generation would increase air pollution around the affected thermal

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<sup>25</sup> USDOE/BPA, Corps, and BOR, 1995, at 4.3.3

plant.<sup>26</sup> See **Appendix F** (“per-unit table”) for the specific levels of air emissions associated with the different types of power generation.

Ambient concentrations of carbon monoxide (CO) do not measurably affect plants or materials. CO has 210 times more affinity for red blood cells than does oxygen, so continued exposure to CO interferes with the oxygen-carrying capacity of the blood. 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.

When combined with moisture, sulfur dioxide (SO<sub>2</sub>) forms sulfuric acid, which corrodes most building materials and causes lake acidification and loss of plant life. Sulfuric acid and SO<sub>2</sub> 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 by-product. Another by-product is sulfur dioxide, which can acidify and impoverish soils and have long-term effects on crops and forests, and possibly on nearby livestock.

Nitrogen oxide (NO<sub>2</sub>) can also slow plant growth and reduce crop yield at relatively low concentrations. NO<sub>2</sub> is a respiratory irritant which, in the presence of sunlight, combines 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.

Carbon dioxide (CO<sub>2</sub>) is a natural product of respiration and is produced by burning fossil fuels. It is taken up by plants during photosynthesis for use it as a building block for leaves and growth. Elevated concentrations are known to accelerate plant growth. Atmospheric CO<sub>2</sub> absorbs heat radiated from the earth, preventing heat loss to space. For this reason CO<sub>2</sub> is considered a greenhouse gas and has been linked to global warming. It has no health effects at atmospheric concentrations. CO<sub>2</sub> is also produced during the production of natural gas.

Polycyclic aromatic hydrocarbons (PAHs) consist of over 100 chemicals that are formed during the incomplete combustion of fossil fuels, municipal waste, and other organic substances. 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.

Reservoir drafting exposes shoreline areas that are normally underwater to the drying action of the sun and wind. Clear, windy summer days typically provide the weather conditions most conducive to high levels of blowing dust. Effects would occur primarily around reservoirs located in the drier portions of the Columbia River Basin, and would

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<sup>26</sup> USDOE/BPA, 1995, Section 4.3.1.1 Health/Environmental Effects of Air Pollutants.

affect both local residents and recreational users of the projects. An estimated 40,000 people live within 1 mile of the shorelines of the major reservoirs. Approximately 4.5 million people visit these shorelines each year for recreation. Effects would decrease as land is reclaimed.

Additionally, two types of air quality effects could potentially be important locally, though less substantial on a regional basis. Consequences of deconstruction include increased dust and emissions from construction equipment. Also, breaching would result in a permanent increase in truck transportation. Increases in emissions may be particularly critical in eastern Washington. <sup>27</sup>

Air quality issues associated with particulate matter include exceedance of air quality standards, 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 upon the size of the particulates and the pollutants contained in the particle. Particulate matter less than 10 microns in diameter 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 is currently considering lowering the primary PM-10 (particulate matter of 10 microns or less) standard because the existing standard ( $75 \mu\text{g}/\text{m}^3$ ) does not adequately protect human health.

### **5.2.3.2 Social and Economic Environmental Consequences**

Actions for fish and wildlife affect both social and economic activities. Beginning with industries, those most affected by fish and wildlife actions are as follows:

- Power Generation and Transmission,
- Transportation,
- Agriculture (both farming and grazing) and Forestry,
- Commercial Fishing,
- Recreation,
- Residential and Commercial Development and Construction, and
- Other Industries (Mining, Services, Aluminum).

Some actions are clearly focused on one type of industry. Actions to reduce fish harvest, for example, have readily identifiable effects in the commercial fishing sector. Other actions directly affect many industries. Dam breaching, for example, causes direct adverse effects on several of the industries listed above.

Habitat actions can affect almost any of these industries because the term “habitat” basically encompasses the entire land and water environment on which fish, wildlife, and

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<sup>27</sup> GAO, 2000.

humans depend. Habitat actions to restore riparian lands may affect agriculture, forestry, or urban development, depending on which industry happens to be located in the riparian zone. Other habitat actions are specifically targeted to an industry activity such as irrigation or grazing. Actions to modify in-stream areas and in-stream passage might not create any loss of economic activity in any industry; economic costs are generally just the costs of implementing the actions.

This section also covers economic costs, regional economics, tribal effects, and funding. All of these economic categories are related to industry effects and to each other. Generally, there is overlap in terms of the persons affected under each category.

- Economic costs are paid by all affected persons, including ratepayers, taxpayers, workers, and business owners.
- Regional economics includes economic costs, but the concept also includes income, output, employment, and other economic measures defined for a specific geographic region.
- Tribal effects counts economic costs and other effects on tribal members.
- Funding is concerned primarily with ratepayers, especially program costs, and the ability of ratepayers to cover costs.

Economic costs and funding are related when a fish and wildlife action requires a costly change that is paid for, or compensated for, using ratepayer funds.

The discussion for each industry first identifies the types of fish and wildlife actions that affect that industry. Then, factors that condition the intensity, location and groups of persons affected are described. Finally, potential mitigation actions are provided. Each industry includes a discussion to clarify the reasoning and information behind the pattern of environmental effects described.

### ***Power Generation and Transmission***

#### ***Human Actions***

The types of proposed actions that would affect this industry are as follows:

- dam breaching or drawdown,
- changes in reservoir operations,
- facility modifications for fish and wildlife,
- changes in transmissions needs,
- increases/changes in habitat protection that conflict with transmission system maintenance, and
- non-hydro load-carrying alternatives.

#### ***Possible Adverse Effects***

The types of effects that follow from these actions are as follows:

- Dam breaching or drawdown results in a complete loss of electrical generation. Breaching or drawdown may also affect downstream hydrology in a way unfavorable to downstream power generation.
- Changes in reservoir operations affect power generation at the reservoir and at downstream generation facilities.
- Facility modifications for fish and wildlife can have adverse or beneficial consequences for power generation. Sometimes, a facility modification can result in improved generation efficiency. For example, modifications may allow fish to be protected with less spill, and turbine improvements increase generation while passing fish with less mortality.
- Transmission facilities are 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 can require additional transmission facilities. New generation can also require additional transmission facilities. If the new generation facility is strategically located, however, it can defer some load service transmission that might otherwise be needed.
- Habitat restoration/protection activities can change the capability of the transmission system due to decreased maintenance activities (vegetation removal, pesticide use) at or near habitat areas causing costs to increase. Decreased road densities that affect transmission facility access could increase the time required for maintenance activities causing costs to increase.
- Power and transmission facilities affect socially acceptable environmental qualities.

### ***Context and Intensity***

The power generation and transmission industry consists of ratepayers, owners of generation and transmission equipment, and workers. Changes in costs tend to affect ratepayers more than the other groups because the structure of the industry allows most costs to be passed to consumers. Effects on some owners and workers may be positive even as ratepayer effects are negative. For example, loss of hydropower capacity can lead to construction of thermal capacity and transmission facilities at a benefit to workers and owners of the new capacity, but to the detriment of ratepayers and hydropower owners.

Many factors influence socioeconomic effects involving power generation and transmission, as Table 5.2-5 illustrates.

<b>Table 5.2-5</b>	
<b>Factors that Shape Effects on Power Generation and Transmission</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Specific changes in hydro operations and facilities	Amount of power loss or gain
Market conditions, power industry deregulation, timing of power loss or gain	Dollar value of power loss or gain
Extent to which policies may influence new generation, power markets, laws affecting economics and feasibility of new power capacity	Amount of new generation
Extent to which states, affected public, markets and other institutions influence the characteristics of new generation	Characteristics of new and socially acceptable generation
The amount of renewable energy resources used to meet demand and energy conservation measures that can be taken	Characteristics of air emissions and subsequent costs
The changes that alter the present availability of transmission facilities, the capacity of the lines, and the ability to reroute power efficiently in emergency conditions	Availability of subscribed transmission, cost of new transmission to replace the transmission capability that was lost
New generation	New transmission is required to connect the new generation to the transmission system. Depending upon where the new generation is located, it might either cause new transmission to be built or defer existing transmission project
The changes that result in different maintenance practices to improve habitat across the system	Costs increase, and transmission capability may decrease in certain areas

***Possible Mitigation Measures***

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are:

- Increase cost-effective energy conservation to reduce electricity use in the most environmentally and socially acceptable manner. Electricity consumers could be encouraged to consume less by education, subsidies, higher prices, or by development and application of new technology.
- Increase thermal generation for replacement of lost hydropower. This would be generation capacity above and beyond capacity needed to meet population and economic growth. Natural gas combustion turbines are currently the most economical and reasonable replacement for peaking and base load capability, but additional natural gas pipeline capacity will likely be needed.
- Renewable energy resources could be used to replace some of the lost hydropower at a more socially acceptable environmental cost than thermal

combustion. The economic cost of power may be more than combustion turbines. In some cases the power is dependent upon an unreliable supply of natural resources (i.e., wind and solar).

- Increase power imports or reduce exports to reduce power replacement costs. Additional power imports will be limited at times by the capacity of transmission systems.

### ***Discussion***

Hydrosystem strategies include all plans directed at the configuration or operation of reservoir facilities on the mainstem Columbia and Snake rivers. Hydropower facilities on tributaries also are included. Actions being considered include the removal or construction of dams, modification of dam configuration to improve passage or downstream habitat conditions, and change in dam operations to affect reservoir storage, downstream flows, or water quality.

Hydropower losses for any alternative that includes mainstem dam breaching range into hundreds of millions of dollars annually.<sup>28</sup> Considerable new, higher-cost generation capacity would be required to compensate for the loss of any major dam and low-cost power. Breaching of the Lower Snake dams would require changes to the regional transmission system. Breaching of John Day or McNary also would require more transmission additions. Additional economic effects of dam breaching include sales, income, and job losses that might be caused by increased electricity ratepayer costs.

Hydrosystem operations actions include changes to the operations of existing dams to provide more flow downstream or to otherwise improve habitat conditions. Flow management strategies would operate reservoirs differently to achieve normative seasonal flow patterns, temperature, estuarine conditions or flooding; for channel maintenance; or to minimize dissolved gas or flow fluctuations. Tributary reservoirs could be managed to achieve normative flow conditions in tributary streams. Reservoir operation rules could be modified to achieve resident fish habitat goals using Integrated Rule Curves, or operation rules could be set to meet flow or water quality criteria. Other actions would operate passage facilities for a longer period or all year.

Hydrosystem configuration actions would change the facilities at existing dams to facilitate passage and water quality goals. Examples include new fish ladders, surface bypass structures, other bypass improvements, modified turbines, turbine intake screening systems, and facilities for gas abatement. Juvenile fish transportation is included because the potential for successful transportation is closely linked to dam configurations. Juvenile fish transportation currently uses trucks and barges to carry

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<sup>28</sup> See, for example, the Lower Snake River Juvenile Salmon Migration Feasibility Study (Corps, 1999a) or the Human Effects Analysis of the Multi-Species Framework Alternatives (Council, 2000a).

young anadromous fish downstream past reservoirs, turbines, and other sources of mortality.

The removal of economically marginal dams on tributaries would also result in some losses in jobs, and income, and increased ratepayer costs. However, hydropower effects would be less severe than those estimated for removal of mainstem dams. Deconstruction costs also would be much less than those estimated for the mainstem dams.

Changes in habitat protection and enhancement priorities by BPA and other entities could increase restrictions on how the transmission system is maintained and operated. These restrictions have the potential to greatly increase costs of transmission in the region, and to affect the capability of operating the system safely.

### ***Transportation***

#### ***Human Actions***

The types of proposed actions that would affect this industry are as follows:

- dam breaching or drawdown,
- substantial changes to juvenile fish transportation, and
- habitat improvements targeted at transportation infrastructure.

#### ***Possible Adverse Effects***

The types of effects that follow from these actions are:

- Dam breaching on the lower Snake or mainstem Columbia would eliminate barging transportation downstream to the last dam breached. It is expected that rail and trucking would be used to replace the lost barging, but costs would increase and new rail and road capacity might be required. Local upstream economic activity associated with barging ports would be lost, or perhaps relocated to new downstream ports.
- Substantial changes to juvenile fish transportation would have a small effect on fish transportation expenditures and related industries. Current transportation expenditures are about \$1 million annually.
- Habitat improvements targeted at the transportation industry could affect the location and costs of new roads, railroads, pipelines, and other transportation infrastructure.

#### ***Context and Intensity***

The transportation industry consists of owners, workers and consumers of barge, rail and road transportation. Dam breaching or drawdown below minimum operating pools can render the mainstem Columbia or Snake rivers unusable for barge navigation. The transportation industry can also be affected by many other types of actions including juvenile fish transportation, habitat measures on roadways and other

transportation corridors, and effects of financing fish and wildlife on economic growth.

Many factors influence socioeconomic and other human effects involving the transportation industry, as Table 5.2-6 illustrates.

<b>Table 5.2-6</b>	
<b>Factors that Shape Effects on Transportation</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Location of the most downstream dam breached or drawn down below MOP	Amount of navigation lost from dam breaching
Availability and costs of alternative transportation routes, infrastructure costs, and transportation market structure	Dollar value of navigation, and net transportation employment lost
Location of dam breaching, fish transportation strategy used	Amount of fish transportation used
Types of habitat actions implemented; extent to which mitigation is used, costs of compliance	Effects of habitat actions on transportation infrastructure and taxes for infrastructure

***Possible Mitigation Measures***

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are:

- compensation, retraining employees, and facilitating movement of resources and employment out of the adversely affected transportation industries; and
- habitat protections, planned with existing and future transportation in mind. Transportation projects should include mitigation for adverse consequences at the least possible cost.

***Discussion***

The existing reservoirs on the Columbia and Snake rivers support commercial barge navigation to Lewiston, Idaho. Grains, primarily wheat and barley, account for about three-quarters of the tonnage shipped on the Lower Snake River.

The annual cost of transportation needed to replace barge navigation lost from breaching Snake River and mainstem dams ranges from tens of millions to \$100 million annually, depending on which reservoirs are lost and which study assumptions are used.<sup>29</sup> The Corps' Lower Snake River Juvenile Salmon Migration Feasibility Study and the John Day Drawdown Study did not measure economic losses in the navigation or port industries, or the job gains and increased profits in the

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<sup>29</sup> Cost estimates are from Corps, 1999a and 1999b, the Corps Lower Snake River Juvenile Salmon Migration Feasibility Study and the John Day Drawdown Study.

rail and trucking industries. Losses in the navigation and port industries would be substantial. No data are available about the offsetting increases in rail or trucking.

Little information is available to suggest how habitat actions might affect the development or improvement of transportation infrastructure.

### ***Agriculture and Forestry***

#### ***Human Actions***

The types of proposed actions that would affect these industries are as follows:

- dam breaching and changed hydrosystem operations,
- habitat improvements targeted at land use, and
- point and non-point pollution controls and subsidies.

#### ***Possible Adverse Effects***

The types of consequences that follow from these actions are as follows:

- Dam breaching and changed hydrosystem operations. Agriculture and forestry would be affected in several ways. Agriculture would be affected by higher electricity costs as a power consumer. Irrigation surface water diversions that depend on water elevations behind breached dams would have to be relocated. Groundwater irrigation adjacent to the same reservoirs would be impaired by lower water tables following breaching. Barging of agricultural products and inputs would be eliminated from Lewiston downstream to the furthest downstream breached dam. As a consequence, agriculture and forestry would pay higher costs for transportation of products and supplies.
- Habitat improvements targeted at land use. Many types of habitat improvements would be targeted at agricultural and forestry land use practices, increasing costs; and some agricultural and forestry production would be lost.
- Non-point pollution controls and subsidies could affect dryland cropping, irrigation, livestock management, and forestry.

#### ***Context and Intensity***

The agriculture and forestry industries include landowners, farmers, ranchers, workers, and persons who sell to or buy from farms and timber industries. Agriculture and forestry are affected primarily by habitat actions. The effects of habitat actions depend on the habitat values being diminished by these activities, and the habitat values are themselves dependent on a number of unique local and human conditions. The effect of dam breaching on irrigation water diversions and pumping lifts, transportation costs for agricultural commodities and inputs and wood products, and irrigation power costs are also important issues.

Many factors influence the socioeconomic and other human effects involving agriculture and forestry, as Table 5.2-7 illustrates.

<b>Table 5.2-7</b>	
<b>Factors that Shape Effects on Agriculture and Forestry</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Amount of expenditure on active versus passive restoration	Amount of expenditure for land shaping or construction versus expenditures that compensate for lost use; potential increased risk from fires and other natural disturbances versus risk reduction
Extent to which regulation and positive incentives are used	Distribution of adverse economic effects between farmers and landowners versus ratepayers and taxpayers
Amount and quality of land removed from production, either directly or because of increased cost. Changes in crop yields caused by changes in irrigation technology or deficit irrigation	Amount of agricultural/forestry production lost or gained
Types of crops affected, agricultural markets	Value of agricultural/forestry production lost or gained
Effects on transportation costs, see Table 5.2-6	Transportation costs for products and inputs (i.e. raw materials, energy, other components of production processes)
Locations of dams breached, who pays costs of diversions/wells improvements	Effects of lower water levels and groundwater tables
Power effects, see Table 5.2-5	Effects of power costs on irrigation costs
Extent of competition in agriculture, affected production as a share of market total, share of affected production exported	Effects of cost increases or reduced production on consumers.
Linkages between the local farms/forestry and local economies; location of suppliers and forward processing industries	Effects on rural communities

**Possible Mitigation Measures**

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are as follows:

- Use agricultural and forestry practices that preserve or enhance production while meeting the fish and wildlife purpose.
- Use positive incentives and education rather than regulation.
- Avoid actions that would have unprecedented or permanent effects on local agricultural/natural resource-dependent communities.
- Land or water purchase or lease compensates the farmer for his loss of net income, but regional economies may suffer because the farmer's expenditures

in the regional economy are lost. Mandatory water supply reductions are damaging to individual farmers as well as the regional economy.

***Discussion***

Many habitat actions would affect land use, or they have the potential to impair land uses that rely on water or land adjacent to streams. Habitat costs consist of the costs of economic activities impaired or eliminated, plus implementation costs.

Habitat costs resulting from changes in agricultural/forestry land use could be large, depending on intensity of the overall effort. The intensity of most habitat actions corresponds to the amount of acreage proposed for improvement.

Socioeconomic consequences are very sensitive to the implementation method chosen; especially, to what extent, if any, resource users are compensated. For private lands and water, methods of compensation include subsidies, land lease or purchase, and/or water lease or purchase. For public resources, users may not be compensated for their lost use.

Many implementation options can be used to change irrigation practices; the selected option has a strong effect on irrigation water use and economics. Land or water purchase or lease compensates the farmer for his loss of net income, but regional economies may suffer because the farmer's expenditures in the regional economy are lost. Fallow of irrigated land only in dry years can be used to maintain flows in these more adverse conditions, and the regional benefits of agricultural production are retained in most years.

Irrigation water conservation techniques are often used to reduce diversions and return flows, often with water quality and quantity benefits for the aquatic system. Conservation subsidies can be beneficial to regional economies as well as individual farmers because spending on irrigation technology increases, and crop yields and productivity may increase. Most irrigation occurs on private lands, but some irrigation occurs with water from federal facilities. Some regulation for water conservation may be feasible within state and federal laws. Mandatory water supply reductions are damaging to individual farmers as well as the regional economy. Screening of irrigation diversions is used to avoid direct mortality caused by diversion of fish with water.

Over 300,000 acres of irrigated land are served out of the Lower Snake reservoirs. Breaching or lowering of the reservoirs would require modifications to surface irrigation diversions or fundamental changes to irrigation use. In addition, many wells benefit from the raised groundwater levels caused by reservoir storage nearby. The annual cost of fixing wells and diversions impaired by breaching could run into tens of millions of dollars annually.

Habitat actions may affect dryland agricultural land use for purposes of watershed protection or water quality improvement. Such actions generally increase the costs of agricultural production.

Many strategies are used to reduce livestock effects on aquatic systems. In riparian areas, livestock are often fenced out and alternative watering sources are provided on uplands. Other actions include seasonal or rotational grazing, reduced grazing intensities, deferred grazing, and land acquisition and retirement. Wastewater and sedimentation ponds are often used to retain and treat degraded runoff from feedlots or intensively grazed uplands.

Forestry actions would limit unnatural forest patterns; reduce density of poorly performing forest roads; and reduce forestry effects to riparian and aquatic ecosystems. Harvest techniques to retain some of the original habitat elements can be used instead of clearcuts. Size of harvest units can be reduced. More normal forest habitat can be developed by appropriate silvicultural techniques, including controlled burns. Forestry actions used to reduce sedimentation include sound silvicultural practices, tailoring of harvest methods to slope and soils, and closing and obliteration of forest roads. Costs would include the net economic value of lost timber production, including changes in the economic costs of these activities and implementation costs.

### ***Commercial Fishing***

#### ***Human Actions***

The types of proposed actions that would affect this industry are as follows:

- changes in fishing regulations (reduced season length, alternate year fishery closures, change in allowable methods, size or location, or better enforcement of existing regulations might be used);
- buy-outs or other payment to stop commercial fishing (fishing effort would be reduced by purchase of the fleet or by payment to not fish at specific times and or places);
- changes in hatchery practices; and
- any other actions that decrease fish populations.

#### ***Possible Adverse Effects***

The types of consequences that follow from these actions are as follows:

- For changes in fishing regulations, adverse effects are generally catch- and revenue-decreasing, or cost-increasing.
- In buy-outs or other payment to stop commercial fishing, the owner of the fishing “right” is fully compensated. However, deckhands, other labor, and coastal communities may still be adversely affected.

- Following changes in hatchery practices, increasing or decreasing hatchery production could have strong effects on commercial catch. Adverse effects are generally catch and revenue losses.
- Increased poaching may increase.
- Adverse effects from reduced fish populations are decreased revenues, net revenues, and decreased ability to cover costs

**Context and Intensity**

There are many factors that will influence the socioeconomic and other human effects on commercial fishing, as Table 5.2-8 illustrates.

<b>Table 5.2-8</b>	
<b>Factors that Shape Effects on Commercial Fishing</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Total amount of fish produced (Table 5.2-3), including hatchery and non-Columbia stocks, which stocks are recovered, changes in commercial harvest practices	Amount of fish available for harvest
Technologies, timing and locations allowed for selective harvest	Costs of fishing, quality and timing of catch.
Ocean conditions, location of harvest, amount of fish harvested	Quality of fish for harvest
Market conditions, fish harvest costs	Value of fish harvested
Linkages between the local fleet and local economies; location of suppliers and forward processing industries	Effects on coastal communities

**Possible Mitigation Measures**

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are as follows:

- use of education and positive incentives instead of regulation;
- use of Community Based Policing<sup>30</sup>
- assistance in transferring fixed and human capital (boats and fishermen) to alternative fishing uses such as guide-based sport fishing, or other employment;
- compensation for costs of regulation; and
- compensation or retraining/retooling for local communities.

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<sup>30</sup> Peters et al., 1998.

### ***Discussion***

Specific actions would require selective (targeted) fisheries, a focus on sport or commercial and sport fisheries, harvest based on escapement needs for the smallest population unit or population aggregates, management of overall harvest to meet escapement needs, or the use of various new harvest techniques, such as fish wheels or use of fish ladders to select individual fish for harvest or release.

Some actions would eliminate almost all ocean salmon fishing, at least until stocks recover. Salmon range up and down the coast in mixed stock fisheries. Therefore, the entire west-coast salmon fishery, and even some non-salmon fisheries, from California to Southeast Alaska would need to be eliminated to ensure that no Columbia River fish were caught. As a practical matter, ocean catch of Columbia River fish would not be entirely eliminated. Rather, those fisheries that catch the largest shares of Columbia River fish would be eliminated or modified, and some Columbia River catch would continue as long as total harvest stays within harvest goals.

Costs of harvest management include implementation costs, enforcement costs, and lost profits from reduced fishing. Numbers, size and quality of fish are important, but fishing costs, affected by fishing methods and regulations, are also important. Any strategy that reduces harvest would have the direct consequence of reducing the annual value of salmon catch. Actual costs may be even higher, since economic incentives and value for fisherman may not be based solely on the value of the catch. Reduction in harvest levels would also require costs for implementation and enforcement, in addition to lost value.

### ***Recreation***

#### ***Human Actions***

The types of proposed actions that would affect this industry are as follows:

- dam breaching and reservoir operations,
- changes in recreational fishing and hunting regulations,
- changes in hatchery practices,
- controlled recreational access and quality associated with habitat actions,
- build more boat and fishing access sites, and
- actions that decrease non-targeted fish and wildlife populations.

#### ***Possible Adverse Effects***

The types of effects that follow from these actions are:

- Dam breaching and reservoir operations. Dam breaching would eliminate most flatwater recreation that occurred on the reservoir, including activities

such as fishing, boating and water-skiing. Changes in reservoir operations can adversely affect reservoir fishing and other recreation opportunities.

- Changes in recreational fishing and hunting regulations. Recreational fishing and hunting regulations might be changed to help fish and wildlife by reducing harvest, incidental catch, or damage to habitat, or by increasing recreational effort on undesirable species. Generally, losses are associated with a diminished value of the recreation experience.
- Changes in hatchery practices. Some hatcheries produce fish primarily for recreation; these hatcheries might be eliminated or modified. Generally, losses are associated with a diminished value of the recreation experience.
- Effects on recreational access and quality associated with habitat actions. Some habitat actions might make more areas available for certain types of recreational use, but other actions might reduce the availability of areas to some types of use.
- Decreased fish and wildlife populations would reduce economic value of recreational fishing and hunting, and other outdoor recreation activities that are enhanced by fish and wildlife.

**Context and Intensity**

The recreation industry includes individual recreationists as well as the commercial recreation industry that serves them. Virtually all types of outdoor recreation could be affected. Table 5.2-9 illustrates how factors influence socioeconomic effects involving recreation.

<b>Table 5.2-9</b>	
<b>Factors that Shape Effects on Recreation</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Total amount of fish and game provided (Table 5.2-3), which stocks are recovered, changes in sport fishing and hunting regulations.	Amount of fish and game available for recreation harvest
Amount of fish and game caught, changes in regulations.	Value of fishing and hunting recreation
Which dams are breached.	Amount of flatwater and riverine recreation available
Amount and conditions of access to lands, types of uses that may be restricted	Value of recreation on lands affected by habitat actions

**Possible Mitigation Measures**

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are as follows:

- development or improvement of alternative recreational opportunities, and

- focus on education rather than regulation.

### ***Discussion***

Some of the more popular recreational activities, such as boating, fishing, and swimming, require developed facilities that allow access to water. Hydrosystem actions that would result in changes to lake elevation and river flow patterns would affect recreation areas, influence visitation, and affect the ability to use facilities.

Reservoir drafting can expose waterside facilities such as beaches, swimming areas, boat ramps, docks, and marinas, leaving them unusable and unsightly. Some floating facilities, such as docks, can be relocated as pool elevations drop. However, moving the facilities can be difficult and is often not practical when surface elevations change rapidly. Large drawdowns may leave camping, picnicking and other land-based facilities visually and physically separated from the water.

Hydrosystem operations can also reduce or improve fish and wildlife population numbers, which in turn influence opportunities for fishing, hunting and wildlife viewing. Low pool elevations can expose rocks, tree stumps, and other objects that can pose hazards for water recreationists. Increased water velocity can increase risks to swimmers and water craft operators.

Reservoir drafting exposes shorelines and lake bottoms to the effects of wind. Fine sediments dry out and are carried off by the wind, which can be a nuisance to nearby residents and recreationists. Odors can be created in areas where organic material is exposed as a result of drafting. When water levels in reservoirs are lowered, the remaining water flows at a higher velocity and picks up additional sediment, which in turn leads to increased turbidity. Increase in turbidity can decrease water clarity and change its color.

As a consequence of dam breaching, there may be beneficial effects from restored recreational opportunities on formerly inundated land or rivers. Activities on the formerly inundated river include fishing and boating. There would be little whitewater in the rivers that are restored by breaching dams on the Lower Snake and mainstem Columbia. Formerly inundated land might be used for recreation, but some land would also be used for other purposes.

Recreational fishing and hunting adverse effects from fish and game population declines are conditioned by regulations, alternative opportunities for use of time, quality of recreational amenities, and recreational costs such as license fees and gasoline prices. Recreational values are often measured from information on recreational expenditures such as travel costs. Some regional economies have important economic linkages with recreational fishing and hunting.

Recreational fishing can be an important source of mortality for special status species, both by intentional and incidental catch. Actions may include keep limits, tackle regulations such as flies-only or barbless hooks, and better posting and enforcement

of special regulations. Other recreational activities affect habitat or fish and wildlife directly. Public education, location of recreational activities away from fish and wildlife habitat, and improved regulations and enforcement can all be used to diminish effects of recreation on fish and wildlife habitat.

### ***Residential and Commercial Development and Construction***

#### ***Human Actions***

The types of proposed actions that would affect these industries are as follows:

- dam breaching and other direct construction effects;
- effects on residential and commercial development associated with habitat actions; and
- effects on economic growth associated with fish and wildlife costs, and effects associated with quality of living.

#### ***Possible Adverse Effects***

The types of consequences that follow from these actions are:

- Dam breaching and other direct construction effects. These effects are the expenditures for dam breaching and other construction programs paid to construction interests. Other construction programs may include hatcheries, dam and facility modifications, and construction of new diversion and outfall facilities at affected reservoirs.

The expenditures on construction are generally recognized to be beneficial from the perspective of regional economics. Other construction effects are adverse. Adverse effects from construction may include habitat loss, community disruption, local public finance costs, air quality effects, runoff problems, and social dislocation.

- Effects on residential and commercial development associated with habitat actions. These actions may include preservation of lands that would otherwise be developed. Programs to reduce non-point source and source pollution may increase costs to existing and future urban areas.
- Effects on economic growth associated with fish and wildlife costs, and effects associated with quality of living. Increased fish and wildlife costs, paid through electricity costs or taxes, may increase living and business costs and reduce the attractiveness of the region to potential new residents and businesses.

#### ***Context and Intensity***

The residential and commercial development and construction industries include people affected by the development of real property, including construction, realtors, lenders, other industries using real estate, and home buyers and renters. Residential

and commercial development are affected primarily by the habitat group of fish and wildlife actions.

Table 5.2-10 shows how residential and commercial development is influenced by factors. The location and types of habitat actions are important, but so are the methods of obtaining these actions. Especially, policies can choose to affect land use by regulation, by purchase, or by other negative or positive incentives. The mix of incentives, regulation, and purchases will have an important influence on the distribution of costs among real property owners, taxpayers, and ratepayers.

<b>Table 5.2-10</b>	
<b>Factors that Shape Effects on Residential and Commercial Development and Construction</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Location and types of habitat actions selected, effects of hydrosystem actions on floodplain	Development and land use patterns
Types of habitat action implementation chosen; land use restrictions, purchases or incentives, real estate markets	Economic costs of development effects
Amount of new development restrictions, construction markets, location of owners and workers. Amount of construction activity is positively related to amount of active habitat restoration	Employment and incomes in construction
Costs passed on to real property owners depend on housing and electricity markets, initial allocation of costs among ratepayers, taxpayers and others	Housing and building costs
Size and characteristics of local economies, communities and infrastructure	Economic and social effects of construction
Habitat actions that limit construction	Construction revenues

**Possible Mitigation Measures**

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are as follows:

- Economic effects from construction are generally beneficial or zero. Therefore, no mitigation is required.
- Habitat acquisition, erosion control, and assistance to local communities can help to permit construction.
- Where habitat needs limit development, suitable alternative sites for development can be acquired.
- Adverse effects on economic growth can be minimized by maximizing the efficiency of fish and wildlife investments to reduce need for higher levels of mitigation.

### ***Discussion***

Potential fish and wildlife actions associated with urban areas include locating urbanization away from sensitive habitats, acquisition of sensitive habitats, improved municipal water diversion management, improved wastewater treatment, public education, and improved laws governing refuse and use of stormwater drains.

Non-point pollution and wastewater are increasing problems near urban areas. Actions would improve municipal wastewater management and urban storm runoff control. Urban road management (other than culvert replacement) is included. Stormwater detention ponds or wetlands for wastewater treatment can have incidental habitat benefits.

### ***Other Industries***

#### ***Human Actions***

The types of proposed actions that would affect these industries are as follows:

- habitat actions targeted at mining practices and cost recovery for mine rehabilitation,
- any actions that affect electricity generation and its costs, and
- actions to reduce point-source pollutants.

#### ***Possible Adverse Effects***

The types of effects that follow from these actions are as follows:

- The mining industry may be affected by habitat actions targeted at mining practices and cost recovery for mine rehabilitation.
- The aluminum industry and other direct service industries would be harmed by increased electricity prices in most Policy Directions.
- The pulp and paper industries could be affected by stringent point-source pollution control costs, costs of raw materials, and transportation costs.
- Industrial development could be affected by changes in hydropower and natural resource costs and availability.

#### ***Context and Intensity***

There are several industries that may experience important consequences related to fish and wildlife actions. The following are examples of the major industries linked with fish and wildlife effects.

<b>Table 5.2-11</b>	
<b>Factors that Shape Effects on Mining, Aluminum, Pulp and Paper, and Other Industries</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Markets for minerals, mining regulations, government programs	Share of costs passed to industry owners, consumers and government
Aluminum markets, share of aluminum consumed locally and nationally, share of increased fish and wildlife costs passed to aluminum electricity costs	Share of increased power cost paid by aluminum owners, workers and consumers; share of consumer cost paid locally and nationally
Nature of effluent regulations, forest product markets, share of products used locally and nationally	Share of increased products costs paid by industry owners, workers and consumers; share of consumer cost paid locally and nationally
Comparative cost of power and local and imported natural resources	Amount of cost increase and comparative advantage of local natural resource industries

***Possible Mitigation Measures***

The types of mitigation that might be undertaken to eliminate, reduce, or compensate for these adverse effects are as follows:

- minimize adverse effects of electricity price increases by maximizing the efficiency of fish and wildlife mitigation investments, and
- emphasize subsidies and education, as opposed to regulation.

***Funding***

***Human Actions***

Funding is concerned with the distribution of fish and wildlife program costs among ratepayers, taxpayers and others. The types of proposed actions that would affect funding are as follows:

- financing fish and wildlife programs using ratepayer revenues, tax revenues, or other public revenues;
- use of regulation instead of positive incentives to achieve habitat goals; and
- constraint of increased funding through ratepayers by maximum sustainable revenue (MSR)<sup>31</sup>, and uncertainty in ratepayer fish and wildlife cost shares, resulting in increased planning costs for BPA and its customers.

***Possible Adverse Effects***

- Funding through ratepayers or taxpayers has a similar effect in that their discretionary income is reduced, and they have less to spend.

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<sup>31</sup> See Chapter 2, Section 2.3.2.3, for more detail on MSR.

- Regional economies are affected by the reduced discretionary income of ratepayers and taxpayers. Ratepayers and taxpayers may be located in different areas, however, so the distribution of reduced spending is affected. While federal taxation is spread around the nation, ratepayer funding has important regional implications because most ratepayers live in the region. These adverse effects are offset to the extent that fish and wildlife expenditures are paid back to the regional economy.
- Increased wholesale power costs may cause wholesale buyers to shift to alternative sources. An increase in the retail cost of electricity may cause ratepayers to use less of it. BPA cannot increase prices to cover costs when customers reduce their electricity use or switch to other, low-cost power sources.

**Context and Intensity**

Funding of fish and wildlife programs will be influenced by the types of actions proposed, their context, and their intensity. Table 5.2-12 shows some of the factors that may influence funding.

<b>Table 5.2-12</b>	
<b>Factors that Shape Effects on Funding</b>	
<b>Factors leading to Effect</b>	<b>Effect</b>
Scale of fish and wildlife recovery effort	Total cost of fish and wildlife programs to resource users, taxpayers, and ratepayers
Use of regulation versus subsidy, acquisition or education	Share of cost paid by resource users versus ratepayers and taxpayers
Costs of thermal generation, electricity market conditions, willingness of electricity consumers to pay higher prices	Distribution of fish and wildlife costs among ratepayers versus taxpayers, and others
Use of regulation instead of compensation to achieve objectives	Impairment of value and use of private property
Effects on agriculture, forestry, transportation, and residential and commercial development	Local government costs and revenues

**Possible Mitigation Measures**

- Adverse effects of funding can be mitigated by maximizing the effectiveness of fish and wildlife expenditures.
- Spreading costs so that no one group is disproportionately affected.
- This situation then requires one of the response strategies as discussed in Chapter 4.

**Discussion**

Funding issues involve the source of money needed to pay for fish and wildlife programs in the region. For every dollar of money spent for construction of passage

improvements, habitat improvements, or hatcheries, for every dollar received for services, education or subsidies—someone must pay.

Although BPA is a federal agency, programs administered by BPA are funded by receipts from BPA's sales of electricity. In other words, BPA's fish and wildlife expenditures are funded by ratepayers rather than by federal taxpayers. Some fish and wildlife programs administered by federal agencies are funded by federal taxpayers through appropriations from the US Congress. Some federal actions, such as CWA programs, have multiple benefits that include fish and wildlife protection and enhancement. Regional fish and wildlife programs may also be funded through state or local taxes, fees, and fines, or through private, commercial, or tribal groups. Other funds come through costs of regulation, volunteer contributions and other private contributions. Socioeconomic effects include all of these related groups.

BPA has been concerned that a combination of fish and wildlife costs and reduced efficiency of hydropower generation can result in hydropower costs that are not competitive. Recent events in regional power markets have overshadowed these concerns. Current concerns involve the financial stability of power buyers, tradeoffs between fish protection and electricity needs, and BPA's role in regional power markets. Low power prices increase concerns involving fish and wildlife and other costs, but high prices increase concerns regarding lost hydropower generation and ability to shape loads as affected by fish protection goals and requirements.

### ***Regional Economy***

This category of effects considers all of the industry-level effects combined, plus the effect of trade linkages, on regional economic activity. There are no actions targeted to regional economies. Rather, adverse economic effects on natural resource industries, higher costs for electricity and other goods, and reduced personal income combine to diminish value of regional output, employment, and income. Actions that reduce non-targeted fish and wildlife populations reduce commercial fishing, recreational fishing and hunting, and other wildlife-related economic activity. Regional economic effects vary from locale to locale. Not all effects are adverse. Some persons in some places will benefit in almost any case.

### ***Possible Adverse Effects***

The types of effects that follow from fish and wildlife actions are as follows:

- Reduced regional production causes reduced buying and selling in the region. This reduces income, output and employment in linked industries
- Reduced regional production can have price effects for bulky products and products sold locally.
- Reduced regional economic activity may adversely affect local public finance including property and sales taxes, and costs of public services may be increased.

- Financing (funding) of fish and wildlife programs reduces discretionary income used for other spending
- Decreased non-targeted fish and wildlife populations would reduce commercial fishing, recreational fishing and hunting, and other outdoor recreation activity. Coastal and tribal communities have important economic links to commercial fishing, and substantial decreases in commercial catch would decrease regional economic activity through economic multiplier effects. Reduced sport-fishing activity would hurt economic activities such as guiding, lodging, and services that depend on these activities.

**Context and Intensity**

Table 5.2-13 shows regional economic effects and influencing factors.

<b>Table 5.2-13</b>	
<b>Factors that Shape Effects on Regional Economics</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Amount of funding and effects on ratepayers and taxpayers (Table 5.2-12)	Amount of reduced discretionary income for regional spending
Incremental spending patterns for discretionary income	Pattern of regional effects from reduced discretionary income
Value of lost production in transportation, agriculture, forestry and recreation; pattern of spending (imports) and sales (exports) by these industries (Tables 5.2-5 to 5.2-11)	Reduced spending by these industries in regional economies
Local markets, supply and demand patterns	Price effects
Effect of adverse regional effects on property values	Property tax revenues
Fish and wildlife populations (Table 5.2-3) and effects on related industries (Tables 5.2-8 and 5.2-9)	Spending by commercial and recreational fishers and hunters
Extent to which adversely affected resources (unemployed persons) seek assistance	Local government costs for services

**Possible Mitigation Measures**

The types of mitigation that might be undertaken to eliminate, reduce or compensate for these adverse effects are as follows:

- Adverse effects on the regional economy can be minimized by maximizing the efficiency of fish and wildlife mitigation investments.
- Land retirement actions and other actions that reduce production should not be concentrated in economic regions.
- Adverse effects on regional industries can be minimized as discussed previously for each industry.

### ***Tribal Effects***<sup>32</sup>

This section is concerned with the potential adverse effects of fish and wildlife declines on tribal members and communities. The discussion is focused on the effects of human actions on Native Americans. The values of tribal members in the larger non-Indian society are covered in the other sections.

#### ***Human Activities***

The types of human activities that will affect Native Americans are as follows:

- changes in timing and extent of reservoir operations, e.g., increased reservoir drawdowns;
- multiple decisionmaking processes and associated decisions reducing tribal opportunities to have and use resources (e.g., harvest opportunities decreased as use of hatcheries moved away from production purposes);
- actions reducing funds available for fish and wildlife mitigation and recovery; and
- non-Native forestry; agriculture, including irrigation, cropping and grazing; recreation; mining; urban and rural development for residential, commercial, and industrial uses.

#### ***Possible Adverse Effects***

- increased exposure of cultural resources, decreased resident or anadromous fishing opportunities; decreased tourism; exposure to toxic sediments; reduced scenic values of reservoirs; land lost to new generation and transmission facilities;
- decline of practices essential to preservation of tribal culture and religion;
- reduced tribal employment; reduced tribal health; reduced protection and mitigation for fish and wildlife and their habitats; and
- greater competition for fewer resources; increased air, land and water pollution; habitat declining in quality and quantity.

#### ***Context and Intensity***

Many factors influence the degree of effect of human activities on Native American values. The degree of effect on Native Americans is a function of the extent that decisionmakers choose to take the actions identified above, and the types, intensity, and amounts of such actions. Native American interests may be cultural, religious, economic, or recreational. Tribal members also express values related to water

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<sup>32</sup> Considerable analysis has been conducted in the Lower Snake River Feasibility Study (Corps, 2000a, b) and its Drawdown Regional Economics Workgroup (DREW)] 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" (CRITFC, 1999). Additional analysis is available in the Framework Report (Council, 2000a).

quality, use of traditional resources and locations, preservation of cultural resources, health education, and socioeconomic concerns such as employment and income.

Many factors affect the socioeconomic and other human effects involving tribal groups, as Table 5.2-14 illustrates.

<b>Table 5.2-14</b>	
<b>Factors that Shape Effects on Native Americans</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
Total amount of natural resources, especially anadromous fish, available for Native American use; definition of ESU under ESA	Amount and location of fish available for tribal harvest; cultural, economic, social and spiritual value of resources available to Native Americans
Choices between competing resources such as resident fish and anadromous fish, wild fish and hatchery fish, or land for wildlife habitat or economic development	Native Americans affected depending upon rights under treaties, statutes, or executive orders
Failure to allow tribal management of natural resources and use of traditional tribal techniques and knowledge	Reliance on Western scientific method leading to tendencies of underestimating risk of extinction of stocks listed under the ESA
Increasing number and complexity of decisionmaking processes	Disenfranchisement of tribes as resource co-managers and sovereign entities; depletion of tribal economic and staff resources as they try to maintain presence in the numerous processes
Funding available for mitigation and recovery	Employment and incomes; level of mitigation and recovery achieved
Changes by Congress, the President, states, tribes, and agencies in laws and policies, or their implementation	Further limit, clarify, or resolve tribal trust and treaty obligations of the United States; reduction of environmental protection under Federal law

***Possible Mitigation Measures***

The tribes themselves recommended many of the following mitigation measures in government-to-government consultations and policy level discussions during the comment processes on the Lower Snake River Feasibility Study EIS and the 2000 FCRPS Biological Opinions. BPA derived other possible mitigation measures based on its experiences in working with tribes and the advice of BPA’s tribal liaisons.

- **Changing Reservoir Operations**
  - Update NEPA coverage; especially examine resident fish, toxic waste, and cultural resource impacts of upriver and blocked areas on tribes.
  - Implement storage reservoir rule curves in Montana for sturgeon and bull trout.
  - Cooperate with EPA in toxic sediment studies and mitigation.

- **Multiple decisionmaking processes**
  - Create enhanced process structure for Federal action agencies consulting with the tribes.
  - Provide appropriate level of funding for tribal participation in numerous federal processes and multi-agency decision making forums.
  - Increase number of Native Americans in agency decisionmaking positions.
- **Reducing funds available for fish and wildlife**
  - Design, locate and operate hatcheries in a manner that respects tribal cultural values and fishing practices.
  - Transfer operation of some hatcheries to tribes.
  - Raise power rates; sell BPA to entity more responsive to Native American rights and needs.
  - Re-evaluate priorities in regional funding decisions regarding resident fish and wildlife and the effectiveness of mitigation.
  - Increase number of mitigation contracts with tribes or businesses owned by tribes; pay tribal employment ordinance taxes on all projects on or near reservations.
- **Greater competition for fewer resources**
  - Decrease over-grazing, non-sustainable forestry, water spreading, and urbanization of rural areas; confine industrial, commercial, and residential development to urban areas.
  - Clarify tribal trust and treaty rights; fund and enforce them.
  - Apply conservation necessity principles to assure that treaty fishing takes priority over non-treaty fishing and other sources of salmonid mortality.
  - Enforce Clean Water Act total daily maximum load requirements on all tributaries in all states in Pacific Northwest.

***Discussion***<sup>33</sup>

Native Americans have unique concerns that transcend their roles in the non-tribal economy. Given the broad cultural and spiritual relationship between Columbia Basin natural resources and tribal peoples, it is likely inappropriate—and also not fully possible—to establish linkages between Policy Directions and the circumstances of tribal peoples based on some single measure. Direct information provided by Native Americans provided an important basis for identifying which Policy Direction would improve tribal living circumstances, and which would not.

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<sup>33</sup> This text is paraphrased from the Human Effects Analysis of the Multi-Species Framework Alternatives (Council, 2000a).

Historically, Native Americans have been substantially affected by the cumulative destruction of the salmon-producing capabilities of the FCRPS and by declines of many game and plant species upon which tribes depended. Much of this destruction has often been accompanied by assurances of mitigation that, with time, did not occur as promised by the government or as anticipated by the tribes. As a result, the tribes are skeptical of promises regarding mitigation. Policy Directions that do not further tribal goals for fish and wildlife will likely engender litigation and even greater tribal skepticism of the Federal government.

Assessment of tribal effects depends heavily upon whether populations of key fish and wildlife species, and more broadly, Columbia Basin ecological diversity, increases or decreases. Tribes fear that the Federal commitment to upholding trust responsibilities and treaty rights will continue to diminish under the Status Quo or other Policy Directions that do not place a higher priority on mitigation and recovery of all fish and wildlife. Policy Directions that do not curb or concentrate growth and development will support encroachment on resources valued by tribes and diminish the area over which tribes may exercise their rights to manage and use resources. In the long run, tribal influence may be eroded and, both off and on their reservations. Tension and conflict will increase between Native Americans and other citizens as tribes increasingly compete with others for limited resources.

Tribes may overextend their political and economic resources attempting to participate in the many processes in which tribal interests may be adversely affected—hydropower relicensing proceedings, the Council’s program, harvest regulation, forest and range planning, siting of new generation and transmission facilities, harvest and hatchery agreements, water rights adjudications, NEPA processes, ESA consultations, and CWA enforcement actions, to name a few. With the shrinking of tribally influenced areas and over-extension of tribal government, Native American culture may also be further fragmented and lost, especially traditional knowledge and practices pertaining to natural resource management.

Conflict could increase between treaty tribes and Executive Order tribes under alternatives that emphasize anadromous fish mitigation and recovery. Upriver or blocked-area Executive Order tribes often face or perceive increased environmental, social, and economic impacts from efforts to address ESA-listed anadromous fish because there is less funding available for resident fish and wildlife. In addition, there are greater upriver impacts from deeply drafted reservoirs. Upriver tribes feel excluded from mitigation and recovery processes that omit proposals to reintroduce anadromous fish to areas permanently blocked by dams or laws and policies that prohibit them from participating in fisheries. These tribes also may view an emphasis on anadromous fish as slighting their cultures, some of which have historically depended more on resident fish and wildlife than anadromous fish.

Hatchery, harvest, and implementation of the ESA all directly affect all the Region’s tribes. Closing hatcheries for all but conservation purposes—that is, using hatcheries only for preserving genomes, not for supplementation or production for harvest—

could severely reduce the fish available for harvest and undermine mitigation promises. Or, increased use of hatcheries for production or supplementation could, in the long run, have deleterious effects on the genetic integrity of wild stocks and potentially lead to reduced survival and declining fish population growth rates. Continued focus on lower Columbia River hatcheries, to the exclusion of upper river hatcheries could favor downstream non-tribal harvest over upper basin tribal harvest. Finally, continuing to define ESUs restrictively (such that individual stocks are protected instead of whole species) will prolong mitigation and recovery efforts by forcing all activities in all four Hs to be closely regulated—including tribal harvest.

### ***Adverse Economic Effects from Declining Fish and Wildlife Populations***

This section provides a summary discussion of economic and social adverse effects from fish and wildlife population reductions. Commercial, recreational, regional and tribal effects were discussed previously. Additional adverse effects involve non-consumptive use values and non-use values that are lost when fish and wildlife populations decline or biological diversity is lost.

Given the level of detail of this EIS, as well as the state of the science, economic losses of alternative Policy Directions caused by fish and wildlife populations and harvest can not be calculated. Economic losses are not quantified because future fish and wildlife populations are not quantified, but also because the amount of economic loss as a function of population decline is also quite uncertain. **Appendix F** provides some typical commercial, recreational and non-use unit values for fish and wildlife.

### ***Possible Adverse Effects***

Economic and social adverse effects may include the following

- tribal effects;
- commercial fishing losses;
- recreational fishing and hunting losses;
- aesthetic economic values associated with lost viewing of fish, wildlife, or other natural features;
- non-use economic values such as existence, option and bequest values; and
- losses associated with feeling of moral or ethical obligation, religious beliefs, pity or equity.

### ***Context and Intensity***

Fish and wildlife losses will be influenced by human culture, activities and development and by the characteristics of fish and wildlife restoration, mitigation and recovery. Table 5.2-15 shows some of the factors that may influence economic losses from fish and wildlife declines.

<b>Table 5.2-15</b>	
<b>Factors that Shape Effects Involving Economic Losses of Fish and Wildlife Declines</b>	
<b>Factors Leading to Effect</b>	<b>Effect</b>
See Table 5.2-14. Tribal members are also affected through their roles within the larger society	Tribal effects
See Table 5.2-8. Fish populations and characteristics. See Table 5.2-3. Also, commercial fishing regulations, technology, markets, costs of inputs	Commercial fishing losses
See Table 5.2-9. Fish and wildlife populations and characteristics. See Table 5.2-3. Recreational fishing and hunting regulations, alternative recreation opportunities, recreation costs, especially travel	Recreational fishing and hunting losses
Fish and wildlife populations and characteristics. See Table 5.2-3. Locations and mobility of humans; cultural attributes	Aesthetic values (non-consumptive use)
Fish and wildlife populations and characteristics. See Table 5.2-3. Human and cultural characteristics and preferences	Non-use values: existence, option, and bequest values; feeling of moral or ethical obligation, religious beliefs, pity or equity

**Possible Mitigation Measures**

- Mitigation measures are largely those used to reduce fish and wildlife declines; see Section 5.2.
- Mitigation for economic effects may include monetary compensation, provision of alternative economic opportunities, or retraining.

**Discussion**

Commercial fishing losses are perhaps the most simple and easily calculated economic losses, and recreational losses associated with reduced availability of fish and game are commonly estimated. Other types of adverse economic effects are not so easily measured.

Many persons enjoy observing fish and wildlife. Observation is sometimes classified as "non-consumptive use" because fish and wildlife are not taken. Some observation, such as birdwatching, is a specific recreation activity, but much observation is incidental to other activities.

Non-use values occur even though their holder has no intent to actually use or observe the valued resource. Types of non-use values *include existence* values, a value associated with continued existence of a resource; *option* value, associated with retaining the option to use a resource in the future; and *bequest* value, associated with maintaining the resource for future generations. Some persons may maintain that they have a moral, ethical, or religious responsibility toward other living things, or they may express empathy or equity values for fish and wildlife.

Economists and other social scientists are largely unanimous in their belief that non-use values exist and that they are justifiable economic values. The economic measurement of these values, however, is a very contentious matter. Economists often base their measurement of economic value on prices. There are, however, no useful prices for non-use values. Therefore, measurement must rely on a variety of indirect methods. *Contingent valuation* uses a survey format to query people about their willingness to pay for their non-use values. Proponents of this method can provide evidence in support of their results, but opponents can provide evidence that results are not realistic economic values.

Even with the uncertainty of measurement, most studies agree that, with fish and wildlife population declines, economic value of lost uses is less than the non-use values. Commercial use losses are especially limited because most species, especially wildlife species, are no longer sold commercially. Commercial salmon values are limited by a very competitive international market and the growth of inexpensive salmon farming as an alternative to conventional production and harvest techniques.

The counting of losses requires a definition of *whose* losses are being counted. In this case, we are primarily concerned with regional economic losses: those losses incurred by citizens of the region. Regional residents suffer most fish and wildlife losses. Exceptions involve recreational fishing and hunting by non-residents and non-use values of nonresidents.

Regional citizens include tribal members. Economic and social losses for this group were described previously. Primary values are cultural, religious and subsistence. Fish and wildlife losses might reduce levels of self-sufficiency, perceptions of control, and tribal health. Tribal members also have economic interests in common with the larger non-Indian society, as described above.

### ***Cultural Resources and Aesthetics***

Cultural resources are specific places that may be or are important in the history of the nation and its peoples. The term encompasses archaeological resources such as prehistoric settlements and artifacts, historical resources such as settlers' homes and other buildings, and existing cultural resources such as buildings, structures, and locations that help define and maintain existing cultures.

Applicability or eligibility is largely derived from and limited by Federal law, regulation, and Executive Orders, and Departmental or agency standards or policies. A cultural resource becomes important as it bears witness to the values, uses, meanings, and relevance people hold for their natural, cultural, and spiritual world. An historic property or historic resource—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.<sup>34</sup>

Aesthetic effects involve the qualities of sensory experiences. These qualities are inherently a matter of personal value judgments, and different people have different preferences. For many aesthetic values, there is no commonly accepted basis for what is beneficial or adverse. Some people prefer natural attributes, while others prefer developed ones.

### ***Human Activities***

- Reservoir drawdown would expose reservoir sediments and lead to impaired aesthetic values. Increased emissions from thermal generation could impair visibility.
- Certain river operations will involve the modification of structures such as spillways, dam embankments, and fish passage facilities, potentially causing direct effects on historic or cultural properties.
- Habitat restoration actions could convert farmland to native vegetation, and preservation could keep some land from being converted to urban uses.

### ***Possible Adverse Effects***

Possible adverse effects on cultural resources and aesthetics include the following:

- exposure and loss of cultural resources;
- exposure of unsightly reservoir sediments;
- reduced visibility; and
- changes in scenic qualities that some persons would dislike.

### ***Possible Mitigation Measures***

Adverse effects can be mitigated by planning and acting to protect historic and cultural resources.

### ***Discussion***

Changing water levels and flows can cause wave action, inundation, and exposure of reservoir drawdown zones, all of which can affect cultural resources. System operations can also cause indirect consequences for historic properties as a result of changes in the human use and aesthetics of shore and drawdown zones.

Effects within the reservoir pool occur most often to non-structural archeological deposits, since initial reservoir construction and filling usually removed or damaged above-ground or structural cultural resources such as historic architecture. Direct

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<sup>34</sup> Definitions adapted from Governors, 2000.

effects on archeological deposits resulting from reservoir shoreline fluctuations occur differently in each of three reservoir zones: (1) exposed beach; (2) wave-impact; and (3) inundation zones. Indirect effects on historic and cultural properties due to system operation strategies involve changes in the human use of the shore. The devegetation and deflation of archeological sites in the exposed beach zone make them more visible to the public, increasing the likelihood of theft, vandalism or disturbance.

Decisions to develop or permit camping, summer homes, hiking trails, or off-road vehicle uses may all lead to increased effects on historic and archeological sites from human caused erosion, vandalism, and artifact theft.

System operation strategies that change land uses might also change the integrity of “feeling” or association of a historic property. Reservoir drawdown might destroy the visual integrity of a historic sight or traditional cultural property by introducing an element that is inconsistent with its historic or cultural character.

Reservoir operations, primarily drafting, can have pronounced aesthetic effects on adjacent lands. These consequences result from a number of factors, including increased shoreline visibility and contrast, erosion, changes in recreational facilities, reduction in the size of embayments and seep lakes, changes in water characteristics, and production of dust and odors. A decrease in aesthetic quality at a project can affect recreational use and have social and economic consequences for visitors and residents.

### **5.2.3.3 Summary of Generic Effects By Common Activity**

The following diagrams are offered as a way for the reader to view the generic effects of common human activities. In the previous sections, the generic effects were given by type of effect and a discussion was provided on what activities were associated with them. That format works well for the analysis needed to determine environmental consequences addressed in this DEIS.

In response to requests made during the public meetings and in early scoping, we are providing below an easy way for those who want to understand the possible environmental effects of their activities. These diagrams are an attempt to illustrate some of the same material in Sections 5.2.2 and 5.2.3 in a condensed, easy-to-read format that shows the environmental concerns of several common human activity. There are several other activities that could be shown, but these represent those that were specifically requested by the public that participated in meetings with the DEIS team.

#### **5.2.4 Context and Intensity of Policy Directions**

Throughout the section above, we have described the role of context and intensity for each environmental consequence. The following tables are offered to help understand how context and intensity work with the Policy Directions evaluated in this EIS.

- **Context:** How each of the alternative Policy Directions varies from the Status Quo in addressing the Key Regional Issues (context).
- **Intensity:** The relative deviations in terms of the possible shift in fish and wildlife activity levels from Status Quo.

The reader should recognize that comparisons of this nature are *conceptual*: actual implementation plans for actions under each alternative have not yet been fully determined.

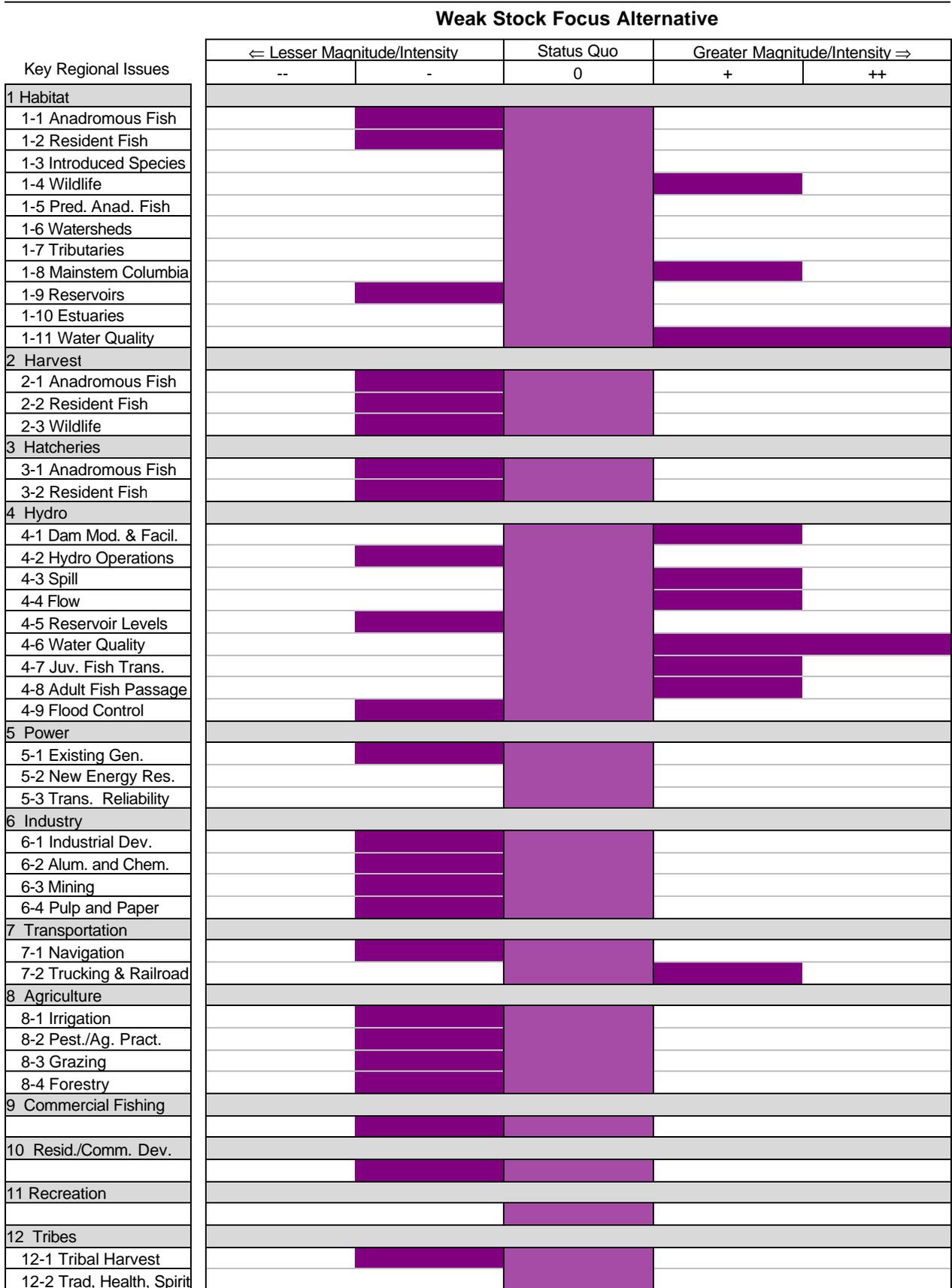
On an issue-by-issue basis, the alternative Policy Directions typically will overlap with Status Quo. However, they will deviate in the magnitude and intensity of activities and actions: that is, there will be more or less emphasis on individual categories of actions, depending on the Policy Direction's philosophy and focus. Deviation is expressed as the projected amount of activity or shift in policy direction as Key Regional Issues are emphasized or de-emphasized during program implementation. The portrayal of these relationships is for a visual aid and is only a qualitative judgment.

**Figure 5-21: Projected Deviation of Proposed Natural Focus Policy Direction from Status Quo (No Action)<sup>1</sup>**

Key Regional Issues	Natural Focus Alternative				
	⇐ Lesser Magnitude/Intensity		Status Quo	Greater Magnitude/Intensity ⇒	
	--	-	0	+	++
<b>1 Habitat</b>					
1-1 Anadromous Fish				+	
1-2 Resident Fish				+	
1-3 Introduced Species				++	
1-4 Wildlife					
1-5 Pred. Anad. Fish					
1-6 Watersheds				+	
1-7 Tributaries				+	
1-8 Mainstem Columbia				++	
1-9 Reservoirs					
1-10 Estuaries					
1-11 Water Quality				+	
<b>2 Harvest</b>					
2-1 Anadromous Fish		-			
2-2 Resident Fish		-			
2-3 Wildlife					
<b>3 Hatcheries</b>					
3-1 Anadromous Fish					
3-2 Resident Fish					
<b>4 Hydro</b>					
4-1 Dam Mod. & Facil.				++	
4-2 Hydro Operations		-			
4-3 Spill		-			
4-4 Flow				++	
4-5 Reservoir Levels		-			
4-6 Water Quality				+	
4-7 Juv. Fish Trans.					
4-8 Adult Fish Passage				+	
4-9 Flood Control					
<b>5 Power</b>					
5-1 Existing Gen.		-			
5-2 New Energy Res.					
5-3 Trans. Reliability					
<b>6 Industry</b>					
6-1 Industrial Dev.					
6-2 Alum. and Chem.					
6-3 Mining					
6-4 Pulp and Paper					
<b>7 Transportation</b>					
7-1 Navigation					
7-2 Trucking & Railroad				++	
<b>8 Agriculture</b>					
8-1 Irrigation		-			
8-2 Pest./Ag. Pract.		-			
8-3 Grazing		-			
8-4 Forestry					
<b>9 Commercial Fishing</b>					
<b>10 Resid./Comm. Dev.</b>					
		-			
<b>11 Recreation</b>					
				+	
<b>12 Tribes</b>					
12-1 Tribal Harvest					
12-2 Trad, Health, Spirit					

<sup>1</sup> Deviation is expressed as the projected amount of activity or shift in Policy Direction from Status Quo to address Key Regional Issues.

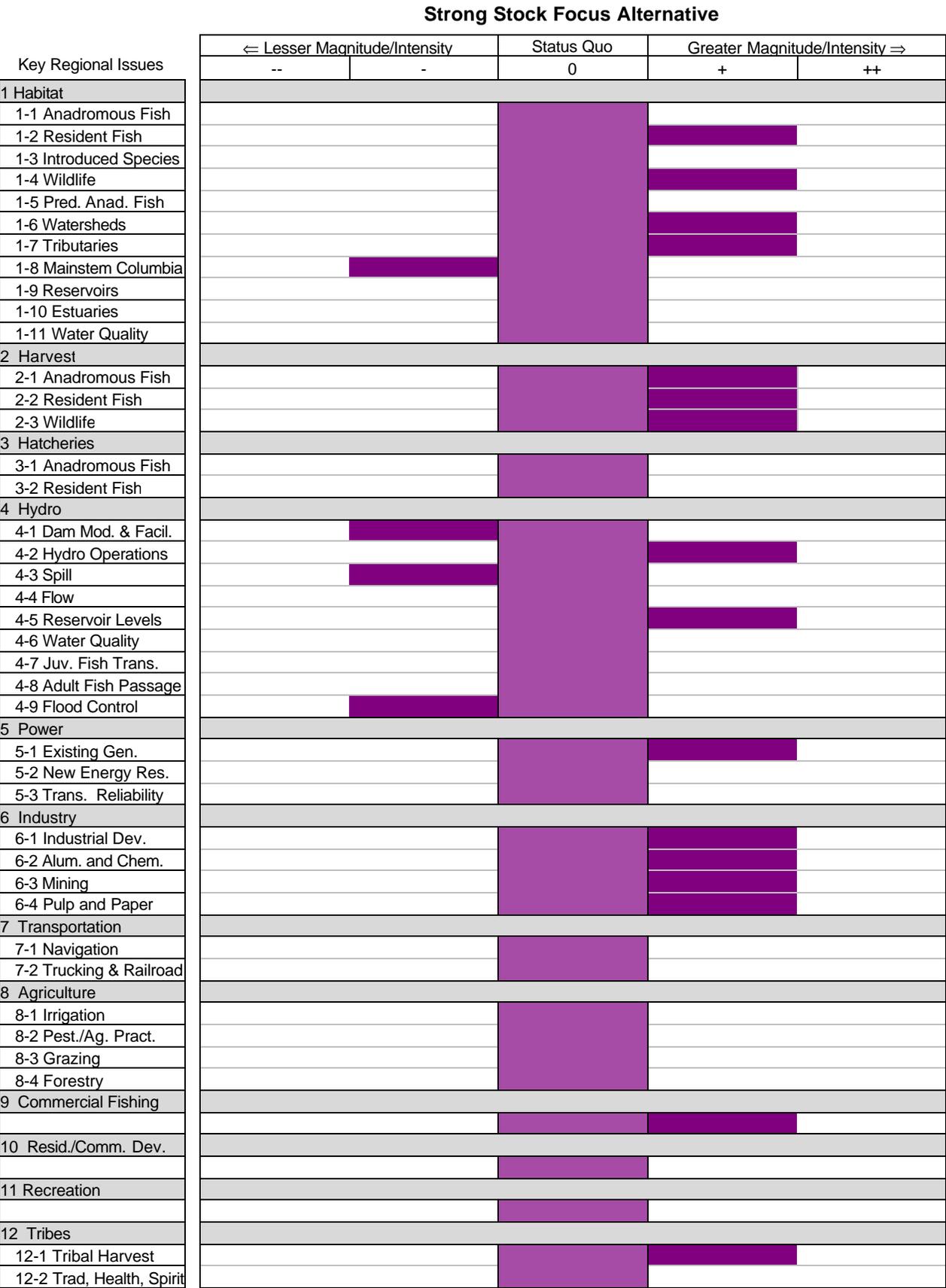
**Figure 5-22: Projected Deviation of Proposed Weak Stock Focus Policy Direction from Status Quo (No Action)**



**Figure 5-23: Projected Deviation of Proposed Sustainable Use Focus Policy Direction from Status Quo (No Action)**

Key Regional Issues	Sustained Use Focus Alternative				
	⇐ Lesser Magnitude/Intensity		Status Quo	Greater Magnitude/Intensity ⇒	
	--	-	0	+	++
<b>1 Habitat</b>					
1-1 Anadromous Fish					
1-2 Resident Fish					
1-3 Introduced Species					
1-4 Wildlife					
1-5 Pred. Anad. Fish					
1-6 Watersheds					
1-7 Tributaries					
1-8 Mainstem Columbia					
1-9 Reservoirs					
1-10 Estuaries					
1-11 Water Quality					
<b>2 Harvest</b>					
2-1 Anadromous Fish					
2-2 Resident Fish					
2-3 Wildlife					
<b>3 Hatcheries</b>					
3-1 Anadromous Fish					
3-2 Resident Fish					
<b>4 Hydro</b>					
4-1 Dam Mod. & Facil.					
4-2 Hydro Operations					
4-3 Spill					
4-4 Flow					
4-5 Reservoir Levels					
4-6 Water Quality					
4-7 Juv. Fish Trans.					
4-8 Adult Fish Passage					
4-9 Flood Control					
<b>5 Power</b>					
5-1 Existing Gen.					
5-2 New Energy Res.					
5-3 Trans. Reliability					
<b>6 Industry</b>					
6-1 Industrial Dev.					
6-2 Alum. and Chem.					
6-3 Mining					
6-4 Pulp and Paper					
<b>7 Transportation</b>					
7-1 Navigation					
7-2 Trucking & Railroad					
<b>8 Agriculture</b>					
8-1 Irrigation					
8-2 Pest./Ag. Pract.					
8-3 Grazing					
8-4 Forestry					
<b>9 Commercial Fishing</b>					
<b>10 Resid./Comm. Dev.</b>					
<b>11 Recreation</b>					
<b>12 Tribes</b>					
12-1 Tribal Harvest					
12-2 Trad, Health, Spirit					

**Figure 5-24: Projected Deviation of Proposed Strong Stock Focus Policy Direction from Status Quo (No Action)**



**Figure 5-25: Projected Deviation of Proposed Commerce Focus Policy Direction from Status Quo (No Action)**

Key Regional Issues	Commerce Focus Alternative				
	⇐ Lesser Magnitude/Intensity		Status Quo	Greater Magnitude/Intensity ⇒	
	--	-	0	+	++
<b>1 Habitat</b>					
1-1 Anadromous Fish					
1-2 Resident Fish					
1-3 Introduced Species					
1-4 Wildlife					
1-5 Pred. Anad. Fish					
1-6 Watersheds					
1-7 Tributaries					
1-8 Mainstem Columbia					
1-9 Reservoirs					
1-10 Estuaries					
1-11 Water Quality					
<b>2 Harvest</b>					
2-1 Anadromous Fish					
2-2 Resident Fish					
2-3 Wildlife					
<b>3 Hatcheries</b>					
3-1 Anadromous Fish					
3-2 Resident Fish					
<b>4 Hydro</b>					
4-1 Dam Mod. & Facil.					
4-2 Hydro Operations					
4-3 Spill					
4-4 Flow					
4-5 Reservoir Levels					
4-6 Water Quality					
4-7 Juv. Fish Trans.					
4-8 Adult Fish Passage					
4-9 Flood Control					
<b>5 Power</b>					
5-1 Existing Gen.					
5-2 New Energy Res.					
5-3 Trans. Reliability					
<b>6 Industry</b>					
6-1 Industrial Dev.					
6-2 Alum. and Chem.					
6-3 Mining					
6-4 Pulp and Paper					
<b>7 Transportation</b>					
7-1 Navigation					
7-2 Trucking & Railroad					
<b>8 Agriculture</b>					
8-1 Irrigation					
8-2 Pest./Ag. Pract.					
8-3 Grazing					
8-4 Forestry					
<b>9 Commercial Fishing</b>					
<b>10 Resid./Comm. Dev.</b>					
<b>11 Recreation</b>					
<b>12 Tribes</b>					
12-1 Tribal Harvest					
12-2 Trad, Health, Spirit					

### **5.3 ENVIRONMENTAL CONSEQUENCES OF POLICY DIRECTIONS**

With the information from Section 5.2 in mind—the potential environmental consequences of human activities as they relate to both fish and wildlife and to socioeconomic factors—we can now turn to the environmental consequences of implementing actions as they fall under each of the five Policy Directions. These environmental consequences result from the interactions of humans, fish, and wildlife, and the implementing actions.

The Status Quo Policy Direction (the "No Action" alternative) provides the baseline against which the other Policy Directions are compared. Status Quo represents the future if current policies are not changed. This future includes, among other important attributes, increasing human population, additional urbanization, continued ocean and tribal harvest, the existing hydrosystem with currently planned improvements, and existing fish and wildlife recovery and mitigation program efforts.

Fundamental areas of environmental consequences are *air, land, water, fish and wildlife, and social and economic effects*. This section addresses the general nature of the effects in each of these fundamental areas. Each section below will provide the following:

- an illustration of the anticipated environmental effect compared to environmental conditions in the Status Quo Policy Direction; and
- a brief description of why the effect occurs in relationship to conditions under the Status Quo Policy Direction.

First, environmental conditions under each Policy Direction are compared to environmental conditions in the Status Quo Policy Direction in a graphic format. The effects illustrated in the graphics are based on long-term effects (10 years or more). Major short-term effects are noted below the tables. Short-term effects will be examined in greater detail in future project-specific tiered RODs.

Shading is used to quickly show the reader whether the Policy Direction results in *more adverse, the same, or more favorable conditions* relative to the Status Quo policy. The ratings were assigned through a modified Delphi process using a panel of experts.<sup>35</sup> "Adverse" "same" or "favorable" are defined with respect to a particular perspective, either that of fish and wildlife, or human. The human perspective is meant to capture the human concerns—health, economic and social—that are beyond and separate from the human interest in fish and wildlife.

Environmental conditions under the Status Quo Policy Direction are briefly described, and other Policy Directions are compared to the Status Quo. The objective of this analysis is to describe the expected environmental conditions under the possible range of

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<sup>35</sup> Charles Alton, Roger Mann, Steve Mader, John Pizzimenti, Jean Edwards, Ben Underwood, Kathy Pierce. See List of Preparers for backgrounds.

implementing actions for the fish and wildlife recovery effort under each Policy Direction. The comparisons of the five Policy Directions to Status Quo are meant to show how the environmental consequences of each Policy Direction may differ from conditions in the Status Quo Policy Direction. This analysis *does not* try to make a value judgment on whether Status Quo or the current state of the environmental variables is good or bad.

The analysis in this DEIS is, by design, more qualitative than quantitative; this is a policy-level evaluation, not a site-specific one. Therefore, the analysis is based upon predictable *relationships* between changes to the environmental elements (land, air, water) and the consequence to 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. Any necessary site-specific analysis will be carried out when the actual implementation actions for the chosen Policy Direction are known. This clarifying information and the decision for the site-specific projects will then be tiered to the overall Policy Direction decision, as appropriate.

The Policy Directions include the 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 economic and social well-being. Therefore, for any Policy Direction, the same environmental consequences may be both beneficial and adverse, depending entirely upon whether the perspective is one of fish and wildlife or economics and social well-being. The reader is provided with a description of these trade-offs associated with each Policy Direction.

### **5.3.1 Source for Analysis**

Over the last several years, an enormous database of environmental analysis has been created. In our analysis, we sought to maximize the use of this existing database. Some of the most important sources are the Columbia River SOR EIS, the Lower Snake River Juvenile Migration Feasibility Study, and reports from the Multi-Species Framework Process and Federal Caucus. Other important sources include each of the relevant BiOps prepared by NMFS and USFWS in the region, BPA's Business Plan EIS, and the Forest Service/BLM's ICBEMP. Many environmental documents are incorporated by reference and are listed in Section 1.3.3 and in the bibliography.

This DEIS is a compilation of recent processes, each aimed at different facet of fish and wildlife conservation and recovery efforts, with the goal of placing relevant information before the public and decisionmakers in a structured manner to facilitate analyzing it together. For example, the Columbia River SOR FEIS considered alternatives to Columbia River system hydro operations and the effect of those changes on users of the system and the environment.<sup>36</sup> The SOR described the effects of each alternative system

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<sup>36</sup> USDOE/BPA, corps, and Bureau, 1995

operations by resource or subject area (e.g., air quality, water quality etc.). A more quantitative analysis of each alternative and its anticipated effects can be found in SOR Appendices A through O, separated by subject area. This analysis was instrumental in identifying the hydrosystem activities and potential effects for each subject area in this policy-level analysis. This DEIS is not designed to replace the SOR, but merely to incorporate its data in the consideration of a new Policy Direction that also includes an assessment of additional hydro-related actions outside the scope of the SOR, including habitat, harvest and hatchery actions.

The qualitative effects analysis below was provided by an informal panel of experts who are familiar with the existing database of environmental analysis. The experts reviewed the sample implementation actions, developed qualitative ratings, and met formally and informally with other experts to develop the ratings and the qualitative descriptions of how each rating was developed.

The use of multiple sources has been critical to the qualitative analysis used in this DEIS. It is recognized that comparison across the many studies and processes that have occurred in the last 10 years is somewhat ambiguous and subjective. Complexity arises because studies differ in the kinds of models and assumptions they use, e.g., different baseline conditions such as base years, biological and economic assumptions, and different hydrologic periods. We believe that the qualitative rankings will serve as a realistic if imprecise reflection of the results from these other sources.

Some environmental effects are described and labeled as “better” and “worse.” These terms are equivalent to the NEPA terms “beneficial” and “adverse.” They describe environmental consequences in the conventional terms as defined by NEPA. The use of these terms is not intended to place a value judgment on the outcome.

### **5.3.2 Natural Environment**

The Policy Direction ultimately selected and implemented by the Region will cause distinct environmental effects on the natural environment. Broad categories of effects that are evaluated in this DEIS include air quality, land (land use), water, and fish and wildlife. Where possible, the environmental impacts were evaluated and described for subcategories of effects. The anticipated effects associated with each Policy Direction are discussed in the subsequent sections of this chapter.

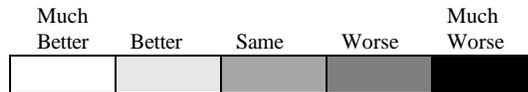
#### **5.3.2.1 Air Quality**

The table below shows how air effects would vary across the range of Policy Directions. Constituents of major concern are carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen (NO<sub>x</sub>), particulate matter (PM<sub>10</sub>), and sulfur dioxide (SO<sub>x</sub>). Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects on humans that are the same, greater, or less than, Status Quo. More air pollution is

characterized as worse in the table. Most of the effects are based on the Columbia River SOR FEIS.<sup>37</sup>

**Table 5.3-1A: Air Effects across the Policy Directions**

Effect Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
CO						
CO <sub>2</sub>						
NO <sub>x</sub>						
PM <sub>10</sub>						
SO <sub>x</sub>						



**Summary of Effects:** The table above clearly shows that air conditions would worsen under the Natural Focus, Weak Stock, and Sustained Use Policy Directions. The driving factor is that these Policy Directions would require more new thermal generation capacity to replace hydropower capacity lost by dam breaching. Increased coal generation would increase PM<sub>10</sub>, CO, CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> emissions. Additional combustion turbine plants would produce the same pollutants as coal, but at a rate much less per unit of energy produced because of greater efficiency (note: the reason SO<sub>x</sub> is present is that it used in the natural gas as an odor indicator). The Sustained Use Focus would modify operations enough to require some new capacity and breach only if necessary in the future. The Strong Stock and Commerce Focus Policy Directions would reduce losses of less-polluting power sources relative to existing conditions. The Commerce Focus would reduce the need for new generation capacity most of all, but CO<sub>2</sub> emissions might be increased somewhat by an increased level of economic activity. The Effect Area table for Air Quality below expands on this reasoning.

<sup>37</sup> DOE, 1995, Section 4.3

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

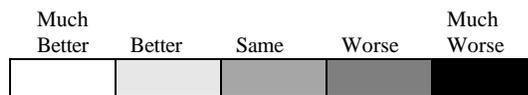
	<b>EFFECT AREA: AIR (POLLUTION)</b> More pollution = worse
<b>Existing Conditions</b>	Existing conditions of concern are mostly by-products of combustion engines used for transportation and thermal resources (e.g., coal and combustion turbines) used for power generation. Elements of major concern are carbon monoxide (CO), carbon dioxide (CO <sub>2</sub> ), nitrogen (NO <sub>x</sub> ), particulate matter (PM <sub>10</sub> ), and sulfur dioxide (SO <sub>x</sub> ).
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	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.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	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 <sub>10</sub> , CO, CO <sub>2</sub> , SO <sub>x</sub> and NO <sub>x</sub> 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.
<b>Weak Stock Focus</b>	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 <sub>10</sub> , CO, CO <sub>2</sub> , SO <sub>x</sub> and NO <sub>x</sub> 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.
<b>Sustained Use Focus</b>	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.
<b>Strong Stock Focus</b>	Restricts hydro operations less than under Status Quo; delays the need for replacement power and related air emissions.
<b>Commerce Focus</b>	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 <sub>10</sub> and CO <sub>2</sub> air emissions slightly. Overall, air emissions are likely less than under Status Quo.

**5.3.2.2 Land Use**

The table below shows how land uses would be affected by the Policy Directions. Land use effects include the following: quality of uplands for habitat; amount of new 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 a given Policy Direction would tend to have effects that are the same, greater, or less than, Status Quo, from the perspective of fish and wildlife. Reduced habitat or lower quality habitat is characterized as worse in the table.

**Table 5.3-2A: Land Use Effects across the Policy Directions**

Effects Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
Upland habitat quality						
Upland habitat amount						
Riparian/wetland habitat quality						
Riparian/wetland habitat amount						



**Summary of Effects:** The major differences across the Policy Directions would be evident in the habitat attributes of land resources. The methods, types, amounts, and results of land-based habitat maintenance and restoration would vary among the Policy Directions. All would include preservation or maintenance elements for existing, quality core habitat because they would be effective and relatively less expensive than restoration.

Natural Focus would decrease human intervention by substantially curtailing human disturbances, but benefits would be slow to accrue because natural systems would recover at an unassisted, natural rate. In some areas, especially riparian and wetland habitats, natural habitat features might not recover within the foreseeable future. The quantity of land habitat created is largest of any Policy Direction, because the most

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reservoirs are breached or drawn down, thereby exposing presently inundated land habitat. However, quality in the long run may not be the best possible.

Weak Stock would emphasize terrestrial and riparian/wetland habitat for listed species, especially in the Snake River corridor, estuary, and weak stock tributary areas. Aggressive active restoration would create better habitat in those areas, but the amount would not be as great as that under Natural Focus.

Sustained Use would be ambitious in area and scope, including preservation, passive restoration, and active restoration. Due to the blending of human interaction and fish and wildlife conservation and recovery, this Policy Direction, long term, would perform more quickly than under Status Quo.

Strong Stock Focus would preserve and maintain the habitat in healthy stock areas. For salmon, mainstem Columbia stocks would be emphasized. The terrestrial habitat quality would only slightly be improved over Status Quo.

Commerce Focus would ease restrictions on private property rights and encourage more development, especially on uplands. Human use of riparian areas would not be affected much because uses tend to be already established. Habitat improvements would emphasize positive incentives, trading of development rights and mitigation credits, and cost-effective practices. In the balance between development and habitat maintenance, the extent of habitat restoration would probably be less than for the Status Quo alternative. The Effect Area table for land below expands on this reasoning.

**Table 5.3-2B: Land Use Effects across the Policy Directions (Detail)**

	EFFECT AREA: LAND More habitat = better
<b>Existing Conditions</b>	Habitat conditions largely controlled by human influence. Use or development of some areas controlled or limited by regulation. Terrestrial habitat is spotty and is influenced by degradation by development, fragmentation, and increase in exotic species.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Increased development of native habitat and agricultural land to urban or other, more developed uses. Continue trend toward fragmentation, some increase in preservation of less-disturbed areas.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Lost and damaged fish and wildlife habitat would gradually and naturally return. Upland and riparian habitat restored by breaching. Emphasis on passive restoration and preservation, following a natural progression of fish and wildlife recovery without a specific target species. Terrestrial/riparian restoration by ceasing human land use activities such as farming, grazing, mining, and development in or encroaching upon pristine wilderness areas. Periodic natural disturbance events would reset restoration trajectories. Overall natural habitat improvement is much greater than under Status Quo.

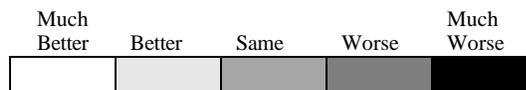
<b>Weak Stock Focus</b>	Immediate, substantial human intervention to preserve and restore lost habitat for weak native stocks, especially in areas designated critical habitat for threatened or endangered species. Some upland and riparian habitat restored by breaching. Mostly active and some passive habitat restoration used to obtain habitat features for weak stocks. Overall, much more habitat for weak native ESA-listed species, and some habitat for non-listed species would be preserved and restored.
<b>Sustained Use Focus</b>	Balanced approach for listed and non-listed stocks. Intensive effort to maintain and moderate effort to restore habitat. Focus on preservation and active management of essential habitats and ecosystems for more species. Would result in some areas being saved that would be developed in Status Quo. More active management might include more land shaping, removal of obstructions and other human artifacts, and wetlands creation. Strengthen habitat protection through improved management for agriculture, forestry, livestock grazing, mining, and road building. More habitat maintained than under the Status Quo.
<b>Strong Stock Focus</b>	Human intervention and focus on preserving existing habitat for healthy stocks where they occur. Strong Stock habitat would not be sacrificed for weak stocks but improved where most stocks could benefit. Emphasis on preservation, maintenance, and active management. Efforts would be more focused on quality of habitat than under Status Quo but overall would not increase the amount of habitat.
<b>Commerce Focus</b>	Land not preserved for habitat unless benefits exceed costs. Some existing terrestrial habitat would be developed for commercial interests. Federal, regional and state programs for habitat restoration would be limited and focused on the land most valuable for species and less valuable for commercial interests. Emphasis on private, cost-effective and efficient habitat preservation and creation. Use market incentives, such as tradable mitigation credits. Increase in artificial habitat or preservation as a trade against new development. Provide incentives (start-up grants, tax breaks, etc.) and technical assistance to encourage local landowners, businesses, corporations, and trustee agencies to improve and protect wetland, riparian and terrestrial areas. The amount of fish and wildlife habitat would likely be less than under Status Quo.

**5.3.2.3 Water**

The table below shows how water quality, instream water amounts, and reservoir habitat for fish and wildlife would be affected by the Policy Directions. Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same, greater, or less than, Status Quo. Creating water conditions that diminish the environment for fish and wildlife is characterized as worse in the table. Some water quality factors, such as more instream flow and dissolved oxygen, would be better for fish and wildlife. Other constituents, such as nitrogen supersaturation or sedimentation, would be worse.

**Table 5.3-3A: Water Effects across the Policy Directions**

Effects Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
Nitrogen Supersaturation						
Non-thermal Pollution						
Sedimentation <sup>38</sup>						
Temperature/ Dissolved Oxygen						
Instream Water Quantity						
Amount of Stream/River Habitat						
Reservoir Habitat						



**Summary of Effects:** The change in Policy Directions from Status Quo show gains or losses in water quality and amount of aquatic habitat. Natural Focus would attempt to achieve natural conditions by eliminating major human-made structures, pollution sources and human land uses affecting water resources. Sedimentation effects following breaching could be severe in the short term, but temporary, lasting for five to ten years. Passive, natural restoration might not achieve water quality potential over the short-to-medium term because ability to use storage to capture sediment and improve water quality would be lost. In the long term, water quality would improve over Status Quo. Artificial nitrogen supersaturation would be eliminated. Slackwater habitat would be eliminated in up to six mainstem reservoirs

Weak Stock would be similar to Natural Focus, but fewer dams would be breached and instead, improvements would emphasize Weak Stock tributaries. On the other hand, existing storage could be operated for flow and water quality purposes, so some short- and intermediate term improvements would be greater than Natural Focus.

<sup>38</sup> In scenarios involving a breach, the short-term effects of sedimentation could be enormous; however, over time these effects would stabilize.

Sustained Use includes no breaching in the short-term. Active restoration and reservoir management could achieve faster benefits in tributaries. Without breaching, most potential for water quality benefit on the mainstem involves operations and facility modifications. Strong Stock Focus effects would be similar to Status Quo because there would be comparable actions in water management. Commercial Focus would likely have some water quality degradation and reduced aquatic habitat quality in comparison to Status Quo.

**Table 5.3-3B: Water Effects across the Policy Directions (Detail)**

	EFFECT AREA: WATER (1): Nitrogen Super Nitrogen supersaturation More = worse
<b>Existing Conditions</b>	Nitrogen supersaturation is caused by spill over large dams. Existing structures and operations have not been planned to minimize nitrogen supersaturation problems
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Nitrogen supersaturation is being managed by controlled flow and spill operations and by flip lips at spillway ogees. Some excessive voluntary spill operations for weak stocks and spring migrations may continue to cause nitrogen supersaturation problems. Unless modernization of turbines and generators is implemented, failure of the units will cause substantial nitrogen supersaturation effects, as happened at Ice Harbor in 1995-1996. Attempt to manage spill at dams to keep gas levels within federal clean water guidelines will be partially attainable except in high flow years.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Several dams would be breached. The closer the return to a natural river, the less nitrogen supersaturation would remain a problem. A completely natural river (no dams anywhere) would return nitrogen supersaturation levels to those that would have occurred as a result of flow dynamics experienced for the given natural structures (e.g., water falls, rapids, etc.). Those dams that remained might elevate TDG locally over Status Quo situation.
<b>Weak Stock Focus</b>	The removal of some dams would eliminate saturated gas problem from those specific sites. Other dam operations, if they increased flows for weak stocks, would increase the levels of saturated gas exposure per above policies. Virtually all of the dams have been modified to minimize (not eliminate totally) the gas problem; a few remaining dams would be modified to reduce TDG.
<b>Sustained Use Focus</b>	Spill and flow regimes would be balanced with local clean water standards. In-river migration would only occur during high flow years when forced spill potentially creates better in-river migration conditions. Flip lips would keep dissolved gas levels within federal clean water guidelines to the extent possible. Nitrogen supersaturation, a problem even with improvements, would not be appreciably better than under Status Quo.
<b>Strong Stock Focus</b>	Healthy stocks might be less dependent on coordinated spill and flow schemes, and juvenile transportation might be used more to reduce spill further. The supersaturated gas problems would be less than under Status Quo.
<b>Commerce Focus</b>	Except in instances of flood control releases or large flows, spill would be minimized with a commercial focus. Therefore, saturated gas problems would be the same or less than under Status Quo.

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	<b>EFFECT AREA: WATER (2): Instream Water Quantity</b> More = better
<b>Existing Conditions</b>	Water withdrawals, especially storage and irrigation, reduce amount of river and stream habitat. Tributaries, more arid areas, and areas upstream of Snake River dams experience the most substantial adverse effects from water storage and withdrawals.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	There are some programs managing storage releases and acquiring water supplies from irrigation such as the 427,000 AF to augment Snake River flows. 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 will reduce water application per acre.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Substantially reduce existing surface water withdrawal through land retirement. Improve instream flows, reduce water temperature and improve water quality relative to Status Quo. Surface water screening and irrigation management would be used on many remaining diversions. Increase water conservation. Municipal withdrawals would continue but with intense efforts to meet increased conservation standards. Remaining storage would be managed to mimic natural flow conditions.
<b>Weak Stock Focus</b>	Irrigation and industrial withdrawals reduced where there are direct effects on weak stocks, but emphasis on irrigation management instead of retirement. Most reduction in Snake River system and in arid tributary regions in Central/Eastern Oregon and Washington. Irrigation and other withdrawals remain about the same as Status Quo elsewhere in region. Storage in weak stock habitat would emphasize weak stocks.
<b>Sustained Use Focus</b>	Water withdrawals reduced primarily through management and positive incentives. Irrigation land acquisition and management targeted for multiple purposes including water supply, water quality, and habitat. Focus on irrigated lands in historical riparian zone. Elsewhere, irrigation and other withdrawals managed to reduce or avoid adverse effects. Adopt strong water conservation programs and use saved water to replenish flows. Screen withdrawals. In most areas, some flow improvements relative to Status Quo.
<b>Strong Stock Focus</b>	Withdrawals managed to avoid future listing of healthy stocks. Screening, positive incentives, avoid new water supply depletions to maintain healthy stocks. Overall, withdrawals about the same as Status Quo.
<b>Commerce Focus</b>	Irrigation, industrial and municipal water withdrawals would increase more than under Status Quo to accommodate growing population, commercial and residential needs. Cost-effective and efficient screening might be used to avoid direct mortality of listed stocks. Use of storage and flows for fish would decrease in comparison to Status Quo.

	<b>EFFECT AREA: WATER (3): Non-thermal pollution</b> More = worse
<b>Existing Conditions</b>	Non-thermal pollution problems include municipal and industrial wastewater, run-off from mines, and non-point sources such as irrigation return flows, agricultural runoff, and stormwater. Problem constituents include organic matter, fertilizers, pesticides, sediment, and a large number of metals and chemicals.

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<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Increasing population and economic growth produces additional pollution, but existing and planned laws and programs, technological improvement, the characteristics of new industry and decline of old industries all combine to reduce pollution. Net effect is that pollution increases from existing levels, but rate of increase may be less than rate of population growth.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Improve water quality by eliminating sources of pollution overall. Eliminate discharges of other contaminants to meet more stringent water quality criteria. Strong new —controls on wastewater and other point and non-point sources. Increased water quality standards along with stronger enforcement. Non-thermal pollution would be better than under Status Quo.
<b>Weak Stock Focus</b>	Improve water quality by actively pursuing reductions in pollution that accumulate in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for listed anadromous and resident fish. Increase enforcement of water quality standards for pollutants in critical habitat of weak stocks. Take more action in agricultural management and residential/commercial development to reduce non-point sources in weak stock tributaries. Agricultural management, as well as residential/commercial treatments, would reduce use of pesticides and chemicals and reduce runoff from irrigated, dryland and grazing land. There would be a reduction in non-thermal pollution over Status Quo.
<b>Sustained Use Focus</b>	Manage and enforce existing water quality standards throughout region. Manage for multiple purposes including water quality. Riparian land acquisition and active restoration would reduce upslope non-point contribution. Use positive incentives, monitoring and enforcement to reduce point and non-point pollution. Overall, there would be some reduction in pollution over Status Quo due to the regionwide application of the standards and clean up efforts.
<b>Strong Stock Focus</b>	Manage existing water quality standards throughout region to benefit healthy stocks. Focus enforcement in areas occupied by strong stocks. Overall, slight reduction in pollutants in comparison to the Status Quo.
<b>Commerce Focus</b>	Manage existing water quality standards to ensure health and safety of human use and consumption. Some use of positive incentives, some additional pollution allowed, trading of pollution credits allowed to accommodate industrial growth. Pollution controls must be efficient. Non-thermal pollution may become somewhat worse than under Status Quo.

<b>POLICY DIRECTION</b>	EFFECT AREA: WATER (4) Sedimentation More = worse
<b>Existing Conditions</b>	Sedimentation from erosion due to land disturbances including agriculture, grazing, and urban development. Much sediment is captured and accumulates behind existing dams.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	About the same as existing conditions, or gradual improvement as current water quality standards, BMPs and new TMDLs are applied across the land base. Increase in urbanization may increase sedimentation, but other changes in land use practices (conversion to tree, vine, and other permanent crops, agricultural and grazing management; practices to control sediment during construction) may provide some compensation.

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	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Sediment increase downstream from breached facilities for 5-10 years as accumulated reservoir sediments are flushed downstream. This effect would be temporary. Agricultural land retirement and reduction in other human uses reduces sediment loads over the long term relative to Status Quo.
<b>Weak Stock Focus</b>	Similar to Natural Focus, but the amount of breaching is less, and there is less land retirement. Sediment loads decline to natural rates in weak stock tributaries through active management and aggressive land retirement. Conditions improve overall relative to Status Quo.
<b>Sustained Use Focus</b>	No breaching in the short term. Water erosion and sedimentation reduced throughout the basin as part of balanced and more active land use management. Active spawning gravel, streambank, and riparian management may have temporary, adverse effects, but with rapid recovery of stable ground surfaces. Overall, the sedimentation may improve somewhat compared to Status Quo.
<b>Strong Stock Focus</b>	Strong stocks require minimal flow and spill regimes and only moderate additional land management compared to Status Quo. Therefore, sedimentation effects minor. Sedimentation would be about the same as Status Quo.
<b>Commerce Focus</b>	Sedimentation will increase as urbanization, agricultural and commercial development increase, but minimally would comply with water quality standards. Prime watersheds probably would improve. Sediment controls must be efficient (benefits exceed costs). The overall sedimentation may get worse than under Status Quo due to development.

	<b>EFFECT AREA: WATER (5): Temperature/Dissolved Oxygen higher = worse</b>
<b>Existing Conditions</b>	Water temperatures and low dissolved oxygen are a seasonal problem for anadromous fish in the mainstems (Columbia and Snake) and tributaries. Mainstem problems are associated with dry years, low flows, long retention times, and warm weather. Thermal pollution from industrial discharges also contribute. Tributary problems can be more closely 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.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	About the same as existing conditions. Revised regional water quality standards and TMDLs for impaired watersheds should bring about gradual improvement. Water temperature/dissolved oxygen conditions could be affected by global warming.
	<b>Effect in Comparison to the Status Quo Condition</b>
<b>Natural Focus</b>	A return to a natural river, natural tributaries, land retirement and strong thermal pollution controls could gradually help recreate presettlement water temperature ranges, including normal fluctuations for the rivers affected. Upstream reservoirs (upper Columbia, upper Snake, Clearwater) would have to be managed for flow in dry years to avoid downstream problems. Less opportunity for solar heating. Fewer opportunities to control temperature through controlled releases. Overall, both temperature and dissolved oxygen would be somewhat better than under Status Quo, but conditions would be worse or not improved in very dry conditions.

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	EFFECT AREA: WATER (5): Temperature/Dissolved Oxygen higher = worse
<b>Weak Stock Focus</b>	Similar to Natural Focus, but less dam breaching, with more aggressive management measures focused in weak stock areas, and more management of irrigation, as opposed to land retirement. Gains could be greatest where weak stocks are correlated with water-quality-impaired waters. Remaining storage could be used to improve conditions in very dry or hot weather. The temperature and dissolved gas problems would be improved over Status Quo in weak stock watersheds.
<b>Sustained Use Focus</b>	Active balanced management tries to reduce water temperatures in many tributaries. Actions may include systemwide 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 little effect on mainstem in the short term. Temperature control structures or improved mixing zones on mainstem and upstream tributary facilities might help. Overall, temperature and dissolved gas would likely be about the same as Status Quo or slightly better.
<b>Strong Stock Focus</b>	Techniques to cool water or manage dissolved oxygen would be implemented only if healthy stocks were harmed by existing flows, temperature or aeration. Overall, water temperatures and dissolved gas would remain about the same as Status Quo.
<b>Commerce Focus</b>	Manage thermal pollution to insure health and safety of human needs and consumption. Any temperature or gas control must be cost-effective, and much would be regulatory driven. Temperature in prime watersheds might improve. Overall, temperatures and dissolved oxygen may be slightly worse than under Status Quo.

	EFFECT AREA: WATER (6): Amount of Stream/River Habitat more = better
<b>Existing Conditions</b>	Amount of stream and river habitat is a function of highly regulated river system, areas blocked by structures, and land and water use activities.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	About the same amount of stream and river habitat as under Existing Conditions.
	<b>Effect in Comparison to the Status Quo Condition</b>
<b>Natural Focus</b>	Much more stream and river habitat created by breaching or drawdown of up to six reservoirs and removal of some dams on tributaries.
<b>Weak Stock Focus</b>	More stream and river habitat created by breaching of four Lower Snake reservoirs and removal of some dams on tributaries. More stream/river habitat relative to Status Quo.
<b>Sustained Use Focus</b>	About the same as Status Quo because no major changes in river management, land use practices would be involved.
<b>Strong Stock Focus</b>	Overall, about the same as Status Quo because actions would emphasize healthy stocks, while weaker stocks would be de-emphasized.
<b>Commerce Focus</b>	About the same as or less than under Status Quo because only cost-effective actions would be taken.

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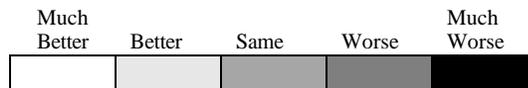
	EFFECT AREA: WATER (7): Amount of reservoir habitat more=better
<b>Existing Conditions</b>	Amount of reservoir habitat is determined by dams in place and their associated storage and operations
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	About the same amount of reservoir habitat
	<b>Effect in Comparison to the Status Quo Condition</b>
<b>Natural Focus</b>	Reservoir habitat lost in four Lower Snake reservoirs, and habitat substantially impaired in John Day and McNary pools.
<b>Weak Stock Focus</b>	Reservoir habitat lost in four Lower Snake reservoirs.
<b>Sustained Use Focus</b>	About the same as Status Quo because no major changes in reservoir habitat would occur
<b>Strong Stock Focus</b>	Overall, about the same as Status Quo because no major changes in reservoir habitat would occur.
<b>Commerce Focus</b>	About the same as or maybe slightly more than under Status Quo, because no major changes in reservoir habitat would occur.

**5.3.2.4 Fish and Wildlife**

The table below shows how anadromous fish, reservoir fish, and other resident fish and wildlife would be affected by the Policy Directions. Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same, greater, or less than, Status Quo from the perspective of fish and wildlife. A population increase of the identified classification of fish and wildlife characterized as better in the table.

**Table 5.3-4A: Fish and Wildlife Effects across the Policy Directions**

Effects Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
Natural Spawning Native Anadromous Fish						
Hatchery Produced Native Anadromous Fish						
Native Resident Fish						
Non-native species						
Native Wildlife						



**Summary of Effects:** The Status Quo assumes an increasing human population and increased pressures on native fish and wildlife. Habitat, hydro, hatcheries, and harvest would be regulated by ESA actions and other existing laws as described in Chapter 2. The Status Quo includes existing hatcheries, existing harvest regulations, a continuation of existing habitat and hydro programs, and some control of exotics and noxious weeds through existing programs.

Natural Focus would remove existing human disturbances, and turn land and water back toward an earlier, undeveloped condition. Human population growth would be kept from encroaching on the fish and wildlife habitat. Natural and Weak Stock Focus include some dam breaching, which would restore natural river conditions and recover bottomlands for habitat. Native species would benefit, but the increase in natural aquatic habitat would be detrimental to exotic and slackwater species. Hatchery production would be phased out.

Weak stock would be similar to Natural Focus, but fewer hatcheries would be eliminated, and most good habitat for non-native and slackwater species would remain in mainstem reservoirs. Most hatchery fish and native species would benefit from reduced harvest, active and passive habitat restoration, and substantial hydrosystem modifications.

The Sustained Use Focus would benefit fish and wildlife somewhat by habitat restoration and preservation, and emphasis on whole-ecosystem approach. Active and passive management would be used. Most native species would benefit. Exotic species would be actively managed, and would not do as well as in Status Quo. The Strong Stock Focus would not change much relative to Status Quo, except that some weak stocks would be lost. The Commerce Focus would reduce the amount of resources committed to fish and wildlife restoration, but some species could benefit because resources might be spent more effectively. Valuable fish and wildlife species would be supported by user fees and artificial production. The Effect Area table for fish and wildlife below expands on this reasoning.

**Table 5.3-4B: Fish and Wildlife Effects across the Policy Directions (Detail)**

EFFECT AREA: FISH AND WILDLIFE (1): Natural and Hatchery Native Anadromous Fish	
<b>Existing Conditions</b>	Many stocks listed as threatened or endangered, few wild stocks are healthy. 80-90% of chinook supported by hatcheries.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Major policies are defined by mitigation requirements, Regional Act, ESA, tribal fishing rights, international treaties. Arguably, anadromous fish populations are expected to vary erratically, driven by ocean and freshwater harvest, ocean and freshwater survival conditions, weather cycles, ESA in near term.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Restoration to natural land and water conditions, phase-out of hatcheries, and elimination of most harvest. Would likely recover natural spawning

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	<b>EFFECT AREA: FISH AND WILDLIFE (1): Natural and Hatchery Native Anadromous Fish</b>
	anadromous fish and lamprey 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), and some genetic stocks are permanently lost. Even with maximum actions, it is likely that fish populations would not approach pre-European immigration levels. However, over the long term, abundance of natural spawning fish and associated harvest should be much better than under Status Quo.
<b>Weak Stock Focus</b>	Weak-stock actions, including habitat improvements, harvest controls and hatchery management, would increase populations of weak native stocks. Populations would not increase to pre-European immigration levels. Natural spawning and hatchery fish would be more abundant than under Status Quo over the long term.
<b>Sustained Use Focus</b>	Full potential unknown; limited by existing dams and lack of spawning habitat. Population sizes vary substantially due to natural and human-caused factors. Harvest and hatcheries would be controlled to accommodate changes in population status. Less hatchery production and harvest overall. Natural and hatchery fish would increase with habitat, hatchery, and harvest improvements.
<b>Strong Stock Focus</b>	Run sizes similar to today's. Mainstem Columbia River stocks emphasized. Harvest and hatcheries would be driven by healthy stocks. Some weak stocks, especially in tributaries, likely to become extinct. Also applies to lamprey.
<b>Commerce Focus</b>	De-emphasize importance of native stocks. Some weak stocks may become extinct. Focus on producing a commercially viable salmon harvest and related industries using least-cost production, primarily hatcheries and fish farming. Mainstem species focus (fall chinook). Total run size might increase even if natural spawning runs decrease. Overall numbers similar to Status Quo.

	<b>EFFECT AREA: FISH AND WILDLIFE (2): Native Resident Fish</b>
<b>Existing Conditions</b>	Native resident fish include bull trout, redband trout, other native salmonids, sturgeon.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions. Some populations continue to decline
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Much improvement in conditions for native species. Improvements limited by slow pace of passive restoration, historical losses, and continued presence of human disturbances.
<b>Weak Stock Focus</b>	Somewhat similar to Natural Focus. Native weak stocks receive special attention. Not as much restored habitat but better quality for weak stocks.
<b>Sustained Use Focus</b>	Emphasis remains on listed species, but non-listed native fish benefit from habitat and hydrosystem actions. Native species improve relative to Status Quo unless limited by anadromous fish weak stock requirements.
<b>Strong Stock Focus</b>	Healthy stocks of native species do better than under Status Quo. Overall, some weak stocks may continue to decline while healthy stocks improve.
<b>Commerce Focus</b>	Comparative commercial value of fish, wildlife and commercial uses will control species management. Conditions similar to Status Quo.

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<b>EFFECT AREA: FISH AND WILDLIFE (3): Non-native Species</b>	
<b>Existing Conditions</b>	Non-native species include shad, striped bass, smallmouth and largemouth bass, and include other species such as introduced invertebrates.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions. Some exotic, often harmful populations continue to increase.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Dramatic reduction of many non-native fish species due to dam breaching. Survival conditions for introduced species decline compared to Status Quo.
<b>Weak Stock Focus</b>	Somewhat similar to Natural Focus. Non-native species frequently sacrificed for the needs of listed anadromous and resident species. Population less than under Status Quo.
<b>Sustained Use Focus</b>	Emphasis remains on listed species. Non-native fish are actively managed and reduced to benefit listed species. About the same as Status Quo.
<b>Strong Stock Focus</b>	Non-native fish populations might increase because reservoirs are managed for all valuable species.
<b>Commerce Focus</b>	Comparative commercial value of fish, wildlife and commercial uses will control species management. Some non-native species allowed or encouraged. More non-native fish than under Status Quo.

<b>EFFECT AREA: FISH AND WILDLIFE (4): Native Wildlife</b>	
<b>Existing Conditions</b>	This category includes all native wildlife. Some species are listed as threatened or endangered, others are substantially diminished in population, some have healthy populations, and some have done well in modified habitats.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	ESA protections expected to keep most threatened and endangered species from extinction for foreseeable future. Listed species managed through federal ecosystem management policies and private initiatives. Many species adversely affected by economic growth and urbanization.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Land retirement and passive restoration would benefit many wildlife species in the long run. Human population and influences likely to decline or grow slower than in Status Quo, thus benefiting wildlife. New riparian and terrestrial habitat created from former reservoir bottoms.
<b>Weak Stock Focus</b>	Habitat improvements for threatened and endangered species increased. Some non-listed species helped incidental to weak stock protections. Weak populations of wildlife may receive specific benefits in terms of habitat improvement, especially if their condition is affected by the existing hydrosystem. Overall, better conditions than under Status Quo.
<b>Sustained Use Focus</b>	Needs of the listed species balanced against the needs of all species. More habitat, better management. Approach should benefit wildlife species more than under Status Quo.
<b>Strong Stock Focus</b>	Active habitat maintenance focus. Would maintain existing viable wildlife populations within socially acceptable ranges. Manage non-listed wildlife to keep existing populations strong. Overall, benefit similar to Status Quo.
<b>Commerce Focus</b>	Wildlife would be managed like a commodity. More user fees for hunting and fishing used to improve habitat for valuable species. Fish and wildlife measures selected for implementation based on benefit and cost analysis. Maximize the public benefit from expenditures of finite wildlife enhancement

	<b>EFFECT AREA: FISH AND WILDLIFE (4): Native Wildlife</b>
	funds. Emphasize benefits and costs of artificial propagation. Benefits to wildlife would be greatest in “prime” watersheds. Increases in urbanization and industrialization would cause negative effects. Overall, emphasis on commercial interest would be about neutral to wildlife.

**5.3.3 Social and Economic Environment**

This discussion is focused on commercial activities and social consequences most directly associated with fish and wildlife concerns. The shading used to indicate adverse and beneficial effects is based completely on a human perspective, exclusive of human values related to fish and wildlife populations or habitat recovery. Broad categories of effects that are evaluated in this DEIS include commerce, tribes, funding, cultural/historical resources, and aesthetics. Where possible, the environmental effects were evaluated and described for subcategories of effects where the analysis allowed. These effects are evaluated, respectively, from the perspective of economics, tribal concerns, people who pay for fish and wildlife restoration, cultural and historical resource protection, and human aesthetic values.

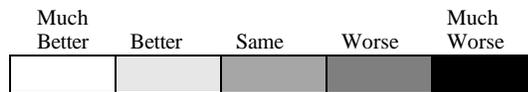
**5.3.3.1 Economics**

The table below shows how commerce, industry, and employment would be affected by the Policy Directions. Effects are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same, greater, or less than Status Quo. All economic costs and benefits are from the perspective of persons affected by the industry, including owners, workers, consumers, and people who sell to each industry. Less economic cost is characterized as better in the table. Employment effects for all industries are summarized as a separate economic effect.

**Table 5.3-5A: Economics Effects across the Policy Directions**

<b>Effects Subcategory</b>	<b>Status Quo</b>	<b>Natural Focus</b>	<b>Weak Stocks</b>	<b>Sustained Use</b>	<b>Strong Stocks</b>	<b>Com. Focus</b>
<b>Commercial Interests</b>						
Power						
Transmission						
Transportation						
Agriculture and Forestry						
Commercial Fish Harvest						

<b>Effects Subcategory</b>	<b>Status Quo</b>	<b>Natural Focus</b>	<b>Weak Stocks</b>	<b>Sustained Use</b>	<b>Strong Stocks</b>	<b>Com. Focus</b>
Other industry (esp. mining, forest products, DSIs)						
<b>Recreation</b>						
Sport Fishing and Wildlife Harvest						
Other Recreation						
<b>Economic Development</b>						
Industrial, Residential & Commercial Development						
Employment						



**Summary of Effects:** Most long-term effects of commercial economic activities involve hydropower, transportation, agriculture, forestry, commercial fisheries and a variety of natural resource and allied industries. The Natural Focus Policy Direction would have very adverse effects on all of these industries in the long run. The Weak Stock Policy Direction has adverse effects, but not as much as Natural Focus. The Sustained Use and Strong Stock Policy Directions have beneficial effects on commercial and recreational fisheries, but effects on other industries are mixed. The Commerce Focus Policy Direction would benefit most industries. These effects are described in greater detail in the commerce table below.

**Table 5.3-5B: Economics Effects across the Policy Directions (Detail)**

	EFFECT AREA: COMMERCE (1): Power less = worse
<b>Existing Conditions</b>	Electricity losses from operations for endangered fish and other fish and wildlife operations. Power losses in FCRPS from fish and wildlife actions are currently about \$160 million annually.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	With population growth, revenues increase relative to recent conditions, as does the need for power.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Hydropower taken off-line, replaced with non-hydro power generation. Framework Alternative 1 (Lower Snake dams, John Day, McNary to natural river levels) reduced value of power by \$590 million compared to Status Quo. Total costs, including deconstruction, could be around \$1 billion annually. Very large adverse effects compared to Status Quo.
<b>Weak Stock Focus</b>	Loss of some hydro facilities due to breaching and additional limits on power generation at existing facilities. Annual power loss from breaching lower Snake River dams would be about \$250 million annually compared to Status Quo. Total cost, including deconstruction, could be up to \$350 million annually. Non-hydro power would become competitive sooner. Large adverse effects compared to Status Quo.
<b>Sustained Use Focus</b>	Limits on generation at existing facilities. Use flow, spill, drawdowns, peak efficiency turbine operation, and facility modifications to improve in-river juvenile salmon survival; avoid fluctuations caused by power peaking operations. Some hydropower losses compared to Status Quo.
<b>Strong Stock Focus</b>	Operations for weak stocks under Status Quo may not be needed. Some hydropower effects for operations to sustain currently productive populations. Overall, cost is less than under Status Quo.
<b>Commerce Focus</b>	Law of supply and demand would dictate power mix; however, hydropower would likely be increased compared to Status Quo. Reduce ineffective flow augmentation and harmful spill at hydroelectric dams. Framework Alternative 7 increased value of electricity by \$250 million annually compared to Status Quo. Therefore, cost is much less than under Status Quo.

	EFFECT AREA: COMMERCE (2): Transmission more = worse
<b>Existing Conditions</b>	Current transmission system
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Some increase in transmission costs to cover population growth
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Major transmission improvements required after six dams are breached.
<b>Weak Stock Focus</b>	Major transmission improvements required after four dams are breached
<b>Sustained Use Focus</b>	Important transmission improvements required
<b>Strong Stock Focus</b>	Similar to Status Quo. Some presently planned projects deferred
<b>Commerce Focus</b>	Some presently planned projects deferred. Some transmission cost savings in the future.

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	EFFECT AREA: COMMERCE (3): Transportation less = worse
<b>Existing Conditions</b>	Shallow draft navigation to Lewiston, Idaho
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Same as existing conditions
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Barging eliminated downstream to last dam breached. Other forms of transportation are more expensive, requiring new infrastructure. Other adverse effects on highways, rails, pipelines, and other transportation corridors, but population demands for new transportation also decreased. Very large adverse effects compared to Status Quo.
<b>Weak Stock Focus</b>	Barging eliminated downstream to last dam breached, possibly Ice Harbor. Other forms of transportation are more expensive, requiring new infrastructure. Other transportation development affected in weak stock tributaries. Large adverse effects compared to Status Quo.
<b>Sustained Use Focus</b>	As there would be no immediate breaching, navigational effects would be delayed, possibly indefinitely. Some increases in other transportation costs.
<b>Strong Stock Focus</b>	No breaching. Little effect on other transportation.
<b>Commerce Focus</b>	Market forces would decide future of barging versus other means of transportation; however, as the system is already in place, maintain barging and navigation. Some benefits from reservoir operations and more efficient navigation lock operations, improved dredging. Some benefits for transportation.

	EFFECT AREA: COMMERCE (4): Agriculture and Forestry less = worse
<b>Existing Conditions</b>	Agriculture largely controlled by world market conditions. Economics and USDA conservation programs provide positive incentives for conserving uses and practices on private grazing and farmlands. Irrigation water permits controlled by states and the Bureau. Grazing and forestry on public lands limited by multiple use, ESA, CWA and other mandates.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	About the same as existing conditions. Gradual improvement as modern best management practices are applied to an increasingly larger land base.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Much farmland retired, and strong management incentives on remaining land increase costs and reduce productivity. Grazing and forestry cost increase, and production reduced on private lands. Uncertain to what extent costs would be paid by landowners, ratepayers, or taxpayers. Grazing and forestry on public lands largely eliminated; losses paid by users. Increased transportation costs due to loss of barging and less efficient road network. Pump/diversion modifications near breached reservoirs would be required for continued diversions. Most agricultural costs cannot be passed to consumers because prices are set in national or international markets. Very large adverse effects compared to Status Quo.
<b>Weak Stock Focus</b>	Similar to Natural Focus, but geographic coverage limited to weak stock habitat, and less land retirement used. Increased transportation costs higher due to loss of barging and less efficient road network. Pump/diversion modifications near breached reservoirs would be required for continued diversions. Large adverse effects compared to Status Quo.

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<b>Sustained Use Focus</b>	Land retirement, land management, technology applied to make agricultural and forestry practices more compatible with fish and wildlife. Some land retirement used where cost-effective. Not clear to what extent costs paid by landowners, ratepayers or taxpayers. Overall, potentially similar to Status Quo.
<b>Strong Stock Focus</b>	Increase irrigation activity due to relaxing of restrictions, elimination of current irrigation water acquisitions in weak stock habitats. Some new agriculture near healthy stock habitat might not be allowed to develop. Allows some flexibility for compatible forestry practices. Overall, potentially similar to Status Quo.
<b>Commerce Focus</b>	The market will dictate the future viability of agriculture in the region. Existing irrigation maintained and increased consumptive use of Columbia Basin water allowed. Dry land and irrigated farming will increase if market forces permit. . Increased forest harvest and grazing allowed compared to Status Quo. Overall, potentially greater commercial benefits than under Status Quo.

	<b>EFFECT AREA: COMMERCE (5): Commercial Fish Harvest</b> less = worse
<b>Existing Conditions</b>	Columbia Basin salmon harvested in U.S., Canada and Alaska ocean fisheries, and in mainstem Columbia River and tributary freshwater fisheries. Harvest seasons and catch have been reduced compared to historical conditions. Commercial fishing associated industries: ocean commercial troll, ocean and in-river sport charter boat and Columbia River commercial gillnet.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions, but harvest may be reduced more to comply with planned ESA and Pacific Salmon Treaty actions. Increased emphasis on protecting threatened, endangered, native fish and wildlife, reducing the economic benefits to local communities, industries, gear manufacturers, etc.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Most ocean and Columbia River harvest eliminated, at least for the short term. Increase in targeted/selective harvest of known stocks, primarily in tributaries. Overall, commercial fishing much worse than under Status Quo for the short term as hatcheries are phased out. Some fishing allowed in the long term, less commercial value than under Status Quo.
<b>Weak Stock Focus</b>	Most ocean harvest eliminated unless weak stocks can be differentiated. Hatchery production curtailed, contributing to extreme restrictions on any commercial harvest that may further endanger weak stocks. Increase in targeted/selective harvest, but less commercial value overall compared to Status Quo.
<b>Sustained Use Focus</b>	Continued restrictions on any commercial harvest that may further endanger weak stocks. Possible increased harvest of other stocks as they recover. Increase in targeted/selective harvest. Direct harvest toward hatchery fish and away from healthier wild stocks. Overall, commercial value may increase relative to Status Quo.
<b>Strong Stock Focus</b>	Constrain commercial harvest only to the extent it interferes with naturally sustaining populations of healthy stocks. Direct harvest toward hatchery fish and away from healthier wild stocks. Overall, commercial fish value may increase relative to Status Quo.
<b>Commerce Focus</b>	Market will control commercial harvest techniques, limitations, and management. Losses of production from upstream areas would be offset by increased hatchery and fish farm production in the lower river and estuary.

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	EFFECT AREA: COMMERCE (5): Commercial Fish Harvest less = worse
	With fish farming and more efficient hatcheries, net economic value of fish production would increase.

	EFFECT AREA: COMMERCE (6): Other Industry less = worse
<b>Existing Conditions</b>	Mining, aluminum products, and pulp and paper industries increasingly affected by environmental requirements. Services and government sectors are being increased by environmental requirements.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Continued trends to less natural resource industries and more services and government.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Many existing industries, especially aluminum, would be severely affected by shortage of affordable and reliable electricity. Strong incentives provided for “clean” industry, pollution abatement, and reduced development. Strong limits to new mining and most existing mining. Active and passive restoration at abandoned mine locations. Overall, effects are very adverse.
<b>Weak Stock Focus</b>	Many existing industries affected by more expensive and less reliable electricity. Strong incentives for “clean” industry, pollution abatement and reduced development in weak stock watersheds. New and existing mining limited in weak stock habitats. Most mine restoration in weak stock watersheds is active. Overall effects are adverse
<b>Sustained Use Focus</b>	Industries affected by more expensive and slightly less reliable electricity. Incentives for environmentally friendly industry and development. Mine site active restoration. Increase in services and government employment to implement intensive programs. Overall effects are adverse
<b>Strong Stock Focus</b>	Industry would benefit from slightly more affordable and reliable power compared to Status Quo.
<b>Commerce Focus</b>	River management would be tailored to needs of industrial sector; thereby, increasing industry presence. Aluminum and mineral production costs reduced.

	EFFECT AREA: COMMERCE (7): Sport Fish & Hunting less = worse
<b>Existing Conditions</b>	Sport fishing industries centered on reservoirs and rivers supported primarily by hatchery production, and on ocean and freshwater recreational fishing for salmonids. Regulation to protect threatened, endangered, native, and strong species of fish and wildlife.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions, but increased emphasis on protecting threatened, endangered, native fish and wildlife, reducing the economic benefits to local communities, tourism industries, gear manufacturers, guides, etc. Inland fish and wildlife harvest and ocean sport fishing opportunities may be further reduced, with economic effect on inland and coastal communities.

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	EFFECT AREA: COMMERCE (7): Sport Fish & Hunting less = worse
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Stop all harvest of wild fish and wildlife in the short term with substantially greater negative impacts on tourism, sport-fishing and hunting industries than under Status Quo. In long run, with much less hatchery production, anadromous fish harvest allowed for fish in excess of naturally sustaining populations. Most anadromous fish sport fishing converted to catch-and-release, sport harvest targeted at eliminating non-native species of fish and wildlife. Overall, less economic benefit compared to Status Quo.
<b>Weak Stock Focus</b>	Restrict harvest that risks further endangering weak species of fish and wildlife. Manage catch to protect weak stocks by stopping all harvest of wild fish. Some catch-and-release fishing in weak stock tributaries may be feasible, off-setting some economic consequences. Overall, less economic benefit compared to Status Quo.
<b>Sustained Use Focus</b>	Restrict methods that risk further degrading weak fish and wildlife species. Promote harvest of non-native species. Manage harvests for ecosystem benefits. Economic benefits to sport fishing and hunting industries may be better than under Status Quo.
<b>Strong Stock Focus</b>	Constrain recreational harvest only to the extent it interferes with naturally sustaining populations of healthy fish and wildlife stocks. Support recreational fish harvest with hatchery production. Possible increase in value of sport fishing and hunting relative to Status Quo.
<b>Commerce Focus</b>	Increase economical sport fishing opportunities using hatcheries. Use non-native species where demanded. Market will control recreational fish and wildlife harvest techniques, limitations and management. Fishers and hunters pay user fees to cover production and other costs. Protect fish and wildlife habitat to preserve hunting and fishing opportunities if benefits exceed costs. Overall, about the same as Status Quo.

	EFFECT AREA: COMMERCE (8): Other Recreation less = worse
<b>Existing Conditions</b>	Affected recreation includes boating on reservoirs and rivers, swimming, other water sports, and terrestrial outdoor recreation such as hiking, other use of trails, camping, and sightseeing and tourism.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Outdoor recreation industry and tourism will continue to grow with the overall economy, maybe faster than the overall economy.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Breaching dams will cause local loss of reservoir recreation. Lost jobs and revenue until new forms of recreation are established. Floating, canoeing, and other river boating opportunities increased in the long run. Some of the formerly inundated land may be available for recreation. Some land acquired for habitat would have limited availability for outdoor recreation. Overall, fewer opportunities than under Status Quo, but many losers and winners.
<b>Weak Stock Focus</b>	Similar to Natural Focus, but only in weak stock watersheds. Overall fewer opportunities than under Status Quo, but many losers and winners.
<b>Sustained Use Focus</b>	Actions to assist weak stocks will consider means to accommodate recreational needs. Other outdoor recreation might benefit from land acquisitions and

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	management for habitat. Overall, about the same as Status Quo, but many losers and winners.
<b>Strong Stock Focus</b>	Some river recreation would benefit from less dramatic flow and spill regimes. Somewhat more opportunities than under Status Quo.
<b>Commerce Focus</b>	Market will dictate any change to the recreational industry. In general, increased access to land and water based outdoor recreation compared to Status Quo.

	EFFECT AREA: COMMERCE (8): Industrial, Residential & Commercial Development less = worse, from commercial perspective
<b>Existing Conditions</b>	Residential and commercial development largely market-driven, affected by local land use plans. ESA has some influence in plan development in special status species habitat. Habitat conservation plans are becoming more common.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Any residential and commercial development contradictory to natural focus would be restricted. Little new development on natural or riparian lands, some development rights acquired, development in critical habitat substantially limited. Very adverse effects.
<b>Weak Stock Focus</b>	Any residential and commercial development threatening weak stocks would be restricted. Adverse effects.
<b>Sustained Use Focus</b>	Encourage and promote development more compatible with fish and wildlife habitat. About the same as Status Quo.
<b>Strong Stock Focus</b>	Development might increase in comparison to Status Quo, as restrictions for weak stocks would be removed. Development would be monitored to insure that healthy stocks were unaffected. Better than under Status Quo.
<b>Commerce Focus</b>	Market would control residential and commercial development. More growth than under Status Quo because of lower costs; less growth to the extent quality of life is reduced. Better than under Status Quo

Most employment effects are associated with breaching dams and alternative approaches to habitat restoration. Dam breaching is a significant construction activity that would create many temporary jobs. In the long term, substantial job losses result from reduced power sales; increased power, transportation and water supply costs; and loss of barging and flatwater recreation industries. In the very long run (10 to 100 years), a restored river system and fish runs would provide some compensating employment benefits. Long-run effects are believed to be negative overall.

Habitat restoration causes jobs to be lost because someone must pay for it, and passive restoration costs more jobs when land is retired or productivity reduced. Job losses would be greatest in Natural Focus because of intensity as well as focus on passive restoration. Weak Stock losses would be less because of reduced scope, but also because more active restoration would be used. Sustained Use Focus would use more active restoration. Active restoration techniques can create jobs through use of construction and services, but these gains are still offset by jobs lost as ratepayers or taxpayers have less to spend. Strong Stock focus would have a positive employment effect overall, and Commerce Policy Direction would have the most positive employment effect relative to

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the Status Quo, both assuming no negative effects from environmental degradation. The Effect Area table below expands on this reasoning.

	EFFECT AREA: COMMERCE (9): Employment less = worse
<b>Existing Conditions</b>	The major economic appeal of the Pacific Northwest has been inexpensive, reliable power; a controlled, functional Columbia; and environmental quality. 1996 employment in mix in 5-state region (AK, ID, MT, OR, WA) was about 3.1% farm, 2.0% forestry/fishing/farm services, 0.5% mining, 6% construction, 11.5% manufacturing, 16.1% government, 22.8% trade, 11.5% transportation/utilities/finance/insurance/real estate, and 29.5% services.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Increasing employment in services, government, technology and trade. Less or stable employment in natural resource industries and manufacturing. More employment in rural areas attributable to outdoor recreation, second home development, migration from urban/suburban areas to rural towns and cities.
<b>Effect in Comparison to the Status Quo Condition:</b>	
<b>Natural Focus</b>	Positive effect from breaching dams and construction of new power capacity is positive but very temporary. Dam breaching, loss of hydropower, land retirement for habitat and other actions would cause enormous employment consequences. Permanent job losses from increased power costs; loss of transportation, flatwater recreation, commercial fishing, other industries, increased agricultural costs, and agricultural and grazing land retirement. New jobs created in restored fishery, river recreation and trucking/rail do not offset job losses in other sectors.
<b>Weak Stock Focus</b>	Similar to Natural Focus, but losses and gains are both smaller. Agricultural and forestry losses are relatively smaller because of increased focus on active restoration, management and positive incentives.
<b>Sustained Use Focus</b>	No effects through breaching. Some loss through increased power costs, increased taxes and, subsequently, reduced discretionary income. Employment benefit of new power capacity construction would come sooner than under Status Quo. Increased employment in agricultural and forestry services associated with land management. Commercial fishing effects negative initially, positive later. Overall, decreased employment in sectors where power consumers and agriculture spend and increased employment where natural resource and land management services spend. Employment effects about neutral overall.
<b>Strong Stock Focus</b>	Small increase employment due to market certainty and predictability, continuation of inexpensive and reliable power, and increased spending for hatcheries. Employment effects about neutral overall.
<b>Commerce Focus</b>	Economy would grow more than under Status Quo, thereby, increasing employment. More employment in hatcheries and fish farms.

**5.3.3.2 Tribes**

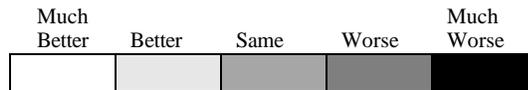
The table below shows how tribal concerns would be affected by the Policy Directions. All tribal effects are above and beyond, and independent of, economic and social values tribal members experience in their roles in the larger society. Concern for effects include those on the ability to harvest fish, as well as on human-centered tribal concerns such as health, spirituality, and tradition. Tribal health is associated with consumption of

traditional foods such as salmon, and additional income from fishing that enables better life style and health care. Spirituality is associated with the quality and opportunities for ceremonial harvest that have religious significance, and the ability to sustain religious and cultural traditions. Traditions include ability to use traditional resources and places at traditional times in traditional ways.

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, greater than, or less than, existing conditions from the perspective of tribal members.

**Table 5.3-6A: Tribal Effects across the Policy Directions**

Effects Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
Fish Harvest						
Health						
Spirituality						
Tradition						



**Summary of Effects:** Tribal fish harvest is associated with the non-commercial realization of treaty harvest rights and historical harvest practices. Tribal health, spirituality, and tradition are all positively associated with subsistence harvest, restoration of habitat, diversity of native fish and wildlife species and recovery of lands made available for tribal use.

Natural Focus and Weak Stock provide the more diversified fish harvest and land restoration. Sustained Use Focus could provide increased harvest and utilization, but some upriver stocks, especially Snake River and other severely depressed stocks, would not recover as much. Strong Stock and Commerce Focus are designed to provide more fish through greater use of hatcheries, but some observers believe tribes would be made worse off because of changes that would be required in traditional practices (such as fishing locations defined by treaties). The Effect Area table below expands on this reasoning.

**Table 5.3-6B: Tribal Effects across the Policy Directions (Detail)**

	EFFECT AREA: TRIBES (1): Fish Harvest less = worse
<b>Existing Conditions</b>	Tribal harvest substantially reduced from historic levels. Most upriver opportunities lost.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Harvest and utilization opportunities expected to continue at about the same as existing conditions.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Until stocks recover, ceremonial and subsistence fishing levels only. Then, more diversified harvest would occur, but be limited to surpluses above naturally sustaining populations. Long-run effects would be beneficial as fish runs recover and return to numerous rivers.
<b>Weak Stock Focus</b>	Similar to Natural Focus. Tribes would adopt more selective harvest methods to avoid weak stocks. Fishing would occur as long as weak stocks were not negatively affected. Long-run effects might be beneficial (more harvest opportunities in more locations).
<b>Sustained Use Focus</b>	Tribal harvest would be allowed as long as weak stocks were not negatively affected. However, benefits for some tribes might be less than Natural Focus or Weak Stock because upriver stocks would not be recovered as much. Upriver stocks about the same as Status Quo, overall effects about the same as Status Quo.
<b>Strong Stock Focus</b>	Tribal fishing would occur as long as healthy stocks were not negatively affected. Hatchery-supplemented stocks would be used to meet mainstem and tributary tribal harvest objectives. Overall, about the same as Status Quo.
<b>Commerce Focus</b>	Some tribal fishing opportunities would be created with artificial production and fish farming, but some upriver opportunities are reduced. Overall, worse than under Status Quo.

	EFFECT AREA: TRIBES (2): Health, Spirituality and Tradition
<b>Existing Conditions</b>	Health, spirituality, and tradition impaired by loss of subsistence and ceremonial harvest, loss of wildlife, and loss of traditional lands.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions except spirituality and tradition further impaired by increasing non-Indian population and competition for resources.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Relative to Status Quo, tribes would benefit by increasing subsistence and ceremonial harvest and access to hunting and riverside lands once used for cultural, material, and spiritual purposes. <sup>39</sup>
<b>Weak Stock Focus</b>	Similar to Natural Focus, although certainty of fish restoration would be less than for Natural Focus. Tribes would benefit by regaining access to restored lands and resources once used for cultural, material, and spiritual purposes. Reservation employment opportunities, income and health associated with active restoration might increase.
<b>Sustained Use Focus</b>	Some tribes would benefit from increased utilization opportunities, especially

<sup>39</sup> Draft Summary, Corps, 1999a, p. 27.

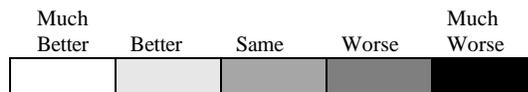
	EFFECT AREA: TRIBES (2): Health, Spirituality and Tradition
	downriver. Upriver stocks may not be improved as much, but upriver fish and wildlife opportunities should increase overall. Reservation employment opportunities associated with active restoration might increase. Overall, more opportunities than under Status Quo.
<b>Strong Stock Focus</b>	Further loss of weak stocks would be damaging to tribal culture and well-being. However, healthy stocks would increase, and associated tribal health and well-being may also increase. Some tribes would benefit from increased fishing opportunities, especially downriver. Reservation employment opportunities associated with active restoration might increase. Overall, however, the same or slightly fewer opportunities than under Status Quo.
<b>Commerce Focus</b>	Tribal health and spirituality would be adversely affected by loss of traditional fishing practices and locations (defined by treaties), change in fishing techniques and increased competition from non-Indian use of resources and population growth. Worse to much worse than under Status Quo.

**5.3.3.3 Costs and Funding**

Concern for funding includes effects on ratepayers, who ultimately pay the costs of BPA's fish and wildlife programs), federal taxpayers, and state, tribal, and private/commercial interests who may be called on to fund fish and wildlife recovery and mitigation. The table below shows how funding would be affected by the Policy Directions. Effects are shown, by shading, to indicate whether a given Policy Direction would increase or decrease costs of fish and wildlife programs. An increase in costs is characterized as worse on this table.

**Table 5.3-7A: Funding Effects across the Policy Directions**

Effects Subcategory	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
Ratepayers						
Federal Taxpayers						
States						
Private/Commercial						



**Summary of Effects:** The Natural Focus Policy Direction would have the largest costs and reduce hydropower and tax revenues most. Therefore, ability to fund fish and wildlife improvements would be most uncertain. A large private or federal contribution

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would be needed. Weak stock has similar but less extreme funding problems. Sustained Use Focus has costs larger than under Status Quo, but ability to fund these costs would not be much impaired relative to Status Quo. Strong Stocks would have total costs similar to Status Quo, and Commercial Focus would have less cost.

The Effect Area table below expands on this reasoning.

**Table 5.3-7B: Funding Effects across the Policy Directions (Detail)**

	EFFECT AREA: FUNDING (1): Ratepayers paying more = worse
<b>Existing Conditions</b>	Ratepayers fund approximately \$250 million annually in fish and wildlife costs consisting of \$100 million of direct fish and wildlife expenses, \$40 million of expenses reimbursed to other agencies, and \$110 million of debt service on capital investments such as hatcheries and bypass facilities.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Similar to existing conditions. Trend has been toward increased expenditure.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Removal of dams and habitat acquisition costs are partially paid by ratepayers, and rates go up because of need to purchase replacement power. Amount of cost passed to ratepayers likely to be limited by maximum sustainable revenue, so more costs would be passed to taxpayers. Very adverse effects on ratepayers.
<b>Weak Stock Focus</b>	Removal of dams and habitat acquisition costs are partially paid by ratepayers, and rates go up because of need to purchase replacement power. Additional ratepayer costs not as large as Natural Focus. Amount of cost passed to ratepayers may be limited by maximum sustainable revenue. Adverse effects on ratepayers.
<b>Sustained Use Focus</b>	Additional fish recovery costs paid by ratepayers. Power rates would rise, but at slower pace than Weak Stock Focus. Amount of cost passed to ratepayers could be limited by maximum sustainable revenue. Adverse effects on ratepayers.
<b>Strong Stock Focus</b>	Less than, or about the same as current expenditures, as weak stock costs are no longer required. Amount of cost passed to ratepayers not likely to be limited by maximum sustainable revenue. About the same as Status Quo.
<b>Commerce Focus</b>	Less than current expenditures. Expanding commercial sector tends to lessen burden on ratepayers. Amount of cost passed to ratepayers not limited by maximum sustainable revenue. Less ratepayer cost than under Status Quo.

	EFFECT AREA: FUNDING (2): Federal and State Taxpayers, Other State, Private and Commercial paying more = worse
<b>Existing Conditions</b>	Important costs are paid by federal taxpayers, and some costs are paid by State taxpayers, lottery revenues, fishing and hunting licenses, and other user fees. Private regulatory costs and value of voluntary contributions are unknown.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Share of costs paid by taxpayers, other state funds, licenses and user fees would remain about the same as existing conditions.

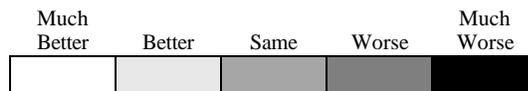
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	A large increase in federal funding relative to Status Quo. Share of costs and amount of costs paid by persons other-than-ratepayers probably the largest because amount of electricity generation reduced most. Regulatory costs also may be high; depends on use of regulation versus positive subsidies. Very adverse effect compared to Status Quo with respect to Federal; adverse as to others.
<b>Weak Stock Focus</b>	An increase in federal funding relative to Status Quo. Share of costs paid by persons other-than-ratepayers probably large, but not as large as Natural Focus. Adverse effect compared to Status Quo.
<b>Sustained Use Focus</b>	An increase in federal funding relative to Status Quo. Greater likelihood that the ratepayers and the region would be able to finance their share of the additional expenditures. Adverse effect compared to Status Quo.
<b>Strong Stock Focus</b>	A small increased financial burden on federal and state taxpayers, or a small decreased burden. About the same as Status Quo.
<b>Commerce Focus</b>	No additional financial burden on federal taxpayers, but State and private costs might be reduced. Cost share paid by resource users (fishers and hunters) would increase. Adverse effect compared to Status Quo with respect to non-Federal taxpayers.

**5.3.3.4 Cultural/Historical Resources**

The table below shows how cultural and historical resources might be affected by the Policy Directions. Cultural concerns include archaeological resources that may be exposed or hidden beneath the surface of water or land. Historical resources include historical and prehistoric and other structures built within written history. Changes are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same as, greater than, or less than under Status Quo. Changes that cause increased losses of cultural resources are worse. Changes that save cultural resources are better.

**Table 5.3-8A: Cultural/Historical Effects across the Policy Directions**

	<b>Status Quo</b>	<b>Natural Focus</b>	<b>Weak Stocks</b>	<b>Sustained Use</b>	<b>Strong Stocks</b>	<b>Com. Focus</b>
<b>Cultural/Historical Resources</b>						



**Summary of Effects:** The most important sources of effects are exposure of inundated archeological sites and destruction of historical structures. The Effect Area table below expands on this reasoning.

**Table 5.3-8B: Cultural/Historical Effects across the Policy Directions (Detail)**

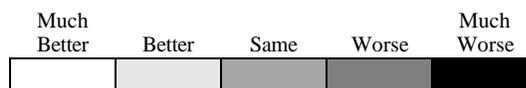
	EFFECT AREA: SOCIAL (1): Cultural/Historical Resources loss of resources = worse
<b>Existing Conditions</b>	Some cultural resources have been inundated by reservoirs and buried by sediment. Many historical structures exist throughout the region.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Same as existing conditions. Some loss of historical and cultural resources over time.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Sites that have been covered and protected by water for years would be exposed. There would be some benefit from documenting the resources, but there would be greater adverse impact on the exposed sites from vandalism. Some historical structures abandoned or removed. The effects would worse than under Status Quo.
<b>Weak Stock Focus</b>	The effects would be nearly the same as for Natural Focus, except fewer reservoirs would be drawn down. The overall impact would be more adverse than under Status Quo.
<b>Sustained Use Focus</b>	Similar to Status Quo. Some historical structures might be removed.
<b>Strong Stock Focus</b>	Less exposure than under Status Quo, as reservoirs would remain more constant.
<b>Commerce Focus</b>	There would likely be less exposure of inundated cultural sites than under Status Quo, as dramatic flow and spill regimes would be abandoned.

**5.3.3.5 Aesthetics**

The table below shows how aesthetics might be affected by the Policy Directions. Aesthetics includes the difficult-to-measure natural elements of the Pacific Northwest (other than air quality) that bring pleasure to the lives of its inhabitants. Changes are shown, by shading, to indicate whether a given Policy Direction would tend to have effects that are the same as, greater than, or less than under Status Quo. Diminished aesthetics are characterized as worse.

**Table 5.3-9A: Aesthetics Effects across the Policy Directions**

	Status Quo	Natural Focus	Weak Stocks	Sustained Use	Strong Stocks	Com. Focus
<b>Aesthetics</b>						



**Summary of Effects:** The most important sources of effects are visibility of naturally appearing landscapes and exposure of reservoir bottoms. The Effect Area table below expands on this reasoning.

**Table 5.3-9B: Aesthetic Effects across the Policy Directions (Detail)**

	EFFECT AREA: SOCIAL (2): Aesthetics (More natural features = better)
<b>Existing Conditions</b>	Aesthetics is a value judgment that differs by person. Aesthetic resources for some persons include natural features, native vegetation, and wildlife. For others, aesthetic resources may be reservoirs, developed land, or farms. Most people prefer appearance of clean air and water. Air quality effects were covered in a previous table.
<b>POLICY DIRECTION</b>	
<b>Status Quo</b>	Same as existing conditions, except more developed land.
	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Natural Focus</b>	Riverbeds exposed until re-vegetated. Eventually re-establishing a free-flowing river. Limited access by humans, less economic activity such as logging. More land in wild vegetation, more recovery to natural state. Fewer developed features. Much better than under Status Quo.
<b>Weak Stock Focus</b>	Riverbeds exposed until re-vegetated. Some re-establishment of free-flowing river. More land in wild and native vegetation, more restoration to natural state, less development and access in weak stock watersheds. Better than under Status Quo.
<b>Sustained Use Focus</b>	Little exposure of reservoir bottoms, but maybe more than under Status Quo. More land in native vegetation. About the same as Status Quo.
<b>Strong Stock Focus</b>	About the same urbanization and development. About the same as Status Quo.
<b>Commerce Focus</b>	Increased urbanization and industrialization would typically result in negative visual effects. Adverse effects compared to Status Quo.

## 5.4 ENVIRONMENTAL CONSEQUENCES OF RESERVE OPTIONS

Just as certain potential actions within the scope of this DEIS would have been considered unreasonable 5-10 years ago, actions currently dismissed as unreasonable may become viable 5-10 years from now. Such actions, representing the more extreme approaches to the fish and wildlife recovery, are characterized in this DEIS as Reserve Options (please see Chapter 4). Undoubtedly, fish and wildlife policy will adjust to accommodate the advancement of science or a material change in circumstances. The Reserve Options may provide future decisionmakers with the ability to extend or intensify a Policy Direction to fit future circumstances. For example, these sharply divergent actions could be implemented in response to a drastically lower regional priority for fish and wildlife recovery; the successful recovery of a listed species of fish and wildlife; or the continued collapse and further listings of fish and wildlife due to unsatisfactory recovery efforts.

Extreme measures at a given point in time are usually imprudent measures, and fish and wildlife policy is no exception to this rule. However, the relationship methodology provides the analytical flexibility to assess, at least preliminarily, the range of actions and degree of the impacts associated with extreme circumstances. As demonstrated in Table

5.4-1, these extreme actions produce some unwanted and unexpected results under existing circumstances.

For example, the Reserve Options RO-1 through RO-6 push the concept or theme of the Natural Focus Policy Direction to extremes. These Options would include the following actions:

- Restore pre-dam habitat (RO-1) and/or preserve all existing habitat (RO-2).
- Ban all harvest (RO-3).
- No hatcheries (RO-4).
- Operate the existing hydrosystem entirely for fish and wildlife (RO-5) or breach/remove all of the mainstem dams (RO-6).

Reserve Options RO-7 through RO-12 push the theme of a more extreme Commerce Focus Policy Direction. These Options would include the following actions:

- Restore habitat only if most cost-effective (RO-7), or maximize commercial use of habitat resources (RO-8).
- Allow unrestricted harvest (RO-9).
- Maximize artificial production (RO-10).
- Operate existing hydrosystem entirely for commercial purposes (RO-11), or build new dams if cost-effective (RO-12).

The following is an illustration of the possible long-term environmental consequences of these extreme measures compared to Status Quo. Keep in mind that in the short-term, certain impacts could be extraordinary; however, the long-term impacts would be the objective of a future decisionmaker and, therefore, are the basis for the assessments in Table 5.4-1.

**Table 5.4-1: Comparison of the Main Sets of Reserve Options Against Baseline Conditions\* and Summary of Effects**

<i>Effect Category</i>	<i>Status Quo*</i>	<i>Reserve Options 1-6 Extending Natural Focus</i>	<i>Reserve Options 7-12 Extending Commerce Focus</i>
<b>NATURAL ENVIRONMENT</b>			
<b>Land Habitat</b>			
Upland			
Riparian/Wetland			
<b>Water Habitat:</b>			
Nitrogen Supersaturation			
In-Stream Water Quality			
Non-Thermal Pollution			
Sedimentation			
Temperature/Dissolved Gas			
Amount of River Habitat			
Reservoir Habitat			
<b>Fish &amp; Wildlife</b>			
Anadromous Fish			
Resident Fish			
Wildlife			
<b>Air Quality</b>			
<b>SOCIAL and ECONOMIC</b>			
<b>Commerce</b>			
Commercial Interests			
Recreation (including fishing & hunting)			
Economic Development			
<b>Tribes</b>			
Fishing Harvest			
Health, Spirituality, & Tradition			
<b>Costs and Funding</b>			
<b>Cultural/Historical Resources</b>			
<b>Aesthetics</b>			

\* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.



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EFFECT AREA: LAND More habitat = better	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	In the short term, riparian habitat would be eliminated as river boundaries change due to breaching. New riparian habitat would gradually and naturally re-establish along new river banks. Emphasis on passive restoration and preservation following a natural progression of fish and wildlife recovery without a specific target species. Terrestrial/riparian restoration by ceasing human land-use activities such as farming, grazing, mining, and development in or encroaching upon pristine wilderness areas. Periodic natural disturbance events would reset restoration trajectories. Overall natural habitat improvement is much greater than under Status Quo
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Land not preserved for habitat unless benefits exceed costs. Some existing terrestrial habitat would be developed for commercial interests. Federal, regional and state programs for habitat restoration would be limited and focused on the land most valuable for species and less valuable for commercial interests. Emphasis on private, cost-effective, and efficient habitat preservation and creation. Use market incentives, such as tradable mitigation credits. Increase in artificial habitat or preservation as a trade against new development. Provide incentives (start-up grants, tax breaks, etc.) and technical assistance to encourage local landowners, businesses, corporations, and trustee agencies to improve and protect wetland, riparian and terrestrial areas. The amount of fish and wildlife habitat would likely be less than under Status Quo.

EFFECT AREA: WATER (1): Nitrogen Super Nitrogen supersaturation More = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Several dams would be breached. The closer the return to a natural river, the less nitrogen supersaturation would remain a problem. A completely natural river (no dams anywhere) would return nitrogen supersaturation levels to those that would have occurred as a result of flow dynamics experienced for the given natural structures (e.g., water falls, rapids, etc.). Those dams that remained might elevate TDG locally per Status Quo situation.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Except in instances of flood control releases or large flows, spill would be minimized with a commercial focus. Therefore, saturated gas problems would be the same or less than under Status Quo.

EFFECT AREA: WATER (2): In-Stream Water Quantity More = better	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Substantially reduce existing surface water withdrawal through land retirement. Improve instream flows, reduce water temperature, and improve water quality relative to Status Quo. Surface water screening and irrigation management would be used on many remaining diversions. Increase water conservation. Municipal withdrawals would continue, but with intense efforts to meet increased conservation standards. Remaining storage would be managed to mimic natural flow conditions. In the short term, sedimentation could significantly impair downstream river quality.

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	EFFECT AREA: WATER (2): In-Stream Water Quantity More = better
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Irrigation, industrial, and municipal water withdrawals would increase more than under Status Quo to accommodate growing population, commercial, and residential needs. Cost-effective and efficient screening might be used to avoid direct mortality of listed stocks. Non-thermal pollution levels are likely to increase (see below). Use of storage and flows for fish would decrease in comparison to Status Quo.

	EFFECT AREA: WATER (3): Non-thermal pollution More = worse
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Improve water quality by eliminating sources of pollution overall. Eliminate discharges of other contaminants to meet more stringent water quality criteria. Strong new controls on wastewater and other point and non-point sources. Increased water quality standards along with stronger enforcement. Drafting reservoirs or breaching dams could stir up contaminants, which would be adverse for humans, fish, and wildlife in the short term. In the long term, however, on-thermal pollution would be less than under Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Existing water quality standards may be eased. Emphasize voluntary compliance rather than regulation. Some use of positive incentives, some additional pollution allowed, trading of pollution credits allowed to accommodate industrial growth. Pollution controls must be efficient. Non-thermal pollution may become somewhat worse than under Status Quo.

	EFFECT AREA: WATER (4) Sedimentation More = worse
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Sediment increase downstream from breached facilities for 5-10 years as accumulated reservoir sediments are flushed downstream. Agricultural land retirement and reduction in other human uses reduces sediment loads over the long term relative to Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Sedimentation will increase as urbanization, agricultural and commercial development increase, but minimally would comply with water quality standards. Prime watersheds probably would improve. Sediment controls must be efficient (benefits exceed costs). The overall sedimentation may get worse than under Status Quo due to development.

	EFFECT AREA: WATER (5): Temperature/Dissolved Oxygen higher = worse
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	A return to a natural river, natural tributaries, land retirement and strong thermal pollution controls could gradually help recreate presettlement water temperature ranges, including normal fluctuations for the rivers affected. Upstream reservoirs (upper Columbia, upper Snake, Clearwater) would have to be managed for flow in dry years to avoid downstream problems. Less opportunity for solar heating. Fewer opportunities to control temperature through controlled releases. Overall, both temperature and dissolved oxygen would be somewhat better than under

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	<b>EFFECT AREA: WATER (5): Temperature/Dissolved Oxygen</b> higher = worse
	Status Quo, but conditions would be worse or not improved in very dry conditions.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Manage thermal pollution to insure health and safety of human needs and consumption. Any temperature or gas control must be cost-effective, and much would be regulatory driven. Temperature in prime watersheds might improve. Overall, temperatures and dissolved oxygen may be slightly worse than under Status Quo. If more dams are built, more reservoirs would be created, which would likely increase water temperature.

	<b>EFFECT AREA: WATER (6): Amount of Stream/River Habitat</b> more = better
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Much more stream and river habitat created by breaching or drawdown of up to six reservoirs and removal of some dams on tributaries.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	About the same as or less than under Status Quo because only cost-effective actions would be taken. Also, if more dams were built, some river habitat would be converted to reservoir habitat.

	<b>EFFECT AREA: WATER (7): Amount of reservoir habitat</b> more=better
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Reservoir habitat would be eliminated as storage dams are breached. If all dams were removed, reservoir habitat would be limited to that created by natural reservoirs. Amount of reservoir habitat would be much less than under Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	The existing reservoir system would be preserved for commercial purposes. If more dams are built (if cost-effective), more reservoir habitat would be created. The amount of habitat would be the same or more than the Status Quo.

	<b>EFFECT AREA: FISH AND WILDLIFE (1): Anadromous Fish</b> More = better
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Restoration to natural land and water conditions, and elimination of all harvest. Would likely recover natural spawning anadromous fish and lamprey in the long run, with several caveats. Natural conditions may not be attainable in decades or ever, and harvest may not be completely controllable (other nations may continue to allow harvest). Because hatcheries would be completely eliminated, the abundance of anadromous fish (natural and hatchery populations combined) would dramatically decrease in the short run, and some populations might become so small that they cannot recover. Even with maximum actions, it is unlikely that fish populations would approach pre-European immigration levels. However,

	<p style="text-align: center;">EFFECT AREA: FISH AND WILDLIFE (1):  Anadromous Fish  More = better</p>
	<p>over the long term, abundance of natural spawning fish should be better than under Status Quo.</p>
<b>Reserve Options (7-12) Extending Commerce Focus</b>	<p>De-emphasize importance of native stocks. Some weak stocks may become extinct. Focus on producing a commercially viable salmon harvest and related industries using least-cost production, primarily hatcheries and fish farming. Mainstem species focus (fall chinook). Total run size might increase even if natural spawning runs decrease. Overall numbers less than under Status Quo.</p>
	<p style="text-align: center;">EFFECT AREA: FISH AND WILDLIFE (2):  Resident Fish  More = better</p>
<b>Reserve Options</b>	<p><b>Effect in Comparison to the Status Quo Condition:</b></p>
<b>Reserve Options (1-6) Extending Natural Focus</b>	<p>Restoration to natural land and water conditions, phase-out of hatcheries, and elimination of most harvest. As more dams are breached, less habitat will be available for resident fish and some populations would be completely lost. There is an inherent tradeoff between preserving anadromous fish and preserving resident fish. Even if the existing hydrosystem is operated entirely for fish and wildlife, resident fish would likely be sacrificed in favor of anadromous fish. Those naturally spawning resident fish that are able to survive in a free-flowing river may increase in the long run as habitat improvements are made. But the total resident fish population (naturally spawning plus hatchery fish) would be dramatically reduced in the short run as hatcheries are eliminated. In the long term, as the river returns toward pre-European settlement conditions, resident fish populations would be much less than under Status Quo.</p>
<b>Reserve Options (7-12) Extending Commerce Focus</b>	<p>De-emphasize importance of native stocks. Some weak stocks may become extinct. Focus on maintaining resident fish harvest for recreation using least-cost production, primarily hatcheries supported by recreation fees. Overall numbers similar to Status Quo.</p>
	<p style="text-align: center;">EFFECT AREA: FISH AND WILDLIFE (3): Wildlife  More = better</p>
<b>Reserve Options</b>	<p><b>Effect in Comparison to the Status Quo Condition:</b></p>
<b>Reserve Options (1-6) Extending Natural Focus</b>	<p>The goal of extending the Natural Focus Policy Direction is not to increase particular species, but rather to let the river and the land return to natural balance. Some species may benefit from these conditions, while others may not. Passive restoration to natural land conditions and elimination of harvest would likely increase native wildlife populations. However, non-native species may also benefit from an increase in available habitat, and may out-compete native species. Species dependent upon reservoir habitat would decrease as this habitat is eliminated (as storage dams are breached). Over the long term, abundance of wildlife should be much better than under Status Quo.</p>
<b>Reserve Options (7-12) Extending Commerce Focus</b>	<p>De-emphasize importance of native populations. Some weak populations may become extinct. Focus on managing wildlife for fee-based recreation (i.e. hunting, zoos, nature parks) or other purposes (food or clothing production), assuming fees or sales are sufficient to cover the costs of management. Wildlife habitat would become more scarce. Overall numbers less than under Status Quo.</p>

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EFFECT AREA: AIR QUALITY More pollution = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	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 dramatically increase PM10, CO, CO2, SOX and NOX emissions. Additional combustion turbine plants would produce NOX and CO2 (but much less than coal because of their greater efficiency) and some PM10. 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.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	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 <sub>10</sub> and CO <sub>2</sub> air emissions slightly. More dams could be built if cost-effective. Overall, air emissions are likely less than under Status Quo.

EFFECT AREA: COMMERCE : Commercial Interests less = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Hydropower taken off-line, replaced with non-hydro power generation. Commercial activity would dramatically decrease from current levels, as electricity costs go up and. Very large adverse effects compared to Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Law of supply and demand would dictate power mix; however, hydropower generation would likely be increased compared to Status Quo. New dams could be built, if cost-effective. Industry-friendly approach to air- and water-quality standards would likely result in lower costs of compliance. Commercial interests would likely prosper and expand more than under Status Quo.

EFFECT AREA: COMMERCE : Recreation (including fishing & hunting) less = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Harvest of both fish and wildlife would be banned. Reservoir recreation (boating, waterskiing) would be greatly diminished as storage dams are breached, and most other recreation would be restricted so that riparian, wetland, and upland areas can return to pre-dam conditions. In the long term, tourism and recreation may increase as natural rivers are restored, but access to these sites would be restricted. Recreation opportunities would be much less than Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Because unrestricted harvest would be allowed, fishing and hunting opportunities would dramatically increase in the short term. An absence of regulation may result in some populations being harvested to extinction. Recreation resources (hiking trails, lakes) would be managed on a fee-for-service basis through user fees and licenses, with prices reflecting the costs of maintaining those resources.

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	For fishing and hunting, the costs for sustaining those populations targeted for harvest (through production hatcheries, habitat enhancement, etc.) would be borne by user groups. Over the long term, recreation would likely be more expensive, and less accessible to users, than under Status Quo.
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EFFECT AREA: COMMERCE : Economic Development less = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Economic development would be restricted, and in some cases relocated, as existing habitat is protected and pre-dam habitat is restored. Very large adverse effects compared to Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Economic development would be largely unrestricted, compared to Status Quo, and electricity costs would be less. Therefore, more development would be expected.

EFFECT AREA: TRIBES (1): Fish Harvest less = worse	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	No harvest. Very large adverse effects compared to Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Lifting of restrictions on harvest would increase tribal harvest opportunities in the short term. In the long term, populations targeted for harvest might be diminished. Costs associated with maintaining harvest opportunities would be borne by tribes as well as other user groups. Like other fish and wildlife resource managers, tribes could generate income by offering harvest opportunities to the public on a fee-for-service basis. Overall, worse than under Status Quo.

EFFECT AREA: TRIBES (2): Health, Spirituality and Tradition	
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Relative to Status Quo, tribes would benefit by increasing subsistence and ceremonial harvest and access to hunting and riverside lands once used for cultural, material, and spiritual purposes. <sup>40</sup>
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Tribal health and spirituality would be adversely affected by loss of traditional fishing practices and locations (defined by treaties), change in fishing techniques and increased competition from non-Indian use of resources and population growth. Worse to much worse than under Status Quo.

<sup>40</sup> Draft Summary, Corps, 1999a, p. 27.

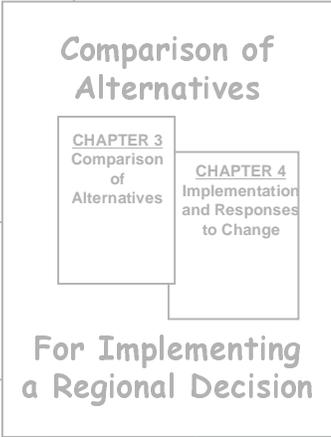
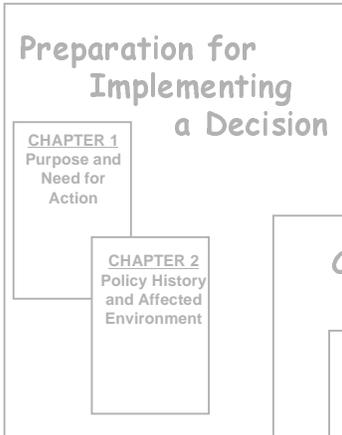
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	EFFECT AREA: SOCIAL (1): Costs and Funding paying more = worse
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Removing additional dams and increased habitat acquisition will further deplete the hydro-system and dramatically increase energy costs.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Maximizing hydro-operations would drop energy costs for the region even further. However, the cost to compensate for the heavy toll of such practices on fish and wildlife would allay much of the cost savings. Overall costs would decrease, but the environmental impact would be substantial.

	EFFECT AREA: SOCIAL (1): Cultural/Historical Resources loss of resources = worse
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Sites that have been covered and protected by water for years would be exposed. Access to these sites would be restricted, which would result in less vandalism, but also less use and enjoyment of the sites. Overall, the effects would be about the same as Status Quo.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	There would likely be less exposure of inundated cultural sites than under Status Quo, as flow and spill regimes would be abandoned. However, restrictions on economic development would be eased, so it is likely that development would proceed in culturally sensitive areas. Also, funding for cultural resource protection would be cut back or eliminated. The effects on cultural resources would be worse than under Status Quo.

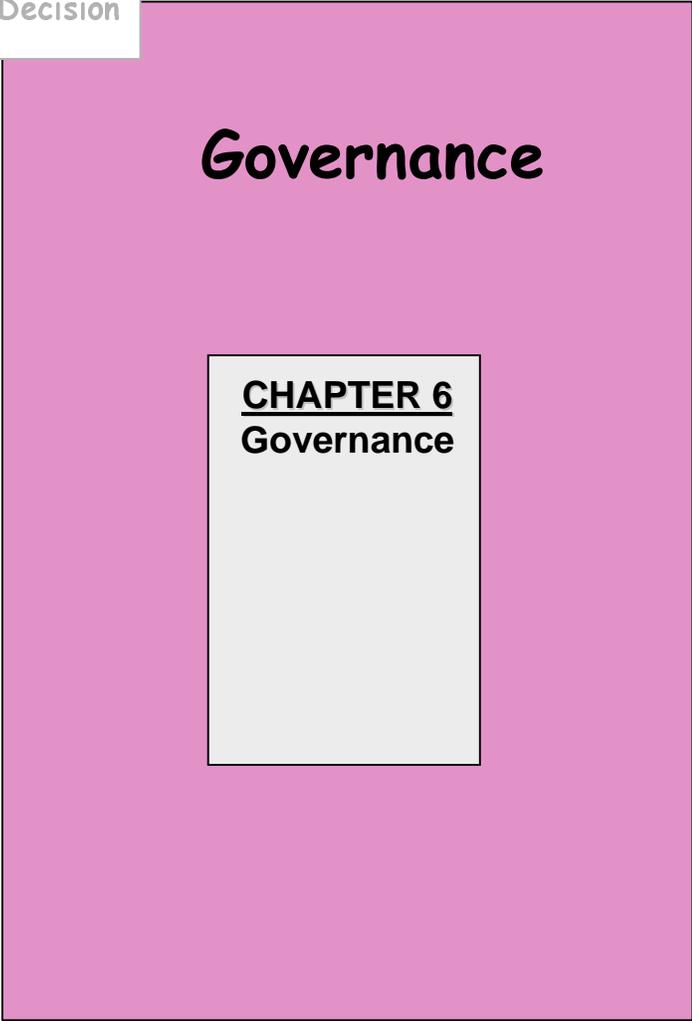
	EFFECT AREA: SOCIAL (2): Aesthetics (More natural features = better)
<b>Reserve Options</b>	<b>Effect in Comparison to the Status Quo Condition:</b>
<b>Reserve Options (1-6) Extending Natural Focus</b>	Riverbeds exposed until re-vegetated. Eventually re-establishing a free-flowing river. Limited access by humans, less economic activity such as logging. More land in wild vegetation, more recovery to natural state. Less developed features. Much better than under Status Quo in the long term; worse than under Status Quo in the short term.
<b>Reserve Options (7-12) Extending Commerce Focus</b>	Increased urbanization and industrialization would typically result in negative visual effects. Adverse effects compared to Status Quo.



# **Chapter 6**

***Governance as an Issue***

***Future Governance  
Models***



## CHAPTER 6 — GOVERNANCE

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- Describes some of the key issues surrounding the management of the Columbia River Basin, including fish and wildlife.
- Defines the governance structures that have been tried in the past, what governance structures and actions exist today, and the possible future direction for fish and wildlife management in the region.
- Provides a methodology for approaching the regional governance of fish and wildlife through examples and a simple model to sort through the key components of governance.

This chapter focuses on understanding why establishing a regionally acceptable governance structure is difficult. Information in this chapter forms a foundation that the region may use to gain perspective on governance issues. The simplified model may provide the beginnings to establish an acceptable future structure for managing the fish and wildlife in the region.

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### 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 DEIS is to provide the reader with enough background (Chapter 2) and understanding of the alternatives and their benefits and consequences (Chapters 3, 4, and 5) that an informed decision may be made about funding and implementing a coordinated fish and wildlife recovery effort 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 people say 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 efforts. These opposed viewpoints reflect the complexity of the governance issue.

In fact, over the past several decades, the designation of who is “in charge” of fish and wildlife matters in the region has shifted constantly among federal and state agencies,

courts, and other entities. What is important to notice, however, is that there has been no corresponding shift in environmental effects. The method of governance appears to have 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 (and we) are following an overall plan or whether (as today) we work under multiple plans, authorities, and entities taking individual actions.

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 by the involved parties to any plan.

For example, many river-basin agreements have collapsed—both in the past and today—because the parties could not agree on commitment 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 fish and wildlife recovery efforts.

The entries below trace some of the major efforts to establish umbrella organizations to govern management of the 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 the 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”<sup>1</sup> 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.

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<sup>1</sup> Lichatowich (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, were mainly under jurisdiction of the states and the Bureau. Private property rights were inextricably interspersed with public issues. The mix would later be still further complicated by the international nature of the Columbia River (see section 6.1.3, below).

**6.1.3 1950: The Columbia River Compact**

During this same 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 the war 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:

**Table 6.1-1: Distribution of Water Resources vs. Population**

	Percent of Water	Percent of Population
<b>Idaho</b>	47.6	9.4
<b>Montana</b>	17.1	9.5
<b>Washington</b>	15.3	38.3
<b>Oregon</b>	12.9	24.5
<b>Wyoming</b>	6.1	4.0
<b>Nevada</b>	1.0	2.5
<b>Utah</b>	—	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).

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.

#### **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 Kootenay 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<sup>2</sup>, 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 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.

The Basin entered the 1970s with a focus on river management that sought to optimize 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,

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<sup>2</sup> 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.

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 action rose out of the environmental movement. The *US v. Oregon* decision (Belloni decision) affirmed the right of Columbia River treaty tribes up to half of the salmonoids 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 nibbled away year after year without replacement—results of the fragmented, multiple-jurisdiction approach to natural resource management. Now began the wake-up call: realization and regret that the policies that had enabled commercial success were now perceived by many as having taken an unacceptable toll on the environment.

### **6.1.6 Governance in the 1980s**

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 Columbia River Power System, 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 of agreement has been unreachable.

### **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. Here are the three basic questions that seem to be involved when governance is discussed:

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 of concern throughout the region as multiple new models for the future are introduced. These are described below.

## **6.2 FUTURE GOVERNANCE MODELS**

The governance models described below have been “ranked” or evaluated with regard to the three distinct categories discussed above:

- **Centralization:** the degree to which each model places the decisionmaking authority in a single entity.

A rating of "1" in this category means a single decision-making authority; a rating of “10” would represent multiple decision-makers.

- **Coordination:** the degree to which each 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.

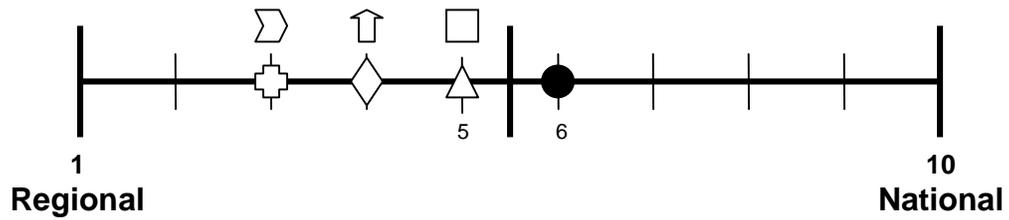
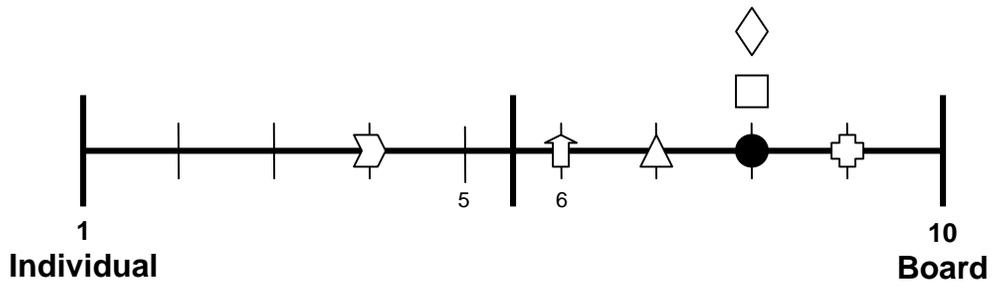
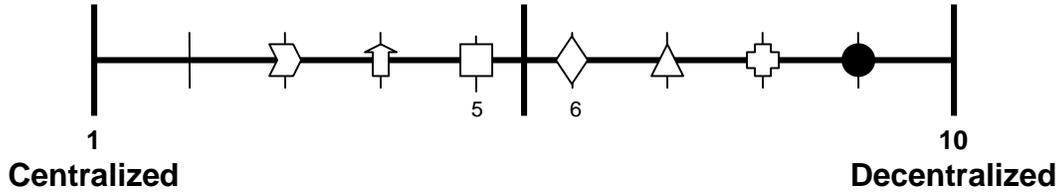
Figure 6-1 shows the different models (Current Model, Columbia River Basin Forum, Power Council/Tribal Member, and Regional Resources Council) proposed and where they fall in a ranking by the three factors. Other models are certainly possible, and may be considered even after one is selected, if an agreement can be reached and a plan has been established.

### **6.2.1 Current Model**

<b>Ranking:</b>	<b>Centralization</b>	<b>9</b>
	<b>Coordination</b>	<b>8</b>
	<b>Regional</b>	<b>6</b>

This model includes federal management of hydropower, flood control, navigation, and irrigation. The states manage permitting processes for water diversions from the river, and 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.

Figure 6-1: POSSIBLE GOVERNANCE MODELS



- **Current Model**
- △ **Columbia River Basin Forum (formally 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**

Indian tribes, many of which do not see their interests 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 Forum (formerly referred to as the Three Sovereigns)**

<b>Ranking:</b>	<b>Centralization</b>	<b>7</b>
	<b>Coordination</b>	<b>7</b>
	<b>Regional</b>	<b>5</b>

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 will 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.<sup>3</sup>

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.

### **Analysis of the Proposal**

**The Problem:** The (implicit) problem that the 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.

Thus, the problem is two-fold: existing forums constrain participants to certain subjects, processes, decision rules, and decisionmakers that some parties mistrust. The region now has multiple fish and wildlife recovery effort plans that compete for attention and

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<sup>3</sup> There was a "Three Sovereigns" group; it is now the Columbia Basin Forum.

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.

**Power:** The Three Sovereigns' process would confer no legal authority, but it would respond to its problem statement by equalizing the power 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 relative to Status Quo.

### **6.2.3 Appoint Tribal Members to the Council; Use the Council Process to Address a Wider Range of Issues**

<b>Ranking:</b>	<b>Centralization</b>	<b>5</b>
	<b>Coordination</b>	<b>8</b>
	<b>Regional</b>	<b>5</b>

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 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.

#### **Analysis of the Proposal**

**The Problem:** The alternative assumes that the primary problem with the existing Council is that it lacks members from tribes.

**Power:** 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**

<b>Ranking:</b>	<b>Centralization</b>	<b>6</b>
	<b>Coordination</b>	<b>8</b>
	<b>Regional</b>	<b>4</b>

A more broadly representative and authoritative new 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 Resource 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. The Resource 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.

Here is how it would work:

- (1) All federal agencies (including the NMFS, the USFS and others) would have obligations with regard to the Resource Council plan. Currently, only the agencies that run the hydropower system have such obligations.
- (2) However, the Resource Council would retain the limitation in the Northwest Power Planning Council's current authority: although federal agencies must act consistently with the Council plan, the Council plan will be implemented only if consistent with federal authorities. In this sense, the Resource Council would represent an incremental increase in authority vis-a-vis federal agencies.
- (3) The Resource Council would participate in federal agency consultations under the ESA, not supplanting existing federal agency authorities, but ensuring the Resources Council an opportunity to assert a system-wide perspective in hydropower operations.
- (4) The Resource Council would play a strong role in federal agency fish and wildlife budgeting.
- (5) The Resource 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.

### **Analysis of the proposal**

**The Problem:** The Resource Council model aims to fix problems in the Council's fish and wildlife process. The model asserts four problems 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.

**Powers:** All federal agencies (including the NMFS, the USFS and others) would have obligations with regard to the Resource Council plan. Currently, only the agencies that run the hydropower system have such obligations. However, the Resource Council would retain the limitation in the Council's current authority: although federal agencies' actions must be consistent with the Resource Council plan, that plan would be implemented only if consistent with federal authorities. In this sense, the Resource Council would represent an incremental increase in authority vis-a-vis federal agencies.

The Resource 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 Resource Council would play a strong role in federal agency fish and wildlife budgeting.

The 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 Resource Council Plus Watershed Council**

<b>Ranking:</b>	<b>Centralization</b>	<b>8</b>
	<b>Coordination</b>	<b>9</b>
	<b>Regional</b>	<b>3</b>

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.

#### **Analysis of the proposal**

This approach would focus decisions on watershed conditions and only incidentally on 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 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 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 Council would establish membership and procedural standards for watershed organizations. Watershed groups satisfying these standards would submit proposals for planning funds to the Council. After development and approval of watershed plans, implementation funds would be allocated consistent with Council 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 Council's program would be considered a systemwide habitat conservation plan. In the absence of a final 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 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**

<b>Ranking:</b>	<b>Centralization</b>	<b>4</b>
	<b>Coordination</b>	<b>6</b>
	<b>Regional</b>	<b>4</b>

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 Endangered Species Act. The ten-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.

#### **Analysis of the proposal**

**The Problem:** This approach sees the primary problem as federal implementation of the ESA.

**Power:** The approach would leave ultimate ESA decisionmaking authority with the President, but would authorize the region to make judgments under the Act in the first instance. 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**

<b>Ranking:</b>	<b>Centralization</b>	<b>3</b>
	<b>Coordination</b>	<b>4</b>
	<b>Regional</b>	<b>3</b>

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 less focused on fish and wildlife matters per se and more on a broad and evolving spectrum of interests in the river.

#### **Analysis of the proposal**

**The Problem:** This model sees the problem as not just fish and wildlife, hydropower, or the ESA. Rather, the problem 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.

**Power:** 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 the NMFS, the USFWS, the 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.



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.

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## **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).<sup>1</sup> BPA's decision to fund or implement fish and wildlife mitigation and recovery activities will reflect these ESA consultations. Therefore, no additional consultation is planned or necessary with respect to the alternative Policy Directions. A complete listing of species in the region listed as endangered or threatened is included in **Appendix C**.

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<sup>1</sup> See Chapter 1, section 1.3.2, for more on these Biological Opinions.

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 or restore the resources.

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, 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 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; 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." 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 (USDOE/BPA, 1996b). 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 had 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) (Federal Caucus, 1999b; formerly known as Draft "All H" Paper). Separate EIS-only scoping meetings were also held in Portland, Oregon, after notice in the *Federal Register*. As a result of these meetings, 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) (CRITFC, 1996). 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 proposed by the treaty tribes in their plan. 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 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 or not 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 tied 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 tied 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 tied to this EIS will be evaluated to determine whether they would impair acquired or developed sites or preclude intended uses.

In 2000, 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 extraregional resources has been incorporated by reference from BPA's Business Plan EIS (USDOE/BPA, 1995) 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.

## **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 (AAQs). 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 hydro-system.

## **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 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.

## GLOSSARY AND ACRONYMS

### GLOSSARY

Term	Meaning
<b>Action</b>	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.
<b>Alternative</b>	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.
<b>Anadromous fish</b>	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.
<b>Average megawatt (aMW)</b>	The average amount of energy (number of megawatts) supplied or demanded over a specified time.
<b>Capacity</b>	The maximum amount of power that can be produced by a generator or carried by a transmission facility.
<b>Critical habitat</b>	The geographic area occupied by or essential to a species.
<b>Cultural resource</b>	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).
<b>De-listing</b>	Removal of a species or evolutionarily significant unit (ESU) from endangered or threatened status under the Endangered Species Act (ESA).
<b>Dissolved gas</b>	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.
<b>Drafting (reservoir)</b>	Lowering of the elevation of a storage reservoir
<b>Drawdown</b>	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.
<b>Ecosystem</b>	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

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<b>Term</b>	<b>Meaning</b>
	characteristics to which the plant and animal life have adapted.
<b>Ecosystem Diagnosis and Treatment (EDT)</b>	An expert opinion and empirical modeling approach to stream and watershed assessments.
<b>Effect</b>	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.
<b>Endangered (ESA)</b>	A species of plant or animal in danger of extinction throughout all or a significant portion of its range.
<b>Endangered Species Act (ESA) -</b>	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.
<b>Environmental Impact Statement, or EIS</b>	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.
<b>ESU (evolutionary significant unit)</b>	A salmonid population or group of populations that are substantially reproductively isolated from other conspecific population units, and contributes substantially to ecological/genetic diversity of the biological species as a whole.
<b>Existing conditions</b>	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.
<b>Exotic Species</b>	An introduced species; a non-native species.
<b>Extirpate</b>	To destroy or remove completely, as a species from a particular area, region, or habitat.
<b>Fisheries</b>	<b>In-river</b> – Harvest occurring within freshwater areas. <b>Marine or ocean</b> – Harvest occurring in marine areas.
<b>Fishery</b>	<b>Indian</b> - See "Tribal Fishing Rights." <b>Non-Indian</b> – Fisheries conducted by non-tribal members.
<b>Floodplains</b>	The area along a stream or river that is subject to flooding.
<b>Fry (emergence)</b>	The first free-swimming life stage of a salmonid.
<b>Gas supersaturation</b>	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.
<b>Generation</b>	Act or process of producing electric energy from other forms of energy. Also refers to the amount of electric energy so produced.
<b>Genetic Diversity</b>	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.
<b>Hatchery</b>	A facility where fish are collected, spawned, reared, and (typically) released.
<b>Healthy stock</b>	A stock of fish sustaining a long-term growth rate adequate to ensure its continued survival over a wide range of variations in its life cycle.
<b>Hydropower</b>	Electrical power generation through use of the gravitational force of falling water at dams.

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<b>Term</b>	<b>Meaning</b>
<b>Impact factors</b>	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.
<b>Implementation action</b>	See <i>Action</i> .
<b>Implementation options</b>	Alternative methods or policy instruments for affecting human behavior to achieve actions; for example, regulation, subsidies, education and purchase.
<b>Implementation plan</b>	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.
<b>Impoundment</b>	Any human-made structure for retaining the flow of a river or stream that creates a reservoirs.
<b>Incidental take</b>	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 “ <i>Take</i> .”
<b>Indigenous</b>	Existing, growing, or produced naturally in a region.
<b>Instream flows</b>	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.
<b>Key issues</b>	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.
<b>Life stage</b>	An organism’s period of development to adulthood.
<b>Listed fish, species</b>	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 it’s range) as allowed under the ESA.
<b>Load</b>	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.
<b>Mainstem</b>	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.
<b>Management responses</b>	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.
<b>Mitigation</b>	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.
<b>Mitigation hatchery fish</b>	Artificially produced fish that are propagated to compensate for loss or reduction of a specific fish population.
<b>Multi-Species</b>	A collaborative project of the Northwest Power Planning Council, the Columbia River Basin’s Indian Tribes, and the United States to create several

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<b>Term</b>	<b>Meaning</b>
<b>Framework Project</b>	scientifically based, agreed-upon alternatives for determining how best to achieve fish and wildlife mitigation and recovery in the Columbia River Basin.
<b>NEPA</b>	National Environmental Policy Act.
<b>Operating agencies</b>	The federal agencies that operate federal dams in the Federal Columbia River Power System, namely, the Corps of Engineers and the Bureau of Reclamation.
<b>Operating responses</b>	Actions by entities specifically authorized to carry out directives.
<b>Operations (FCRPS)</b>	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.
<b>Particulates</b>	Substances that consist of minute separate particles, such as dust or soot.
<b>passive integrated transponder (PIT) tagging</b>	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.
<b>Point source discharges</b>	Pollutants discharged from any identifiable point, including pipes, ditches, channels, sewers, tunnels, and containers of various types.
<b>Policy Direction</b>	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
<b>Polluted</b>	(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.
<b>Population(s)</b>	A group of individuals of the same species occupying a defined locality during a given time that exhibit reproductive continuity from generation to generation.
<b>Reach</b>	A section of stream between two defined points.
<b>Rear</b>	To feed and grow in a natural or artificial environment.
<b>Reclamation Project(s)</b>	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.
<b>Record of Decision, or ROD</b>	The Record of Decision is prepared by the decision-maker to explain the basis for selection of a particular alternative
<b>Redd</b>	A nest of fish eggs covered with gravel.
<b>Refugia</b>	Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range.
<b>Resident fish</b>	Reside in fresh water throughout their life cycles.
<b>Response Strategy</b>	Corrective measures required to maintain the selected Policy Direction

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<b>Term</b>	<b>Meaning</b>
	following economic, political, or environmental changes.
<b>Riparian (zones)</b>	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.
<b>Run (fish)</b>	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.
<b>Run-of-river dams</b>	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.
<b>Runoff</b>	Water that flows over the ground and reaches a stream as a result of rainfall or snowmelt.
<b>Salmonids</b>	Fish of the family <i>Salmonidae</i> , which includes salmon and steelhead.
<b>Screens/ladders (fish)</b>	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.
<b>Sedimentation</b>	The settling of particles that are heavier than water and their deposition on the bottoms of streams and rivers.
<b>Sensitive species</b>	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.
<b>Smolt</b>	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.
<b>Smoltification</b>	Refers to those physiological changes anadromous salmonids and trout undergo in freshwater while migrating toward saltwater that allow them to live in the ocean.
<b>Spawn</b>	The act of reproduction of fishes. The mixing of the sperm of a male fish and the eggs of a female fish.
<b>Species of concern</b>	An unofficial status for a species whose abundance is at low levels.
<b>Spill</b>	Releasing water over a dam's spillways rather than channeling it through the powerhouse.
<b>Stock</b>	A specific population of fish. When referring to salmon, a specific population of fish spawning in a particular stream during a particular season.
<b>Storage reservoir</b>	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.
<b>Status Quo</b>	A policy direction defined by current policies, used as the No Action Alternative in the Fish and Wildlife Implementation EIS.
<b>Subbasin</b>	A watershed area defined by 4 <sup>th</sup> –field USGS hydrologic unit code; the size

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<b>Term</b>	<b>Meaning</b>
	averages 200,000 hectares.
<b>Supplementation</b>	Releasing hatchery produced fish into the wild in an effort to try and reestablish or increase the size of a naturally spawning population.
<b>Take (legal/illegal)</b>	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.
<b>Threatened (ESA)</b>	A genetic population that is at risk of becoming endangered in the foreseeable future.
<b>TMDL</b>	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).
<b>Transport(juvenile)</b>	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.
<b>Tribal fishing rights</b>	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.
<b>Trust obligations/ responsibility</b>	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).
<b>Turbidity</b>	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.
<b>Water quality limited</b>	A water body that does not meet the federally approved state water quality standard established under the provision of the Clean Water Act.
<b>Watershed</b>	A watershed area defined by 5 <sup>th</sup> –field USGS hydrologic unit code; the size ranges between 20 and 40,000 hectares.
<b>Wetland(s)</b>	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.

## **ACRONYMS**

All H	The "All H" paper (referring to hydro, habitat, hatcheries, and harvest). Now titled the Basin-wide Salmon Recovery Strategy.
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
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
IFDG	Idaho Department of Fish and Game
LRMP	land and resource management plans

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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
NPS	National Park Service
NRCS	Natural Resource Conservation Service
PIT	Passive Integrated Transponder” tags,
PMA	Power Marketing Authority
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
SOR	System Operation Review
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WNP	Washington Nuclear Projects

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World Bank, Washington, DC  
Canadian Columbia River Inter-Tribal Fish Commission, Cranbrook, British Columbia, Canada  
Canadian Environmental Assessment Agency, Hull, Quebec, Canada  
Ministry of Environment, Lands, and Parks, Victoria, British Columbia, Canada  
Ministry of Fisheries, Victoria, British Columbia, Canada  
Pacific Salmon Commission, Vancouver, British Columbia, Canada

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USDA Natural Resources Conservation Service, Portland, OR  
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***Fish and Wildlife Implementation Plan DEIS***  
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Confederated Tribes of the Chehalis Indian Reservation, Oakville, WA  
Confederated Tribes of the Colville Reservation, Nespelem, WA  
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Confederated Tribes of the Grand Ronde, Grand Ronde, OR  
Confederated Tribes of the Siletz Indian Reservation, Siletz, OR  
Confederated Tribes of the Umatilla Indian Reservation, Pendleton, OR  
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Cowlitz Indian Tribe, Longview, WA

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Northwest Power Planning Council, Helena, MT  
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Western Governors' Association, Denver, CO

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Port of Vancouver, Vancouver, WA  
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**FEDERAL DEPOSITORY LIBRARIES**

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California State Library, Sacramento, CA  
New Mexico State Library, Santa Fe, NM  
Portland State University, Bradford Price Millar Library, Portland, OR  
University of Idaho Library, Moscow, ID  
University of Montana, Mansfield Library, Missoula, MT  
University of Nevada, Reno University Library, Reno, NV  
University of New Mexico, Zimmerman Library, Santa Fe, NM  
Utah State University, Merrill Library, Logan, UT  
Washington State Library, Joel M. Pritchard Library, Olympia, WA  
Wyoming State Library, Cheyenne, WY

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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  
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Idaho Rivers United, Boise, ID  
Idaho Steelhead and Salmon Unlimited, Boise, ID  
Idaho Wildlife Federation, Boise, ID  
Industrial Forestry Association, Portland, OR  
Kokanee Recovery Task Force, Bayview, ID  
National Wildlife Federation, Seattle, WA  
Native Fish Society, Portland, OR  
Natural Resources Defense Council, San Francisco, CA  
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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 Trout, Portland, OR  
Oregon Water Trust, Portland, OR  
Pacific Fishery Management Council, Portland, OR  
Pacific Northwest Waterways Association, Vancouver, WA

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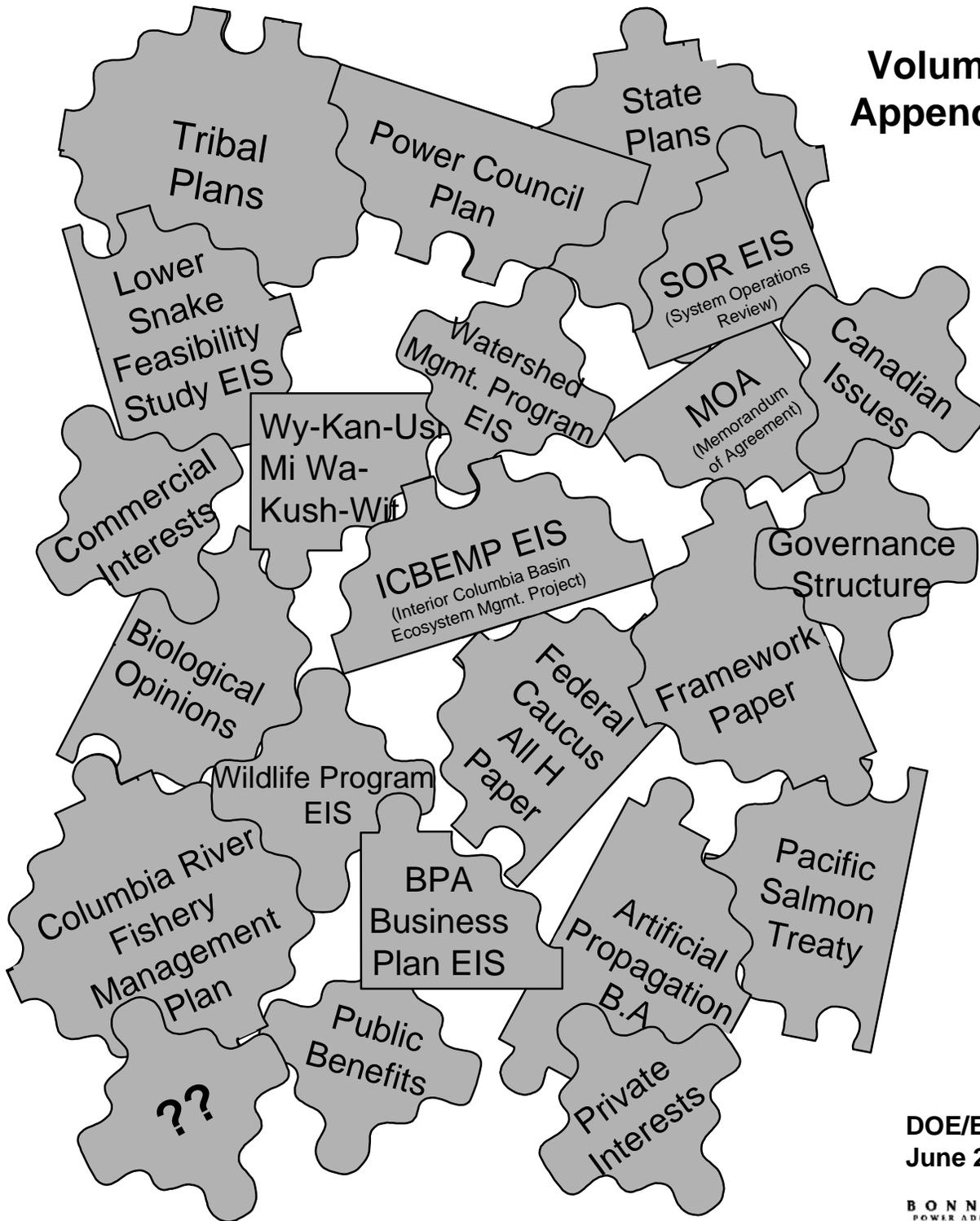
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# Bonneville Power Administration Fish & Wildlife Implementation Plan Draft EIS

*"Piecing The Puzzle Together"*

**Volume 2:  
Appendices**



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## **Appendix A**

# **FISH AND WILDLIFE FUNDING PRINCIPLES FOR BONNEVILLE POWER ADMINISTRATION RATES AND CONTRACTS**

**September 16, 1998**

### **Preamble**

The purpose of these principles is to conclude the fish and wildlife funding process in which Bonneville has been engaged with various interests in the Region, and provide a set of guidelines for structuring Bonneville's subscription and power rate processes. The principles are intended to "keep the options open" for future fish and wildlife decisions that are anticipated to be made in late 1999 on reconfiguration of the hydrosystem and in early 2000 on the Northwest Power Planning Council's Fish and Wildlife Program.

The agreement resulting from these principles is significantly different from the last Bonneville Fish and Wildlife Budget Memorandum of Agreement. Bonneville and the other participants are not establishing a budget for the 2002-2006 period, and Bonneville will not be picking a single number for the rate case.

These principles will ensure that Bonneville's rates and power contracts give a very high probability of meeting all post-2001 financial obligations, including the future fish and wildlife budget commitment, and that all these obligations can be met without creating a new contract and rate "cliff" at the end of the next 5-year rate period in 2006. Bonneville anticipates that after 1999 its fish and wildlife budget commitment for the post-2001 period will be set out in a budget agreement that, among other things, addresses accountability and provides that funds carried forward under the agreement will remain available for expenditure for the benefit of fish and wildlife.

Bonneville's contracts and rates historically have been set in a manner that assumes there is a low, but not zero probability that it will be unable to cover its costs. Continuing this approach, in such circumstances (e.g. low markets, low water, etc.) all of Bonneville's costs will be reviewed, recognizing that fish and wildlife obligations are one of its highest priorities. Guided by the principles below, Bonneville's goal is to reduce the chances of its being unable to cover its costs to an acceptably low level. Bonneville commits to use these principles and financial mechanisms to achieve this goal. These principles have been reviewed by the Office of Management and Budget and are consistent with the Administration's principles and priorities.

## **Principles**

Bonneville will proceed with its power rate case and contracts for its subscription products for the period 2002-2006 using the following principles:

1. Bonneville will meet all of its fish and wildlife obligations once they have been established, including its trust and treaty responsibilities.
2. Bonneville will take into account the full range of potential fish and wildlife costs.
  - Bonneville will use the full range of potential fish and wildlife costs and financial impacts during the 2002-2006 rate period (currently estimated at \$438 million to \$721 million) for planning purposes. This range is based upon the current calculation of the 5 year average financial impact on Bonneville of thirteen long-term alternatives being evaluated in the Region for configuration of the Federal Columbia River Power System and an estimated range of costs for implementing the Northwest Power Planning Council's Fish and Wildlife Program to protect, mitigate, and enhance fish and wildlife on the Columbia River and its tributaries.
  - In setting its rates Bonneville will incorporate the range of \$438 million to \$721 million in its revenue requirement using a method that calculates probabilities across a range of costs in the same manner as Bonneville treats other cost and revenue uncertainties in its rate setting. Because of the uncertainties of the decisions on fish and wildlife at this time, Bonneville will conduct an analysis that assumes that all 13 system configuration alternatives are equally likely to occur. For the direct program, Bonneville will assume that costs have an equal probability of falling anywhere within the current range of \$100M - \$179M.
3. Bonneville will demonstrate a high probability of Treasury payment in full and on time over the 5-year rate period.
  - A 100 percent probability of Treasury payment is not achievable, but BPA's new rates must be designed to maintain or improve Treasury payment probability, even in view of the range of fish costs.
  - Bonneville will demonstrate a probability of Treasury payment in full and on time over the 5-year rate period at least equal to the 80 percent level established in the last rate case and will seek to achieve an 88 percent level.
4. Given the range of potential fish and wildlife costs, Bonneville will design rates and contracts which will position Bonneville to achieve similarly high Treasury payment probability for the post-2006 period by building financial reserve levels and through other mechanisms.

5. Bonneville will minimize rate impacts on Pacific Northwest power and transmission customers.
  - Bonneville’s goal is to avoid a wholesale rate increase for requirements customers (including small farm and residential customers of investor owned utilities) by seeking an additional cost reduction of \$130 million in internally manageable costs that are not fish and wildlife costs.
6. Bonneville will adopt rates and contract strategies that are easy to implement and administer.
7. Bonneville will adopt an approach that is flexible in order to respond to a variety of different fish and wildlife cost scenarios.
  - To create financial flexibility and to avoid another contract “cliff” in 2006, Bonneville's goal will be to have 35% to 45% of its total post-2001 power sales, including secondary sales, in contract terms of 3 years or less, in short-term surplus sales, and/or in cost-based indexed sales.
  - All sales to requirements customers will be renewable at cost-based rates which will reflect changes in Bonneville's costs subsequent to those reflected in the initial subscription rate.
8. Bonneville will use a combination of the following mechanisms to achieve principles 1-7. The specific mix and design of these mechanisms will be determined in the rate case and subscription process, but the mix chosen will meet the above principles:
  - Implementing prudent additional cost-reduction efforts to reduce internally manageable costs before exercising any contingent stranded cost recovery mechanism.
  - Use of Bonneville’s existing authorities if needed to implement stranded costs recovery on the transmission system, while simultaneously seeking more robust authorities legislatively.
  - Selling subscription products on staggered contract terms - some shorter than 5 years (see Principle 6) and some for longer than 5 years.
  - A cost recovery adjustment clause (CRAC) in power contracts for subscription customers.
  - An option fee from some customers in return for increased price predictability after the initial contract period.
  - Cost-based indexed pricing for some of its products.

- Using reserve balances carried into the 2002-2006 rate period from the prior period.

### **Administration Commitments**

- The Administration will extend the availability of section 4(h)(10)(C) credits for Bonneville's costs related to its fish and wildlife programs for the period 2002-2006 on the same terms as established for the 1995-2001 period.
- The Administration will confirm continued access through 2006 to any funds remaining in the Fish Cost Contingency Fund on September 30, 2001 on the same terms as those established for the period 1995-2001.
- The Administration commits to support Bonneville in its Cost Review and revenue enhancement objectives.

## Appendix B

### MISSION STATEMENTS AND STATUTORY TABLES

This appendix is supplied to help understand the numerous different missions and legal requirements that guide the many entities involved in the region's fish and wildlife mitigation and recovery effort. Appendix B has two sections:

- Section A - The Major Stakeholders and Fish and Wildlife Policy Forums
- Section B - Relevant Federal Statutes, Regulations and Executive Orders.

#### Section A

#### The Major Stakeholders and Fish And Wildlife Policy Forums in the BPA Service Area

Numerous stakeholders influence fish and wildlife policies and program implementation within the BPA Service Area. They include multiple sovereignties and levels of government, as well as interagency forums and independent commissions. Their activities in the fish and wildlife arena are linked by varying degrees of coordination, and their missions reflect their geographic locations and constituents. The following table provides the reader with a sense of the breadth and diversity of the major interest groups concerned with BPA's Fish and Wildlife Implementation Program.

Canada	
<b>Fisheries and Oceans Canada</b>	Responsible for policies and programs to support Canada's interests in the oceans and freshwater habitat, and to conserve and sustain Canada's fisheries resources in marine and inland waters.
United States—Federal Agencies	
U.S. Department of Agriculture	
<b>U.S. Forest Service</b>	Manages national forests and grasslands in all eight states in BPA service area for sustainable multiple use, including fish and wildlife.
<b>Natural Resources Conservation Service</b>	Provides assistance about soil and water conservation to private landowners. Has a conservation office in every county.
U.S. Department of Commerce	
<b>National Marine Fisheries Service</b>	Responsible for managing and sustaining most marine resources and their habitats in U.S. waters. Provides services to support domestic and international fisheries management.
U.S. Army Corps of Engineers	
<b>Army Corps of Engineers</b>	Operates federal dams in the Columbia River basin for multiple uses, including fish and wildlife. Salmon migrate through fishways and bypass systems at most dams.

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<b>U.S. Department of Energy</b>	
<b>Bonneville Power Administration</b>	Responsibilities include improvement of Northwest fish and wildlife resources affected by hydropower plants in the Columbia River Basin.
<b>Environmental Protection Agency</b>	Responsible for safeguarding the nation's natural environment - air, water, and land.
<b>U.S. Department of the Interior</b>	
<b>Bureau of Land Management</b>	Manages public lands, including fish and wildlife habitat.
<b>Bureau of Reclamation</b>	<b>Manages, develops, and protects water and related resources</b>
<b>National Park Service</b>	Responsible for preserving natural resources in national parks.
<b>Fish and Wildlife Service</b>	Responsible for conserving, protecting, and enhancing fish and wildlife, and their habitats. Specifically includes migratory birds, endangered species, certain marine mammals, and freshwater and anadromous fish.
<b>United States— State Governments</b>	
<b>California Dept. of Fish and Game</b>	Responsible for managing California's fish, wildlife, and plant resources, and the habitat upon which they depend.
<b>Idaho Dept. of Fish and Game</b>	Responsible for preserving, protecting, and perpetuating all fish and wildlife resources in Idaho.
<b>Montana Fish, Wildlife &amp; Parks</b>	Responsible for maintaining and enhancing the health of Montana's natural environment and the vitality of its fish and wildlife resources.
<b>Oregon Dept. of Fish and Wildlife</b>	Responsible for protecting and enhancing Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.
<b>Nevada Dept. of Conservation and Natural Resources</b>	Responsible for protecting, preserving, managing, and restoring wildlife and its habitat.
<b>Utah Dept. of Natural Resources</b>	Responsible for coordinated and balanced stewardship of Utah's natural resources.
<b>Washington Dept. of Fish and Wildlife</b>	Responsible for providing sound stewardship of fish and wildlife. Serves as an advocate for fish and wildlife species.
<b>Wyoming Game and Fish Dept.</b>	Responsible for providing adequate and flexible system to control, propagate, manage, protect, and regulate all Wyoming wildlife.
<b>Tribes</b>	
<b>Blackfoot Tribe</b>	Reservation, 3,000 square miles Northwestern Montana 8,488 tribal members

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<b>Burns-Paiute Tribe</b>	Reservation, 1,240 acres plus 11,000 acres in trust for individual Indians Eastern Oregon 286 tribal members
<b>Cedarville Rancheria</b>	Reservation, 20 acres Northwestern California Population: 22
<b>Confederated Tribes of the Chehalis Indian Reservation</b>	Reservation, 4,224 acres Western Washington Number of Chehalis Indians in 1984: 382.
<b>Chinook Indian Tribe</b>	No reservation or tribal lands Western Washington 2,000 tribal members
<b>Coeur d'Alene Tribe</b>	Reservation, 69,299 acres Northern Idaho 1,216 tribal members
<b>Confederated Tribes of the Colville Reservation</b>	Reservation, 1.3 million acres Northeastern Washington 7,900 tribal members
<b>Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians</b>	Reservation, 6.1 acres South-central Oregon coast 600 tribal members
<b>Coquille Indian Tribe</b>	No reservation 6,400 acres of tribal lands South-central Oregon coast 695 tribal members
<b>Cowlitz Indian Tribe</b>	No reservation Western Washington 1,400 tribal members
<b>Crow Indian Nation</b>	Reservation, 3,521 square miles South-central Montana 9,024 tribal members
<b>Fort Bidwell Reservation</b>	Reservation, 3,335 acres Northwestern California Population: 200

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<b>Fort McDermitt Paiute and Shoshone Tribe</b>	Reservation, 16,654 acres in northern Nevada; 18,828 acres in southeastern Oregon
<b>Confederated Tribes of the Grand Ronde</b>	Reservation, 10,300 acres Western Oregon 4,104 tribal members
<b>Hoh Tribal Business Community</b>	Reservation, 443 acres Northern Washington coast 212 tribal members
<b>Hoopa Valley Reservation</b>	Reservation, 85,446 acres Northwestern California Population: 2,200
<b>Jamestown S'Kallam Tribal Council</b>	No reservation Northwestern Washington 486 tribal members
<b>Kalispel Tribe</b>	Reservation, 4,600 acres Northeastern Washington 250 tribal members
<b>Klamath Tribes</b>	No reservation or tribal lands South-central Oregon 3,175 tribal members
<b>Kootenai Tribe of Idaho</b>	Reservation, 2,695 acres Northern Idaho 165 tribal members
<b>Lower Elwha</b>	Reservation, 373 acres Northwestern Washington 638 tribal members
<b>Lummi Indian Tribe</b>	Reservation, 12,000 acres Northwestern Washington 3,670 tribal members
<b>Makah Tribe</b>	Reservation, 27,200 acres Northwestern Washington 2,195 tribal members
<b>Muckleshoot Tribe</b>	Reservation, 1,201 acres of trust land Western Washington 1,170 tribal members

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<b>Nez Perce Tribe</b>	Reservation, 88,000 acres North-central Idaho 3,000 tribal members
<b>Nisqually Indian Tribe</b>	No reservation or tribal lands Western Washington 500 tribal members
<b>Nooksack Indian Tribe</b>	Reservation, 2,500 acres including 65 acres of tribally owned trust land Western Washington 1,341 tribal members
<b>Ozette/LaPush Tribes</b>	Reservation, 709 acres Northern Washington coast (Held in trust for the Makah Tribe)
<b>Pit River Indians</b>	Several reservations, Northeastern California 1,350 tribal members
<b>Port Gamble S'Klallam</b>	Reservation, 1,341 acres Northern Washington coast 935 tribal members
<b>Puyallup Indian Tribe</b>	Reservation, a few square miles Western Washington 2,219 tribal members
<b>Quileute Tribe</b>	Reservation, 594 acres Northern Washington coast 706 tribal members
<b>Quinault Indian Nation</b>	Reservation, 189,621 acres Northwestern Washington 2,453 tribal members
<b>Confederation Tribes of the Salish and Kootenai Tribes of the Flathead</b>	Reservation, 1.2 million acres Western Montana 6,800 tribal members
<b>Samish Tribe</b>	No reservation or tribal lands Western Washington 750 tribal members

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<b>Sauk-Suiattle Tribe</b>	Reservation, 23 acres Northwestern Washington 183 tribal members
<b>Shoalwater Bay Tribe</b>	Reservation, 1,035 acres Northwestern Washington 204 tribal members
<b>Northwestern Band of Shoshoni Nation</b>	Reservation, 187 acres Northwestern Utah 411 tribal members
<b>Shoshone-Bannock Tribes of Fort Hall</b>	Reservation, 540,764 acres Idaho 3,951 tribal members
<b>Shoshone-Paiute Tribes of the Duck Valley Reservation</b>	Reservation, 144,274 acres in Nevada Reservation, 145,545 acres in Idaho
<b>Confederated Tribes of the Siletz Indian Reservation</b>	Reservation, 3,669 acres Western Oregon 3,022 tribal members
<b>Skokomish Tribe</b>	No reservation or tribal lands Northwest Washington 796 tribal members
<b>Spokane Tribe</b>	Reservation, 154,000 acres Eastern Washington 2,100 tribal members
<b>Squaxin Island Tribe</b>	Reservation, a small island Western Washington 650 tribal members
<b>Stillaguamish Tribe</b>	No reservation or tribal lands Western Washington 237 tribal members
<b>Summit Lake Paiute Tribe</b>	Reservation, 10,098 acres Nevada
<b>Suquamish Tribe</b>	Reservation, 2,500 acres Northwestern Washington 665 tribal members

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<b>Swinomish Indian Tribe</b>	Reservation, 10 square miles Western Washington 778 tribal members
<b>Tulalip Indian Tribe</b>	Reservation, 8,878 acres Northwestern Washington 2,800 tribal members
<b>Confederated Tribes of the Umatilla Indian Reservation</b>	Reservation, 157,982 acres Eastern Oregon Approximately 2,000 tribal members
<b>Upper Skagit Tribe</b>	Reservation, 99 acres Western Washington 504 tribal members
<b>Confederated Tribes of Warm Springs</b>	Reservation, 641,000 acres Central Oregon 3,755 tribal members
<b>Confederated Tribes and Bands of the Yakama Indian Nation</b>	Reservation, 1.4 million acres South-central Washington 8,870 tribal members
<b>Tribal Coalitions</b>	
<b>Affiliated Tribes of Northwest Indians</b>	Nonprofit organization dedicated to tribal sovereignty and self-determination. Represents 54 Northwest tribal governments.
<b>Columbia River Inter-Tribal Fish Commission</b>	Provides technical support and coordination for the four Columbia River treaty tribes. Members are fish and wildlife management representatives from the tribes.
<b>Northwest Indian Fisheries Commission</b>	Assists tribes in conducting coordinated, biologically sound fisheries management and provides a unified voice about fisheries issues. Members represent 19 western Washington tribes.
<b>Upper Columbia United Tribes</b>	Composed of four tribes. Provides ecological training and studies about fisheries issues.
<b>Other Entities</b>	
<b>Columbia Basin Fish and Wildlife Authority</b>	Represents Oregon, Washington, Idaho, and Montana, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and 13 tribes of the Columbia River Basin. Members are responsible for coordinating interagency and tribal fish and wildlife efforts.
<b>Dissolved Gas Team</b>	Researches and develops measures to abate gas bubble disease (in fish) associated with spill at Columbia River dams. Members represent federal agencies, state agencies, utilities, fisheries interest groups, and tribes.

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<b>Executive Committee</b>	Coordinates implementation of the Endangered Species Act, Northwest Power Act, and other statutory programs for anadromous fish in the Columbia River basin. Members represent federal, state, and tribal entities.
<b>Fish Passage Center</b>	Provides current and historical data about salmon and steelhead passage through the Snake and Columbia river basins.
<b>Implementation Team</b>	Provides a mechanism for coordinating and implementing biological opinions from the National Marine Fisheries Service concerning the federal dams in the Columbia River basin. Members represent federal agencies, states, tribes, and utilities.
<b>Independent Scientific Advisory Board</b>	Provides scientific advice and recommendations about fish and wildlife issues in the Columbia River basin.
<b>International Pacific Halibut Commission</b>	Reviews all U.S. and Canadian regulatory proposals concerning the halibut fishery in the North Pacific Ocean and Bering Sea, and submits recommendations to Canadian and U.S. governments.
<b>Northwest Power Planning Council</b>	Represents Idaho, Oregon, Montana, and Washington to oversee the federal power system planning, and fish and wildlife recovery in the Columbia River basin.
<b>Pacific Fisheries Management Council</b>	Develops fishery management plans for salmon, groundfish, and coastal pelagic species off the coasts of Washington, Oregon, and California. A cooperative effort among states, federal agencies, and tribes.
<b>Pacific Salmon Commission</b>	Formed by the governments of Canada and the United States to implement the Pacific Salmon Treaty. Provides a forum for both countries to resolve salmon management issues.
<b>Pacific States Marine Fisheries Commission</b>	Serves as a forum for discussion about fisheries issues and works for consensus among state and federal agencies. Represents California, Oregon, Washington, Idaho, and Alaska.
<b>Plan for Analyzing and Testing Planning Group</b>	Coordinates regional fish passage and life cycle models and tests the hypotheses about the models to address fish management issues. Members represent federal and state agencies, universities, consultants, and tribes.
<b>Snake River Compact</b>	An agreement between Wyoming and Idaho to allocate waters of the Snake River.
<b>System Configuration Team</b>	Develops proposals, plans, and budget priorities for physical improvements to dams and dam-related structures. Members include the Northwest Power Planning Council, federal and state fish and wildlife agencies, and Columbia River basin tribes.
<b>Technical Management Team</b>	Makes recommendations to operating agencies about dam and reservoir operations to optimize fish passage conditions. An inter-agency team chaired by U.S. Army Corps of Engineers.
<b>Western Systems Coordinating Council</b>	Regional forum to promote electric service reliability in western U.S., Canada, and Mexico.

**Section B**

**Relevant Federal Statutes, Regulations, and Executive Orders**

<p><b>BPA</b> - Bonneville Power Administration  <b>BLM</b> - Bureau of Land Management  <b>BOR</b> - US Bureau of Reclamation  <b>CEQ</b> - President's Council of Environmental Quality  <b>COE</b> - US Army Corps of Engineers  <b>DOC</b> - US Department of Commerce  <b>DOI</b> - US Department of Interior</p>	<p><b>NMFS</b> - National Marine Fisheries Service  <b>NPS</b> - National Park Service  <b>EPA</b> - US Environmental Protection Agency  <b>USDA</b> - US Department of Agriculture  <b>USFS</b> - US Forest Service  <b>USFWS</b> - US Fish and Wildlife Service</p>
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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
American Indian Religious Freedom Act of 1978, 42 U.S.C.S. 1996 (1999)	Same as complying agencies	All federal agencies with statutory or administrative responsibilities for management of federal lands	To protect and preserve the American Indians' inherent right to believe, express, and exercise their traditional religion, including access to sites, use and possession of sacred objects, worship through ceremonials, traditional rites.
Archeological and Historic Preservation Act of 1960 and 1974 16 U.S.C.S. 469 <i>et seq.</i> (1999)	DOI	Any agency constructing a dam or other Federal construction project	Provides for preservation of historic sites, buildings, objects, etc. by providing for preservation of historical and archeological data which might otherwise be irreparably lost or destroyed as the result of flooding, relocation of roads, alterations of terrain, or other acts cause by the construction of a dam by any agency of U.S. or by any private entity holding license issued by such agency or by any alteration of the terrain caused as a result of any Federal construction project or federally licensed activity or program.
Archeological Resources Protection Act, 16 U.S.C.S. 470aa <i>et seq.</i> (1999)	Agency with primary management authority of public lands or DOI	All	Agencies must obtain permits before excavating or otherwise disturbing archaeological resources on public lands and Indian lands.
Bald Eagle Protection Act 16 U.S.C.S. 668 (1999)	USFWS, DOI, Attorney General	All	No one is allowed to take, possess, sell, purchase bald eagle or golden eagle, dead or alive, or any part, nest or egg thereof.

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
Clean Air Act, as amended, 42 U.S.C.A. 7401 <i>et seq.</i> (1999)	EPA	All	Agencies must comply with state implementation plans, and follow new source performance standards as required by EPA. Must comply with all federal, state, interstate, and local air pollution requirements.
Clean Water Act, as amended, 33 U.S.C.S. 1251 <i>et seq.</i> (1999). (Federal Water Pollution Control Act of 1972 and its successors, the Clean Water Act of 1977, and the Water Quality Act of 1987)	EPA	All	Regulates discharge of pollutants into the navigable waters of the U.S. through a permit system. Non-point source requirements control pesticide runoff, agricultural runoff, forestry operations, and parking lots/motor pools. Non-point sources require individual or group permits and must be monitored at the point they enter public waters, storm sewers, or natural waterways.
Coastal Zone Management Act of 1972, as amended, 16 U.S.C.S. 1451 (1999)	USDC	All	Requires that federal actions are consistent, to the maximum extent practicable, with approved state Coastal Zone Management programs.
Columbia River Gorge National Scenic Area Act, as amended, 16 U.S.C.S. § 544 <i>et seq.</i> (1999)	Columbia River Gorge Commission	All	A violation occurs if there is a willful violation of management plans, land use ordinances or implementation measures made by the Columbia Gorge Commission.
Comprehensive Environmental Response, Compensation & Liability Act of 1980 (CERCLA), as amended, 42 U.S.C.S. 9601 <i>et seq.</i> (1999)	EPA	All	Requires restoration of sites with hazardous materials.
Endangered Species Act (ESA), as amended, 16 U.S.C.S. 1531 <i>et seq.</i> (1999)	NMFS, USFWS	Virtually all	Federal agencies must ensure that proposed actions do not jeopardize the continued existence of any endangered or threatened species, or cause the destruction or adverse modification of their habitat.

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Environmental Quality Improvement Act of 1970, as amended, 42 U.S.C.S. 4371 <i>et seq.</i>	CEQ and Office of Environmental Quality	All federal agencies conducting or supporting public works projects	Federal agencies must comply with environmental statutes.
Executive Order 11514 Protection and Enhancement of Environmental Quality, Mar. 5, 1970, 3 C.F.R. 902 (1966-1970), 35 Fed. Reg. 30,959 (Amended by Executive Order 11991, May 24, 1977, 3 C.F.R. 123 (1977), 42 Fed. Reg. 26,967)	CEQ	All	Directs Federal agencies to initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. Federal agencies are responsible for developing procedures (e.g., public hearings, information on alternative courses of action) to ensure the public can review, understand, and comment on Federal plans and programs with environmental impacts in a timely manner. The Council on Environmental Quality (CEQ) developed regulations requiring EISs to be more concise, clear, and to the point (and therefore more useful to the decisionmakers) in response to this executive order.
Executive Order 11644 Use of Off-Road Vehicles on Public Lands, Feb. 8, 1972, 37 Fed. Reg. 2877, as amended by Executive Order 11989, May 24, 1977, 42 Fed. Reg. 26,959	DOI, USDA	BLM, USFS	Establishes policies and procedures for use of off-road vehicles on public land to protect resources of those lands. Includes any vehicle whose use is authorized by respective agency head under permit, license, lease or contract.
Executive Order 11988 Floodplain Management, May 24, 1977, 3 C.F.R. 117 (1977) 42 Fed. Reg. 26961. Amended by Executive Order 12148, July 12, 1975, 3 C.F.R. 412 (1979), 44 Fed. Reg. 43,239	Water Resources Council	BLM, USFS	Federal agencies are required to avoid or minimize adverse impacts associated with short-term or long-term modification and occupancy of flood plains. If activities are going to occur within the 100-year floodplain or within wetlands the agency must first prepare a floodplain/wetlands assessment (similar to NEPA requirements).
Executive Order 11990 Protection of Wetlands, May 24, 1977, 3 C.F.R. 121 (1977), 42 Fed. Reg. 26,961	Each agency	All	Federal agencies are required to issue or amend existing procedures to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
Executive Order 12088 Federal Compliance with Pollution Control Standards, Oct 13, 1978, 3 C.F.R. 243 (1978), 43 Fed. Reg. 47,707, (amended by Executive Order 12580, Jan. 12, 1987, 3 C.F.R. 103 (1987), 52 Fed. Reg. 2423, amended by Executive Order 13016, Aug. 28, 1996, 61 Fed. Reg. 45871)	EPA	All	This executive order delegates responsibility to the head of each executive agency for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the EPA authority to conduct reviews and inspections to monitor Federal facility compliance with pollution control standards.
Executive Order 12898 Environmental Justice, Feb. 11, 1994, 59 Fed. Reg. 7629, amended by Executive Order 12948, Jan. 30, 1995, 60 Fed. Reg. 6381.	Interagency Working Group on Environmental Justice convened by EPA	All	Directs all federal agencies to ensure that their actions do not result in disproportionately adverse environmental or human health effects on minority and/or low-income populations. In addition, federal agencies must analyze the environmental effects of the actions, including human health, economic, and social effects, and effects on minority and low-income communities.
Executive Order 12962 Recreational Fisheries, June 7, 1995, 60 Fed. Reg. 30769	USFWS, NMFS	All	Requires federal agencies to implement laws in manner that will conserve, restore, and enhance aquatic systems that support recreational fisheries; to evaluate the effects of federal funded, permitted, or authorized actions on aquatic systems and recreational fisheries; documents those effects.
Farmland Protection Policy Act 7, as amended, U.S.C.S. 4201 <i>et seq.</i> (1999)	USDA	All	Directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands. The Act's purpose is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses.

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
Federal Insecticide, Fungicide, and Rodenticide Act, as amended 7 U.S.C.S. 136 <i>et seq.</i> (1999) (amended by the Federal Environmental Pesticide Control Act of 1972)	EPA	All	Registers and regulates the manufacture and use of pesticides, including herbicides.
Federal Land Policy and Management Act 43, U.S.C.S. 1701 <i>et seq.</i> (1999)	BLM, USFS	Agencies with federal land management responsibilities	Establishes public land policy and guidelines for its administration and provides for the management, protection, development, and enhancement of the public lands. Requires permits for right-of-way access for activities not in accord with the primary objective of the management of public or Indian lands under the Act.
Fish and Wildlife Act of 1965 PL 85-624, 16 U.S.C.S. 742 <i>et seq.</i> (1999).	USFWS, NMFS (if appropriate), state agencies with jurisdiction over wildlife resources	Any federal agency that proposes to control or modify any body of water	Authorizes the Secretary of the Interior to take steps required for the development, management, advancement, conservation, and protection of fisheries and wildlife resources through research, acquisition of refuge lands, development of existing facilities, and other means. Designed to protect the aquatic environment as it affects fish and wildlife resources. Wildlife conservation should receive equal consideration and be coordinated with other aspects of water resources development.
Fish and Wildlife Conservation Act of 1980, 16 U.S.C.S. 2901 <i>et seq.</i> (1999)	DOI	All	Encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats
Fish and Wildlife Coordination Act, as amended, 16 U.S.C.S. 661 <i>et seq.</i> (1999)	USFWS, NMFS, (if appropriate), DOI, state agencies with jurisdiction over wildlife resources	Any federal agency that proposes to control or modify any body of water	Designed to protect the aquatic environment as it affects fish and wildlife resources. Wildlife conservation should receive equal consideration and be coordinated with other aspects of water resources development.

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, 16 U.S.C.S. sec. 1600 <i>et seq.</i> (1999) (National Forest Management Act of 1976, 16 U.S.C.S. 1600 <i>et seq.</i> (1999))	USDA	BLM, USFS	Requires Federal agencies to develop resource management plans on land affected by their actions. Includes Forest Management Plans.
Magnuson-Stevens Fishery Conservation and Management (Sustainable Fisheries Act of 1996), Act. 16 U.S.C.S. 1801 <i>et seq.</i> (1999)	NMFS	All	Development of regional fishery management plans for off-shore fisheries, anadromous species and Continental Shelf fisheries. Promote protection of essential fish habitat in review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat.
Marine Mammal Protection Act, 16 U.S.C.S. 1361 <i>et seq.</i> (1972)	NMFS	All	Established moratorium, with exemptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas.
Migratory Bird Treaty Act of 1918, 16 U.S.C.S. 703 <i>et seq.</i> (1999).	USFWS	All	An activity violates the Act if the action can kill or take a migratory bird. If the action is unavoidable, a permit can be obtained from the Fish and Wildlife Service.
National Environmental Policy Act (NEPA), as amended, 42 U.S.C.S.4321 <i>et seq.</i>	EPA	Applies to all federal projects or projects that require federal involvement.	Requires Federal agencies to assess the impacts that their proposed actions may have on the environment.
National Historic Preservation Act of 1966, as amended, 16 U.S.C.S. 470 <i>et seq.</i> (1999)	DOI, NPS, states	All	Requires the agency official consider the effects an undertaking may have on historic properties and provide an opportunity for the State Historic Preservation Officer (SHPO) and/or the Advisory Council (AC) to comment on such effects.
National Trail System Act , 16 U.S.C.S. 1241 <i>et seq.</i> (1999)	DOI, USDA	BLM, USFS, BPA	Establishes and protects trails in urban areas and in scenic areas and along historic travel routes. Designates the Oregon National Historic Trail. Provides for additional national scenic or

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
			historical trails. Violations are designated by the agency that manages the area. Includes such regulations as requiring permits when burning or making unreasonable disturbances, or requiring special-use authorization for construction and maintenance in the area.
National Wildlife Refuge Administration Act, as amended, 16 U.S.C.S. 668dd (1999)	DOI (BLM, USFWS)	All	Protects designated wildlife refuges areas. Several are listed in Oregon and Washington.
Native American Graves Protection and Repatriation Act (ARPA) of 1990, 25 U.S.C.S. 3001 <i>et seq.</i> (1999)	DOI	All	Prior to intentional removal of Native American grave remains, obtain an ARPA permit and consult with tribes. When gravesites unintentionally disturbed, halt work immediately, consult land management entity, and consult with tribes. Activity may resume 30 days after confirmation of notification to tribes.
Noise Control Act of 1972, as amended, 42 U.S.C.S. 4901 <i>et seq.</i> (1999)	EPA	All	Requires that federal entities comply with state and local requirements regarding noise. Requires all federal agencies to correct and abate any environmental noise in violation of EPA standards.
Noise Pollution and Abatement Act of 1970, 42 U.S.C.S. 7642 (1999)	EPA	All	Federal agency carrying out or sponsoring activity resulting in noise that is determined to be public nuisance shall abate such noise.
Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) 16 U.S.C.S. 839 <i>et seq.</i> (1999)	Pacific Northwest Power and Conservation Planning Council, DOE	BPA, FERC, BOR, COE, NMFS, USFWS	Contains provisions to protect, mitigate, and enhance the fish and wildlife, including their spawning grounds and habitat, of the Columbia River and its tributaries.
Pollution Prevention Act of 1990, 42 U.S.C.S. 13101 <i>et seq.</i> (1999)	EPA	All	Prevent pollution through source reduction practices.

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Reservoir Salvage Act of 1960. 16 U.S.C.S 469 <i>et seq.</i> (amended by the Archeological and Historic Preservation Act, see above) to extend the provisions of the 1960 Act to all Federal construction activities and all federally licensed/assisted activities that cause loss of scientific, prehistoric, or archeological data	DOI	All	The act requires Federal agencies building or permitting the building of reservoirs to notify the Secretary of the Interior when such activities might destroy important archaeological, historic, or scientific data. That Secretary is authorized to conduct appropriate investigations to protect those data. The act also authorizes agencies to spend up to 1 percent of their construction funds on the protection of historic and archaeological resources. In 1974, the Reservoir Salvage Act was amended by the Archeological and Historic Preservation Act to extend the provisions of the 1960 Act to all Federal construction activities and all federally licensed or assisted activities that cause loss of scientific, prehistoric, or archeological data.
Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C.S. 6910 <i>et seq.</i> (1999) (Solid Waste Disposal Act)	EPA	All	Regulates the storage, use and disposal of solid and hazardous wastes. Imposes requirements on generators and transporters of this waste, and on owners and operators of treatment, storage, and disposal (TSD) facilities.
Rivers and Harbors Act of 1938, as amended, 33 U.S.C.S. 540 <i>et seq.</i> (1999)	COE	Any agency involved in waterway improvements	If a proposed action includes a structure or work in, under, or over a navigable water of the US; Structure or work affecting a navigable water of the US; 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 US, a permit is required from the Corps. Activities shall include a due regard for wildlife conservation.

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
Rivers and Harbors Appropriations Act of 1899, as amended, 33 U.S.C.S. 401 <i>et seq.</i> (1999)	COE	All	Requires consent of Congress and approval from the Corps for construction of bridge, causeway, dam or dike over or in port, navigable river or other navigable waters.
Safe Drinking Water Act as amended, 42 U.S.C.S. 300f <i>et seq.</i> (1999)	EPA	All	Applies to public water systems. Act specifies contaminants that may have adverse health effects, and contains criteria and procedures to assure a supply of drinking water that complies with established maximum permissible contamination levels.
Soil and Water Resources Conservation Act of 1977, as amended, 16 U.S.C.S. 2001 <i>et seq.</i> (1999)	USDA	BLM, USFS, all USDA programs	Provides for program to conserve, protect and enhance soil, water and related resources (within scope of Department of Agriculture programs).
Surface Mining Control and Reclamation Act of 1977, 30 U.S.C.S. 1201 <i>et seq.</i> (1999)	DOI: Office of Surface Mining Reclamation and Enforcement		Focus mostly on coal but seems to include surface mining of other minerals. Provides for reclamation of mined areas that prevent or damage beneficial use of land or water resources or endanger health or safety of the public.
Taylor Grazing Act, as amended, 43 U.S.C.S. 315 <i>et seq.</i> (1999)	DOI	BLM, USFS	To preserve grazing land and its resources from destruction or unnecessary injury; defines grazing rights and protects them by regulation.
Toxic Substances Control Act, as amended, 15 U.S.C.S. 2601 <i>et seq.</i> (1999)	EPA	All	Intended to protect human health and the environment from toxic chemicals. Regulation of toxic chemicals including methods of use and disposal and protection of employees.
Water Bank Act as amended, 16 U.S.C.S. 1301 <i>et seq.</i> (1999)	USDA in coordination with DOI	Implementing agencies	Establishes program to prevent serious loss of wetlands and the preserve, restore and improve such lands through conservation agreements with property owners.
Watershed Protection and Flood Prevention Act as amended, 16 U.S.C.S. 1001 <i>et seq.</i>	USDA	All	Prevention of erosion, floodwater, and sediment damages in watersheds of rivers of U.S.; furthering the

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Statute or Order	Administering Agencies	Complying Agencies	Statutory Requirements
(1999)			conservation, development, use, and disposal of water, and the conservation and use of land and thereby preserving, protecting, and improving the nation's land and water resources and the quality of the environment. Federal agencies cooperate with and assist states and local governments.
Wild and Scenic Rivers Act PL90-542, 16 U.S.C.S. 1270 <i>et seq.</i> (1999)	DOI, USDA	BLM, USFS, COE, BPA	Provides for preservation of designated rivers. Rivers are managed to preserve their natural qualities, with recreational opportunities reduced to prevent deterioration of the environment. Incompatible development in the river corridor or in areas directly affecting the river is prohibited. Listed rivers or river segments in Idaho, Oregon and Washington.
Wilderness Act, as amended, 16 U.S.C.S. 1131 <i>et seq.</i> (1999)	USDA, USFS	All	There can be no settlement, mechanized activities or commercial development within designated wilderness areas.

## Appendix C

### THREATENED AND ENDANGERED FISH AND WILDLIFE SPECIES IN THE BPA SERVICE AREA: LISTING AND LEGAL PROTECTIONS

The following tables provide information on those plant and animal species in the BPA Service Territory that are listed as endangered and threatened under the federal Endangered Species Act. Table A lists the types of species and provides information regarding their listing status and region. Table B identifies the legal documentation that provides the listed species with protection.

**Table A: Federally-Listed Threatened and Endangered Species in the BPA Service Area (As of April 2001).**

SPECIES TYPE	COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS <sup>1</sup>	STATE IN WHICH LISTED
<b>BIRDS</b>	Bald Eagle	<i>Haliaeetus leucocephalus</i>	T	ID, MT, NV, OR, UT, WA, WY
	Brown Pelican	<i>Pelecanus occidentalis</i>	E	OR, WA
	Marbled Murrelet	<i>Brachyramphus marmoratus marmoratus</i>	T	OR, WA
	Mountain Plover	<i>Charadrius montanus</i>	PT	MT, NV, UT, WY
	Northern Spotted Owl	<i>Strix occidentalis caurina</i>	T	OR, WA
	Piping Plover	<i>Charadrius melodus</i>	T	MT
	Short-tailed Albatross	<i>Phoebastria albatrus</i>	E	OR, WA
	Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	T	OR, WA
	Whooping Crane	<i>Grus americana</i>	EXPN	ID, UT, WY
Whooping Crane	<i>Grus americana</i>	E	MT	
<b>INSECTS</b>	Oregon Silverspot Butterfly	<i>Speyeria zerene hippolyta</i>	T	OR, WA
	Fender's Blue Butterfly	<i>Icaricia icarioides fenderi</i>	E	OR
<b>FISH</b>	Borax Lake Chub	<i>Gila boraxobius</i>	E	OR
	Bull Trout	<i>Salvelinus confluentus</i>	T	ID, MT, NV, OR, WA
	Chinook Salmon (Snake R., Tucannon R., Grande Ronde R., Imnaha R., Salmon R., and Clearwater R. [All Fall Only])	<i>Oncorhynchus tshawytscha</i>	T	ID, OR, WA
	Chinook Salmon (Snake R., Tucannon R., Grande Ronde R., Imnaha R., and Salmon R. [All Spring/Summer])	<i>Oncorhynchus tshawytscha</i>	T	ID, OR, WA
	Chinook Salmon (Puget Sound, Upper Columbia R., Upper White Salmon R., Upper Clackamas R. [Fall/Summer], and Upper Willamette R.)	<i>Oncorhynchus tshawytscha</i>	T	OR, WA
	Chinook Salmon (Lower Columbia R.)	<i>Oncorhynchus tshawytscha</i>	E	OR, WA
	Chum Salmon (Columbia R. [Year-Round], Olympic Peninsula Rivers [Summer], Hood Canal [Summer], and Dungeness Bay [Summer])	<i>Oncorhynchus keta</i>	T	OR, WA
	Coastal Cutthroat Trout (Columbia R. and Tributaries, Lower	<i>Oncorhynchus clarki clarki</i>	PT	OR, WA

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SPECIES TYPE	COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS <sup>1</sup>	STATE IN WHICH LISTED
	Willamette R., and Coastal Drainages between Columbia River and Grays Harbor)			
	Clover Valley Speckled Dace	<i>Rhinichthys osculus oligoporus</i>	E	NV
	Coho Salmon (OR Coastal Areas )	<i>Oncorhynchus kisutch</i>	PT	OR
	Coho Salmon (OR SW River Basins)	<i>Oncorhynchus kisutch</i>	T	OR
	Desert Dace	<i>Eremichthys acros</i>	T	NV
	Foskett Speckled Dace	<i>Rhinichthys osculus ssp.</i>	T	OR
	Hutton Tui Chub	<i>Gila bicolor ssp.</i>	T	OR
	Independence Valley Speckled Dace	<i>Rhinichthys osculus lethoporus</i>	E	NV
	Kendall Warm Springs Dace	<i>Rhinichthys osculus thermalis</i>	E	WY
	Lahontan Cutthroat Trout	<i>Oncorhynchus clarki henshawi</i>	T	OR, NV, UT
	Lost River Sucker	<i>Deltistes luxatus</i>	E	OR
	Oregon Chub	<i>Oreonichthys crameri</i>	E	OR
	Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	MT
	Shortnose Sucker	<i>Chasmistes brevirostris</i>	E	OR
	Sockeye Salmon (Snake R. and Wherever Found in ID)	<i>Oncorhynchus nerka</i>	E	ID, OR, WA
	Sockeye Salmon (Ozette Lake and Tributary Streams)	<i>Onchorynchus nerka</i>	T	WA
	Steelhead Trout (Lower and Middle Columbia R., Hood R., Upper Willamette R., and Lower Willamette R. [Winter Only])	<i>Oncorhynchus mykiss</i>	T	OR, WA
	Steelhead Trout (Snake River Basin)	<i>Oncorhynchus mykiss</i>	T	ID, OR, WA
	Steelhead Trout (Upper Columbia River)	<i>Oncorhynchus mykiss</i>	E	WA, OR
	Steelhead Trout (Coastal River Basins South of Elk R. in Curry County, OR)	<i>Oncorhynchus mykiss</i>	PT	OR
	Warner Sucker	<i>Catostomus warnerensis</i>	T	OR
	White Sturgeon (Kootenai R.)	<i>Acipenser transmontanus</i>	E	ID, MT
<b>MAMMALS</b>	Canada Lynx	<i>Lynx canadensis</i>	T	ID, MT, OR, UT, WA, WY
	Columbian White-tailed Deer	<i>Odocoileus virginianus leucurus</i>	E	OR, WA
	Gray Wolf	<i>Canis lupus</i>	E	ID, MT, WA
	Gray Wolf	<i>Canis lupus</i>	EXPN	WY, ID, MT
	Gray Wolf	<i>Canis lupus</i>	PT	ID, MT, OR, UT, WA, WY
	Grizzly Bear	<i>Urus arctos horribilis</i>	T	MT, WA, ID, WY
	Grizzly Bear	<i>Urus arctos horribilis</i>	EXPN	ID, MT
	Northern Idaho Ground Squirrel	<i>Spermophilus burnneus brunneus</i>	T	ID
	Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	T	WY
	Woodland Caribou	<i>Rangifer tarandus caribou</i>	E	WA, ID
<b>PLANTS</b>	Applegate's Milk-vetch	<i>Astragalus applegatei</i>	E	OR
	Bradshaw's Desert Parsley (Lomatium)	<i>Lomatium bradshawii</i>	E	OR, WA
	Colorado Butterfly Plant	<i>Gaura neomexicana coloradensis</i>	T	WY
	Cook's Lomatium	<i>Lomatium cookii</i>	PE	OR
	Desert Milk-vetch	<i>Astragalus desereticus</i>	T	UT
	Desert Yellowhead	<i>Yermo xanthocephalus</i>	PT	WY
	Gentner's Fritillary	<i>Fritillaria gentneri</i>	E	OR
	Golden paintbrush	<i>Castilleja levisecta</i>	T	OR, WA
	Holmgren Milk-vetch	<i>Astragalus homgreniorum</i>	PE	UT
	Howell's Spectacular Thelypody	<i>Thelypodium howellii spectabilis</i>	T	OR
	Kincaid's Lupine	<i>Lupinus sulphureus kincaidii</i>	T	OR, WA
	Large-flowered Woolly Meadowfoam	<i>Limnanthes floccosa grandiflora</i>	PE	OR
	MacFarlane's Four-O'Clock	<i>Mirabilis macfarlanei</i>	T	OR, ID
	Malheur Wire-lettuce	<i>Stephanomeria malheurensis</i>	E	OR
	Marsh Sandwort	<i>Arenaria paludicola</i>	E	OR, WA
	Nelson's Checker-mallow	<i>Sidalcea nelsoniana</i>	T	OR, WA

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SPECIES TYPE	COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS <sup>1</sup>	STATE IN WHICH LISTED
	Rough Popcornflower	<i>Plagiobothrys hirtus</i>	E	OR
	Shivwitz Milk-vetch	<i>Astragalus ampullarioides</i>	PE	UT
	Showy Stickseed	<i>Hackelia venusta</i>	PE	WA
	Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	T	ID, MT, UT, WA, WY
	Water Howellia	<i>Howellia aquatilis</i>	T	MT, OR, WA, ID
	Wenatchee Checker-mallow	<i>Sidalcea oregona calva</i>	E	WA
	Western Lily	<i>Lilium occidentale</i>	E	OR
	Willamette Daisy	<i>Erigeron decumbens decumbens</i>	E	OR
	Winkler Cactus	<i>Pediocactus winkleri</i>	T	UT
<b>AQUATIC INVERTEBRATES</b>	Banbury Springs Limpet	<i>Lanx sp.</i>	E	ID
	Bliss Rapids Snail	<i>Taylorconcha serpenticola</i>	T	ID
	Bruneau Hot Springsnail	<i>Pyrgulopsis bruneauensis</i>	E	ID
	Idaho Springsnail	<i>Fontelicella idahoensis</i>	E	ID
	Snake River Physa Snail	<i>Physa natricina</i>	E	ID
	Utah Valvata Snail	<i>Valvata utahensis</i>	E	ID, UT
	Vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	T	OR

<sup>1</sup> Status Definitions:  
E = Endangered  
EXPN = Experimental Population, Non-Essential  
PE = Proposed Endangered  
PT = Proposed Threatened  
T = Threatened

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**Table B: Legal Documentation Supporting the Federal Listing of Threatened and Endangered Species in the BPA Service Area (as of April 2001).**

<b>COMMON NAME</b>	<b>DATE FIRST LISTED</b>	<b>FEDERAL REGISTER REFERENCE (Most Recent)</b>	<b>LEAD USFWS REGION</b>	<b>CRITICAL HABITAT</b>	<b>SPECIAL RULES</b>
<b>FISH</b>					
Borax Lake Chub	28-May-80	47 FR 43964	1	50 CFR 17.95(e)	None
Bull Trout	10-Jun-98	64 FR 58909	1	None	50 CFR 17.44(w) and 50 CFR 17.44(x)
Chinook Salmon (Snake R., Tucannon R., Grande Ronde R., Imnaha R., Salmon R., and Clearwater R. [All Fall Only])	22-Apr-92	64 FR 14077	NMFS	50 CFR 226.205	None
Chinook Salmon (Snake R., Tucannon R., Grande Ronde R., Imnaha R., and Salmon R. [All Spring/Summer])	22-Apr-92	58 FR 49880	NMFS	50 CFR 226.205	None
Chinook Salmon (Puget Sound, Upper Columbia R., Upper White Salmon R., Upper Clackamas R. [Fall/Summer], and Upper Willamette R.)	2-Aug-99	64 FR 41839	NMFS	50 CFR 226.212	50 CFR 223.203
Chinook Salmon (Lower Columbia R.)	2-Aug-99	64 FR 41839	NMFS	50 CFR 226.212	None
Chum Salmon (Columbia R. [Year-Round], Olympic Peninsula Rivers [Summer], Hood Canal [Summer], and Dungeness Bay [Summer])	2-Aug-99	64 FR 41839	NMFS	50 CFR 226.212	50 CFR 223.203
Clover Valley Speckled Dace	10-Oct-89	54 FR 41453	1	None	None
Coho Salmon (OR SW River Basins)	18-Jun-97	64 FR 33039	NMFS	None	None
Desert Dace	11-Mar-67	50 FR 50309	1	50 CFR 17.95(e)	50 CFR 17.44(m)
Foskett Speckled Dace	28-Mar-85	50 FR 12305	1	None	50 CFR 17.44(j)
Hutton Tui Chub	28-Mar-85	50 FR 12305	1	None	50 CFR 17.44(j)
Independence Valley Speckled Dace	10-Oct-89	54 FR 41453	1	None	None
Kendall Warm Springs Dace	13-Oct-70	35 FR 16048	6	None	None
Lahontan Cutthroat Trout	13-Oct-70	40 FR 29864	1	None	50 CFR 17.44(a)
Lost River Sucker	18-Jul-88	53 FR 27134	1	None	None
Oregon Chub	18-Oct-93	58 FR 53804	1	None	None
Pallid Sturgeon	6-Sep-90	55 FR 36647	6	None	None
Shortnose Sucker	18-Jul-88	53 FR 27134	1	None	None
Sockeye Salmon (Snake R. and ID)	3-Jan-92	57 FR 212 213	NMFS	50 CFR 226.205	None
Sockeye Salmon (Ozette Lake and Tributary Streams)	25-Mar-99	64 FR 41839	NMFS	50 CFR 226.212	50 CFR 223.203
Steelhead Trout (Lower	17-Jun-98	63 FR 32998	NMFS	50 CFR 226.212	50 CFR 223.203

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<b>COMMON NAME</b>	<b>DATE FIRST LISTED</b>	<b>FEDERAL REGISTER REFERENCE (Most Recent)</b>	<b>LEAD USFWS REGION</b>	<b>CRITICAL HABITAT</b>	<b>SPECIAL RULES</b>
and Middle Columbia R., Hood R., Upper Willamette R., and Lower Willamette R. [Winter Only]					
Steelhead Trout (Snake River Basin)	17-Jun-98	63 FR 32998	NMFS	50 CFR 226.212	50 CFR 223.203
Steelhead Trout (Upper Columbia River)	17-Jun-98	63 FR 32998	NMFS	50 CFR 226.212	None
Warner Sucker	27-Sep-85	50 FR 39123	1	50 CFR 17.95(e)	50 CFR 17.44(i)
White Sturgeon (Kootenai R.)	6-Sep-94	59 FR 46002	1	None	None
<b>BIRDS</b>					
Bald Eagle	12-Jul-95	60 FR 36010	3	None	50 CFR 17.41(a)
Brown Pelican	2-Jun-70	35 FR 16048	1	None	None
Marbled Murrelet	1-Oct-92	57 FR 45337	1	50 CFR 17.95(b)	None
Northern Spotted Owl	26-Jun-90	55 FR 26194	1	50 CFR 17.95(b)	None
Piping Plover	11-Dec-85	50 FR 50734	3	None	None
Short-tailed Albatross	2-Jun-70	65 FR 46654	7	None	None
Western Snowy Plover	5-Mar-93	58 FR 12874	1	50 CFR 17.95(b)	None
Whooping Crane	11-Mar-67	35 FR 8498	2	50 CFR 17.95(b)	None
<b>INSECTS</b>					
Oregon Silverspot Butterfly	2-Jul-80	45 FR 44939	1	50 CFR 17.95(i)	None
Fender's Blue Butterfly	25-Jan-00	65 FR 3890	1	None	None
<b>MAMMALS</b>					
Canada Lynx	24-Mar-00	65 FR 16086	6	None	50 CFR 17.40(k)
Columbian White-tailed Deer	11-Mar-67	32 FR 4001	1	None	None
Gray Wolf	11-Mar-67	41 FR 24067	3	50 CFR 17.95(a)	None
Grizzly Bear	11-Mar-67	40 FR 31736	6	None	50 CFR 17.40(b)
Northern Idaho Ground Squirrel	5-Apr-00	65 FR 17786	1	None	None
Preble's Meadow Jumping Mouse	13-May-98	63 FR 26530	6	None	None
Woodland Caribou	14-Jan-83	48 FR 49249	1	None	None
<b>SNAILS</b>					
Banbury Springs Limpet	14-Dec-92	57 FR 59257	1	None	None
Bliss Rapids Snail	14-Dec-92	57 FR 59257	1	None	None
Bruneau Hot Springsnail	25-Jan-93	58 FR 5946	1	None	None
Idaho Springsnail	14-Dec-92	57 FR 59257	1	None	None
Snake River Physa Snail	14-Dec-92	57 FR 59257	1	None	None
Utah Valvata Snail	14-Dec-92	57 FR 59257	1	None	None
Vernal Pool Fairy Shrimp	19-Sep-94	59 FR 48153	1	None	None
<b>PLANTS</b>					
Applegate's Milk-vetch	28-Jul-93	58 FR 40551	1	None	None
Bradshaw's Desert Parsley (Lomatium)	30-Sep-88	53 FR 38451	1	None	None
Colorado Butterfly Plant	18-Oct-00	65 FR 62310	6	None	None
Desert Milk-vetch	20-Oct-99	64 FR 56596	6	None	None
Gentner's Fritillary	10-Dec-99	64 FR 69203	1	None	None
Golden Paintbrush	11-Jun-97	62 FR 31748	1	None	None
Howell's Spectacular Thelypody	26-May-99	64 FR 28403	1	None	None
Kincaid's Lupine	25-Jan-00	64 FR 3890	1	None	None
MacFarlane's Four-O'Clock	26-Oct-79	61 FR 10697	1	None	None
Malheur Wire-lettuce	10-Nov-82	47 FR 50885	1	50 CFR 17.96(a)	None
Marsh Sandwort	3-Aug-93	58 FR 41384	1	None	None
Nelson's Checker-	12-Feb-93	58 FR 8243	1	None	None

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<b>COMMON NAME</b>	<b>DATE FIRST LISTED</b>	<b>FEDERAL REGISTER REFERENCE (Most Recent)</b>	<b>LEAD USFWS REGION</b>	<b>CRITICAL HABITAT</b>	<b>SPECIAL RULES</b>
mallow					
Ute Ladies' Tresses	17-Jan-92	57 FR 2053	6	None	None
Rough Popcornflower	25-Jan-00	65 FR 3875	1	None	None
Ute Ladie's-tresses	17-Jan-92	57 FR 205	6	None	None
Water Howellia	14-Jul-94	59 FR 35864	6	None	None
Wenatchee Checker-mallow	22-Dec-99	64 FR 71687	1	None	None
Western Lily	17-Aug-94	59 FR 42176	1	None	None
Willamette Daisy	25-Jan-00	65 FR 3890	1	None	None
Winkler Cactus	20-Aug-98	63 FR 44595	6	None	None

## **Appendix D**

### **MAJOR PUBLIC COMMENT ISSUES/NORTHWEST POWER PLANNING COUNCIL FRAMEWORK CONCEPT PAPERS**

#### **A. Major Public Comment Issues**

The key questions listed below were identified from a three-day conference held in November 1998.

**DRAFT 3/1/99**

**QUESTIONS FROM THE 3 DAY NOVEMBER CONFERENCE**  
*CREATING AND PRESERVING A HEALTHY, RESILIENT AND SUSTAINABLE  
SOCIAL AND ECOLOGICAL SYSTEM*

**KEY QUESTIONS (More Than 5 Votes)**

1. **(77)** Will politics continue status quo because of
  - a. conflicting legal mandates ( e.g., ESA, CWA, NWPA)?
  - b. a mismatch between political and ecological boundaries?
  - c. Corporate interests?
  - d. environmental groups strong campaign for their interests?
  - e. the lack of regional and/or national political will to resolve the problem?
2. **(35)** Will there be a proliferation of process by the sheer number of decision makers and stakeholders?
3. **(90)** Will the increasing population lead to:
  - a. an urban and rural split?
  - b. reliance on mining and natural resources for economic development?
  - c. an increase in per capita consumption?
  - d. an unwillingness to examine/model futures analyses?
4. **(10)** Will there be a change in values:
  - a. that creates an unavailability of funding?
  - b. that constantly causes changes in economies and values?
  - c. that end in greed
5. **(11)** Is there a lack of trust:
  - a. with the government agencies?
  - b. among stakeholders?
  - c. others?
6. **(34)** Are we:
  - a. pitting species and resources against each other (using mitigation of one to “justify” loss of another)?
  - b. causing conversions of habitat we can’t get back?
7. **(50)** Are we failing to manage ourselves:

- a. by not focusing on species and systems?
  - b. because it is cheaper/easier to avoid responsibility than to take responsibility?
  - c. by transferring costs of one resource to another (e.g., not internalizing costs)?
  - d. by following private agendas (i.e., tragedy of common good)?
  - e. by the lack of developing a stewardship paradigm?
8. **(11)** Are there incompatible goals for river use?
9. **(16)** Is there an inability to deal with uncertainty (analysis paralysis) because:
- a. there is an inability to move from crisis management to planning?
  - b. every interest group has ability to veto a plan?
  - c. there is an inability to change?
  - d. the cynicism is inhibiting the development of solutions?
  - e. there is an unwillingness to act in face of imperfect information?
10. **(23)** Is there something to learn from historical mistakes?
11. **(28)** Will an engineering solution work for the biological/environmental problems (techno-fix)?
12. **(87)** Is there a lack of an ecosystem approach to species recovery because of:
- a. a lack of understanding of the natural spawning process?
  - b. a lack of a total system focus?
  - c. an increasing awareness of natural/normative solutions?
  - d. a lack of understanding the importance location of headwaters to the system makes?
  - e. an increasing recognition of place (i.e. local involvement)?
  - f. a violation of basic ecological principles?
  - g. conversion of irreplaceable habitat?
13. **(47)** Is the Government living up to promises of sovereignty:
- a. involving public v. sovereign concerns?
  - b. by understanding Indian Treaty rights?

## **B. Summary of Framework Concept Papers**

The following is a summary of the 28 concept papers prepared by the Framework Workgroup. These concept papers were submitted to the Framework for consideration as possibilities as multi-species plans for fish and wildlife recovery in the Columbia River Basin.

### **Northwest Power Planning Council FRAMEWORK CONCEPT PAPERS**

November 1998

#### **No.    Concept Paper**

##### **1.    Save Our Wild Salmon Coalition**

###### **GOAL**

Abundant, harvestable, self-sustaining, wild, native fishes.

###### **OBJECTIVES**

- Protect and restore habitat;
- Improve artificial production;
- Improve harvest management by protecting wild stocks and targeting strong stocks; and
- Reduce dam mortality by moving toward normative river conditions and providing safe passage at all projects.

###### **STRATEGIES**

- Habitat: Manage lands to protect f/w habitat; reduce commodity subsidies, protect and restore wetlands, estuaries & riparian areas; provide stream flows, provide water from upper Snake pending dam removal; conserve water; screen diversions; sustainable farming; end water waste; comply with Clean Water Act; control non-native predators.
- Hatcheries: plant fish consistent with watershed carrying capacity avoid harm to wild fish; don't use in lieu of habitat; reduce spending in favor of habitat spending.
- Harvest: allow escapement and renegotiate international treaties.
- Dams: no new dams, end transport, take out lower Snake dams, lower JDA to spillway; move to normative conditions elsewhere; remove unmitigable dams (Condit, Enloe); meet agency and tribal flow targets, spill, pay the true cost of hydropower.

###### **MANAGEMENT ACTIONS**

None identified

##### **2.    Idaho Rivers United, Idaho Steelhead and Salmon United, and Trout Unlimited**

###### **GOAL**

Attain naturally sustainable f/w to support harvest by restoring biological integrity and diversity; delist ESA stocks; maintain affordable energy and strong BPA for regional prosperity.

###### **OBJECTIVES**

- Snake stocks at harvestable levels via 2-6% smolt-adult returns, and improved egg-smolt survival;
- Rebuild Snake ChF in Blue Mtn. Tributaries via 2-6% smolt-adult returns;
- Recover Snake sockeye via 1.5-2% smolt-adult returns to Redfish;
- Rebuild mid-Col ChSp/Su, sockeye and StSu by improved smolt survival with flow aug. and normalized hydrograph;

- Enhance mid-Col. ChF by preserving Hanford and normalized hydrograph below Priest;
- Secure ICBMP category 1 subbasins and reconnect category 2 subbasins, implement IRCs and VARQ flood control strategies at Hungry Horse and Libby; and
- Ensure cost-effective investments.

#### **STRATEGIES**

- Breach lower Snake dams by 2005 (objectives 1-3);
- Restore normative flows from Priest to estuary via flow augmentation (objectives 4-6);
- Use BPA money for projects with the best likelihood of success, and maintain or reduce direct outlays as stocks recover;
- Commit to affordable steps to retain access to low-cost energy.

#### **MANAGEMENT ACTIONS**

##### Snake:

- end transportation;
- breach the lower dams;
- eliminate flow augmentation;
- normalize Hells Canyon flows;
- implement IRCs at Dworshak;
- phase out hatcheries and supplementation as stocks recover.

##### Upper Columbia:

- use Canadian storage to augment flows;
- 24-hour spill in the Spring from Priest down;
- IRCs at all storage projects shift peaking to upper Columbia projects;
- shape flood control releases to help resident and anadromous fish.

##### Lower Columbia:

- operate JDA at MIP pending JDA draw-down studies through 2006; other projects at MOP;
- install gas abatement, ladder improvements, etc.;
- evaluate extended screens, surface collectors, etc. at TDA;
- stop spending on Bonneville outfall.
- Use tiered flow for Kootenai white sturgeon, and IRCs and VAPQ.
- coordinate planning and implementation system-wide

### **3. Columbia River Inter-Tribe Fish Commission**

#### **GOAL**

Restore anadromous fish to support tribes' cultural and commercial practices emphasizing natural production and healthy rivers; protect tribes, sovereignty and treaty rights

#### **OBJECTIVES**

- Within 7 years, halt declines in salmon, sturgeon, and lamprey above Bonneville;
- Within 25 years, increase salmon returns to 4 million naturally-produced fish above Bonneville and sturgeon and lamprey to harvestable levels;
- Restore salmon to historic abundance in perpetuity.

#### **STRATEGIES**

- Improve streams by controlling land use;
- Improve flows by limiting diversions and using water efficiently;
- Restore watersheds for threatened stocks;
- Use supplementation for most threatened fish and re-introductions; use flow, spill, drawdowns, efficient turbines and operations and predator control;
- Restore critical estuary habitat;
- Ret Alaska and Canadian harvest by abundance;

- Use cold stored water and more and better ladders for adults
- Reduce water contaminants
- Monitor tributary production and escapement to improve harvest management
- Research lamprey and develop supplementation programs
- Artificial production for white sturgeon above Bonneville.

**MANAGEMENT ACTIONS**

Habitat:

- land and water users meet habitat conditions required to achieve survival rates
- use coarse-screening process to determine allowable watershed impacts

Production:

- use supplementation to avoid extirpations

Passage:

- end transportation
- return mainstem habitat to natural conditions for 71% survival by drawdowns, flows, spill, breaching lower Snake dams and lowering JDA to spillway.

**4. Shoshone-Bannock Tribes**

**GOAL**

Maintain & restore ecosystem for all naturally producing indigenous species and provide for cultural/spiritual needs.

**OBJECTIVES**

- Restore the natural hydrograph and lessen ecosystem impacts generally;
- Continue existing habitat protections
- Enforce existing treaties and f/w laws;
- Review existing laws that hurt habitat
- Restore damaged habitat;
- Increase production of indigenous f/w
- Secure harvest opportunities.

**STRATEGIES**

None identified

**MANAGEMENT ACTIONS**

None identified

**5. Trout Unlimited**

**GOAL**

Protect and restore ecological values of the Basin, create a network of complex, interconnected, high quality habitats that support sustainable and harvestable wild fish while mitigating impacts on the region.

**OBJECTIVES**

Habitat:

- protect existing habitat;
- restore degraded habitat; and
- enforce existing land use regulations.

Hydropower:

- no new development;
- make existing facilities fish-friendly;
- restore normative conditions by breaching lower Snake dams and lowering JDA to spillway;

- use spill, flow augmentation, better bypass and gas abatement.

Hatcheries:

- use to restore wild salmonids;
- reduce use of hatcheries to replace degraded habitat.

Harvest:

- reduce ocean and river harvest and manage for conservation;
- develop selective fisheries;
- resolve US-Canada allocation and equity issues.

Mitigation:

- maintain cost-based power, low-cost transportation for agricultural products, and irrigation pumping from mainstem reservoirs.

**STRATEGIES**

- **Habitat:** protect habitat for viable populations, breach lower Snake dams and lower JDA to spillway, federal agencies manage land to restore degraded habitat including finalization of standards based on ICBMP science; enforce ESA “take” provisions on private land; implement Clean Water Act TMDLs and state ambient water quality standards and waterway uses; enforce state water laws on waste quantity.
- **Hydropower:** all dams provide suitable flows passage and consistency with watershed efforts; restore normative conditions, reduce reliance on transportation and upstream storage; pending draw-downs, use transportation only in low-flow years; identify and address problems at non-hydropower dams.
- **Hatcheries:** gather more information on natural production; use only if no impact to wild salmonids, mimic natural conditions in broodstock collection, rearing, feeding, acclimation and release; treat artificial production experimentally, complete review of Mitchell Act and LSCR, PUD and other facilities.
- **Harvest:** allow harvest only where impacts to wild fish are quantified and minimized; adopt abundance-based regime in US-Canada to protect weak stocks; reduce harvest of chinook to 50% total mortality throughout their range; continue to develop selective fisheries.
- **Mitigation:** show those who would privatize PMAs that BPA is carrying out vital energy conservation and f/w programs; support development of alternative forms of transportation; and lower irrigation pumps while paying higher electric costs of pumping.

**MANAGEMENT ACTIONS**

None identified

**6. C. Petrosky, H. Schaller, P. Wilson, E. Weber, and O. Langness**

**GOAL**

Sustainable, naturally-producing f/w to support tribal and non-tribal harvest, cultural and economic practices by restoring biological integrity and genetic diversity of ecosystem and through other ways compatible with naturally-producing f/w.

**OBJECTIVES**

- Reduce cumulative mortality to encourage wider distribution and more life history types within metapopulation concept;
- For upper-basin anadromous fish, significantly reduce passage mortality by returning to more normative conditions;
- Recover, de-list and restore ESA fish to harvestable levels;
- Rebuild depleted non-ESA fish and protect healthy natural populations to support harvest while maintaining wide distribution
- Rebuild depleted lamprey to support cultural use and restore ecosystem function;
- Restore anadromous fish ecosystem functions to benefit native resident fish and wildlife by increasing prey base and nutrient recycling and restoring more normative conditions.

### STRATEGIES

- Implement actions with best chance of success,
- Generate information to reduce uncertainties,
- Use an experimental management approach that prioritizes conservation and recovery of weak populations while compatible with other f/w, and
- Emphasize actions that benefit wide range of species:
- Listed fish:
  - Snake: promptly implement hydropower actions under 1999 ESA decision and evaluate effects between regions
  - Upper Columbia: implement hydropower actions under ESA and study feasibility of JDA draw down, evaluate effects of hydropower actions between regions
  - Lower Columbia: take other actions and evaluate stocks for between-region comparison.
- Unlisted anadromous fish: evaluate stocks for between-region comparison.
- Other anadromous fish: evaluate through temporal and spatial comparison of population and survival rates.
- Native resident fish and wildlife: evaluate through coordinated, directed studies.

### MANAGEMENT ACTIONS

- Coordinate major actions through reverse staircase design, taking actions with measurable responses to illuminate uncertainties, primarily through adult-to-adult and/or smolt-to-adult returns, compared to expected responses for key PATH hypothesis
- Listed fish:
  - Snake: breach four lower dams, evaluate flow augmentation components; reduce and evaluate experimental hatchery releases, later increasing; phase out hydro-mitigation hatcheries as runs increase. Initially, low harvest rates, increasing with recovery. Implement improved land management to restore productivity and connections. Coordinate through experimental management program.
  - Upper Columbia: evaluate feasibility of breaching JDA and implement by 2012; evaluate flow augmentation elements, specify major non-hydropower actions;
  - Lower Columbia: access stocks to develop actions within experimental framework.
- Unlisted anadromous fish: manage harvest to achieve management goals; improve land management, evaluate effects of hatchery release, all coordinated through experimental program.
- Other anadromous fish: benefited by actions for anadromous species.
- Native resident fish and wildlife: restore free-flowing river reaches and riparian habitats to reduce conflicts with anadromous fish flows.

## 7.a Oregon office of NWPPC (no drawdown, dam retrofit, incremental approach)

### GOAL

Sustainable, naturally-producing f/w to support social, cultural and economic practices such as tribal and non-tribal harvest, by restoring biological integrity and genetic diversity of ecosystem and through other ways compatible with naturally-producing f/w. When devising strategies, consider economic and social factors to produce high quality of life and achieve multi-species goals.

### OBJECTIVES

- **Primary:** Provide for healthier ecosystem, thereby reducing cumulative impacts on f/w to attain sustainable, diverse, harvestable populations.
- **Specific:**
  - Anadromous salmonids: promote wide array of life histories by restoring depressed populations and maintaining or enhancing healthy stocks and reintroducing and re-establishing stocks across traditional range where feasible.

Non-anadromous salmonids: Rebuild sturgeon and lamprey across historic range, if possible.

Native resident fish: promote wide array of life histories by restoring weak populations to sustainable, harvestable levels and enhancing healthy native stocks, and reintroducing and re-establishing stocks in traditional range where feasible and economically justified.

Non-native resident fish: maintain and enhance in areas where native populations are extirpated or their restoration is infeasible.

Wildlife: manage for native species, protect existing range, expand migratory corridors and link habitats to promote diversity; focus on habitat quality, not quantity. For non-native species, follow non-native resident fish protocol.

Socio-economic:

*Cultural*: allow salmonids to reach tribal treaty harvest objectives and lamprey and sturgeon to serve cultural needs.

*Economic*: Maintain shipping from all river ports. Maintain hydropower production to greatest extent possible and restore lost generation through aggressive energy conservation and peak load management. Maintain grazing through use of best management practices with riparian set-asides and fencing in fish-bearing streams and wildlife refuges and temporary mitigation for transition to different land uses.

*Forestry*: promote sustainable cut with 100-ft riparian set asides for fish-bearing streams and temporary mitigation for transition to best management practices. Irrigation: seek water conservation and efficiencies.

*Social/legal*: strictly enforce Clean Water Act throughout basin.

## **STRATEGIES**

- **Management intent**: re-establish water velocities equivalent to natural hydrograph, provide spawning and rearing habitat in mainstem and tributaries for anadromous and resident fish. This alternative propose the following strategies by implement incrementally, evaluating results and entailing less cost in the short term.
- **Broad strategy**: Implement in an experimental program that prioritizes recovery of imperiled stocks consistent with maintaining healthy stocks. All strategies must reduce cumulative mortality to a wider range of species and involve hydro and non-hydro actions.
- **Specific strategies**:
  - on an incremental basis, promote aggressive technological fixes at dams (spill, gas abatement);
  - develop surface bypass and other technologies;
  - extended length screens;
  - adult passage improvements;
  - transportation in low flow years;
  - 1.6 maf from upper Snake and 3 maf from Canada through purchase of water rights, current BiOp flow from Brownlee and Dworshak;
  - sliding scale, abundance based harvest, reduce ocean bycatch;
  - current hatchery production;
  - aggressive habitat recovery in mainstem and tributaries with tributary dam breaching where feasible;
  - re-establish floodplains, wetlands, estuaries;
  - water conservation and efficiencies;
  - technological fixes at dams to satisfy Clean Water Act;
  - reservoir rule curves for resident fish;
  - aggressive energy conservation and peak load management;
  - efficient, temporary economic mitigation for affected interests;
  - best management practices for grazing and forestry with large riparian set asides in salmonid streams;
  - reduced power peaking to protect spawning and emergence;
  - passage above Chief Joseph, Grand Coulee and Hells Canyon;
  - terminal fisheries on hatchery fish;

- comprehensive monitoring and evaluation.

#### **MANAGEMENT ACTIONS**

None identified.

### **7.b Oregon office of NWPPC (no drawdown, dam retrofit, reverse staircase)**

#### **GOAL**

Sustainable, naturally-producing f/w to support social, cultural and economic practices such as tribal and non-tribal harvest, by restoring biological integrity and genetic diversity of ecosystem and through other ways compatible with naturally-producing f/w. When devising strategies, consider economic and social factors to produce high quality of life and achieve multi-species goals.

#### **OBJECTIVES**

- **Primary:** Provide for healthier ecosystem, thereby reducing cumulative impacts on f/w to attain sustainable, diverse, harvestable populations.
- **Specific:**
  - Anadromous salmonids: promote wide array of life histories by restoring depressed populations and maintaining or enhancing healthy stocks and reintroducing and re-establishing stocks across traditional range where feasible.
  - Non-anadromous salmonids: Rebuild sturgeon and lamprey across historic range, if possible.
  - Native resident fish: promote wide array of life histories by restoring weak populations to sustainable, harvestable levels and enhancing healthy native stocks, and reintroducing and re-establishing stocks in traditional range where feasible and economically justified.
  - Non-native resident fish: maintain and enhance in areas where native populations are extirpated or their restoration is infeasible.
  - Wildlife: manage for native species, protect existing range, expand migratory corridors and link habitats to promote diversity; focus on habitat quality, not quantity. For non-native species, follow non-native resident fish protocol.
  - Socio-economic:
    - Cultural:* allow salmonids to reach tribal treaty harvest objectives and lamprey and sturgeon to serve cultural needs.
    - Economic:* Maintain shipping from all river ports. Maintain hydropower production to greatest extent possible and restore lost generation through aggressive energy conservation and peak load management. Maintain grazing through use of best management practices with riparian set-asides and fencing in fish-bearing streams and wildlife refuges and temporary mitigation for transition to different land uses.
    - Forestry:* promote sustainable cut with 100-ft riparian set asides for fish-bearing streams and temporary mitigation for transition to best management practices.
    - Irrigation:* seek water conservation and efficiencies.
    - Social/legal:* strictly enforce Clean Water Act throughout basin.

#### **STRATEGIES**

- As above, except that all strategies are implement at once, with large up-front costs and less biological risk. Potential to avoid the expense of some strategies based on biological response.

#### **MANAGEMENT ACTIONS**

None identified.

### **7.c Oregon office of NWPPC (no transport/drawdown incremental approach)**

#### **GOAL**

Sustainable, naturally-producing f/w to support social, cultural and economic practices such as tribal and non-tribal harvest, by restoring biological integrity and genetic diversity of ecosystem and through other ways compatible with naturally-producing f/w. When devising strategies,

consider economic and social factors to produce high quality of life and achieve multi-species goals

#### **OBJECTIVES**

- Same fish and wildlife objectives.
- **Socio-economic objectives:**
  - Cultural:* allow salmonids to reach tribal treaty harvest objectives and lamprey and sturgeon to serve cultural needs.
  - Economic:* Maintain shipping from Lewiston by moving to rail transportation; maintain barge transportation through lower John Day pool by using shallow draft vessels to Try Cities. Replace lost hydropower generation. Same objectives for grazing, forestry and irrigation.
  - Social/legal objectives:* Pass legislative to draw down four lower Snake dams and John Day, strictly enforce Clean Water Act throughout basin.

#### **STRATEGIES**

- Same “management intent” and “broad strategy.”
- **Specific strategies:** As above, but incremental drawdown of two dams followed by evaluation and further drawdowns if justified by monitoring results. Drawdown is first strategy implemented. If response is less than anticipated, add restrictions incrementally, monitor response and add further increments if needed. Replace lost hydropower generation through least-cost mix of power purchases, aggressive energy conservation, development of cost-effective renewables, and high efficiency thermal generation. Mitigate incremental production of carbon dioxide through offsets.

#### **MANAGEMENT ACTIONS**

None identified.

### **7.d Oregon office of NWPPC (no transport/drawdown reverse staircase)**

#### **GOAL**

Sustainable, naturally-producing f/w to support social, cultural and economic practices such as tribal and non-tribal harvest, by restoring biological integrity and genetic diversity of ecosystem and through other ways compatible with naturally-producing f/w. When devising strategies, consider economic and social factors to produce high quality of life and achieve multi-species goals.

#### **OBJECTIVES**

- **Primary:** Provide for healthier ecosystem, thereby reducing cumulative impacts on f/w to attain sustainable, diverse, harvestable populations.
- **Specific:**
  - Anadromous salmonids: promote wide array of life histories by restoring depressed populations and maintaining or enhancing healthy stocks and reintroducing and re-establishing stocks across traditional range where feasible. Non-anadromous salmonids: Rebuild sturgeon and lamprey across historic range, if possible.
  - Native resident fish: promote wide array of life histories by restoring weak populations to sustainable, harvestable levels and enhancing healthy native stocks, and reintroducing and re-establishing stocks in traditional range where feasible and economically justified.
  - Non-native resident fish: maintain and enhance in areas where native populations are extirpated or their restoration is infeasible.
  - Wildlife: manage for native species, protect existing range, expand migratory corridors and link habitats to promote diversity; focus on habitat quality, not quantity. For non-native species, follow non-native resident fish protocol.
  - Socio-economic:
    - Cultural:* allow salmonids to reach tribal treaty harvest objectives and lamprey and sturgeon to serve cultural needs.

*Economic:* Maintain shipping from all river ports. Maintain hydropower production to greatest extent possible and restore lost generation through aggressive energy conservation and peak load management. Maintain grazing through use of best management practices with riparian set-asides and fencing in fish-bearing streams and wildlife refuges and temporary mitigation for transition to different land uses.

*Forestry:* promote sustainable cut with 100-ft riparian set asides for fish-bearing streams and temporary mitigation for transition to best management practices.

*Irrigation:* seek water conservation and efficiencies.

*Social/legal:* strictly enforce Clean Water Act throughout basin.

### **STRATEGIES**

Same, but implementing all strategies at once, and drawing down four lower Snake dams to natural river and John Day to spillway crest. Potential to avoid the expense of some strategies based on biological response.

### **MANAGEMENT ACTIONS**

None identified.

## **8. Montana Dept. of Fish, Wildlife & Parks**

### **GOAL**

Restore normative flow conditions in mainstem and headwaters; follow ecologically and economically sustainable operating strategy; restore naturally producing f/w throughout basin by restoring and reconnecting habitats.

### **OBJECTIVES**

- Implement dam operations that reduce storage drafts, improve refill probability and create more natural hydrograph downstream;
- Coordinate operations to extend runoff events for anadromous fish while protecting headwater species;
- Key operations to monthly inflow forecasts and tier springflow releases based on water availability at each project;
- Modify flood control operations to allow variable releases to simulate spring freshet;
- Gradually draft reservoirs to avoid flow fluctuations, reduce width or varial zones and enhance productivity

### **STRATEGIES**

- Implement current IRCs and develop them for other projects, following specified protocol.
- Implement tiered flows for Kootenai white sturgeon below Libby.
- Implement VARQ flood control strategy to approximate spring freshet improve velocities in the Snake, JDA and MCN reservoirs by implementing results of PATH analyses, transfer peaking operations to headwater facilities

### **MANAGEMENT ACTIONS**

- Complete IRCs for projects that lack them (via specific steps);
- Implement IRCs using tiered flows and VARQ strategy;
- Reduce reservoir drafts and improve refill to assure sustainable operations for all species;
- Replace static flow targets in lower Columbia with attainable, normative-type flow targets resulting from basin-wide application of IRCs;
- Coordinate mitigation with system operating plan;
- Reclaim habitat;
- Restore temperature regimes through selective withdrawal at storage projects and correlate flow and temperature with riverine fish growth and migrations for native species;
- Reduce watershed impacts through fencing and other passive measures and Rosgen techniques to restore original channel types;

- Establish alternative fishing opportunities; and
- Establish genetic reserves of important native stocks.

## **9. Idaho Department of Fish and Game**

### **GOAL**

None identified.

### **OBJECTIVES**

- Be risk averse and robust across a range of scientific hypotheses and assumptions;
- Provide high likelihood of recovery within 24 years for Snake ChSp/Su with a 2-6% smolt-adult survival for inriver fish (perhaps 3-7% for steelhead);
- Provide a high likelihood of recovery within 24 years for Snake ChF by restoring more normative incubation, rearing and migration water temperatures, velocities, turbidity and micro-habitats; and reconnecting fragmented habitats;
- Preserve or enhance native stock structures and genetic diversity

### **STRATEGIES**

None identified.

### **MANAGEMENT ACTIONS**

- Focus on primary ecological factors limiting recovery, including divergent productivity of upriver and lower riverstocks
- Recreate key ecological functions rather than circumvent them;
- Focus on wild native fish, using artificial production where ecologically prudent
- Focus on listed anadromous fish while optimizing benefits for resident fish and wildlife.

## **10. Native Fish Society**

### **GOAL**

Protect and rebuild abundance and distribution of locally adapted, native wild salmonids, maintain genetic and life history diversity and ecological benefits.

### **OBJECTIVES**

None identified.

### **STRATEGIES**

- Define units of management action at population and watershed level;
- Inventory biological diversity to establish benchmarks for genetic and life history structure;
- Adopt biological objectives that maintain biological diversity;
- Develop science-based management plans that maintain biological diversity;
- Conduct scientific audit of results, research needs, policy and management issues;
- Involve the public in finding solutions.

### **MANAGEMENT ACTIONS**

- Establish reference watersheds and populations as controls for a range of species and ecological conditions;
- Implement existing laws and regulations for fish, wildlife and habitat protection;
- Determine genetic and life history diversity as benchmarks;
- Establish sediment threshold for spawning areas that protect egg development and fry emergence;
- Establish temperature thresholds for adults; juveniles and eggs;
- Maintain a population structure that protects weak stocks, genetic and life history diversity;
- Re-establish sources of large woody debris;

- Re-establish ecological linkages in watershed;
- Use RASP to establish rebuilding plans for native salmonids;
- Replace mixed stock fisheries with known stock fisheries;
- Establish escapement objectives for watershed populations;
- Hold harvest managers accountable for meeting objectives;
- Terminate hatcheries that disrupt native fish genetic and life history diversity and have negative ecological effects;
- License hatcheries and review licenses;
- Conduct an annual status review of native stocks;
- Establish a basin policy regarding protection of native fish genetic and life history diversity;
- Independent scientific review of funding proposals in which managers identify assumptions;
- Establish a peer-reviewed journal to document recovery program instead of relying on gray literature;
- Establish a biodiversity institute;
- Develop a science-based information service for decision makers;
- Review hatchery program's impacts on native fish;
- Establish a life cycle-based research and management program for salmonids;
- Stop transferring salmonids among facilities and watersheds;
- Test concept of hatchery that conserves wild populations.

**11. Del Lathim**

**GOAL**

Make downriver passage as safe as a natural river, increasing hydro generation 25%

**OBJECTIVES**

- Environmentally friendly passage for anadromous fish;
- Maintain economic benefits of hydro system;
- Protect the ecosystem the dams have created;
- Increase hydro output by 25%;
- Secure tribes' agreement to stop gill netting.

**STRATEGIES**

- Fish-friendly turbines.

**MANAGEMENT ACTIONS**

- Fine-tune prototype at Bonneville Unit #4; replace older Kaplan units with friendly turbines; discontinue fish screens; install turbines in skeletal bays and pass water through them instead of spilling.

**12. Kokanee Recovery Task Force**

**GOAL**

Stabilize resident fish at 75% of pre-dam levels within 12 years, showing progress in 4 years.

**OBJECTIVES**

- Meet fish passage efficiency goals;
- Meet water quality standards;
- Increase habitat;
- Increase aquatic population to historic levels;
- Maintain integrity of dams;
- Keep costs commensurate with benefits; and
- Find regional funding from diverse resources.

**STRATEGIES**

- Determine characteristics of resident fish food sources;
- Determine relationship of target species population dynamics and predators, including level of sustainable harvest;
- Emphasize wild spawning rather than artificial;
- Maximize spawning habitat by manipulating water levels during egg laying, incubation, emergence, and control post-emergence levels to prevent stranding;
- Bring 10 million eggs from other agencies to augment production;
- Use artificial devices to increase fry survival to 80%;
- Reduce gas supersaturation, move fry from Cabinet Gorge hatchery to southern part of lake to avoid gas.

**MANAGEMENT ACTIONS**

- Pend Oreille at 2055' in winter;
- Cabinet Gorge and Noxon reduce gas to 110% by 2001
- Buy 10 million eggs per year pending recovery;
- Transport fry to southern part of lake when gas exceeds 100%;
- Plant kokanee eggs in incubation protection systems in southern part of lake until gas problem is addressed.

**13. Upper Columbia River Co-Management Entities**

**GOAL**

A healthy Columbia River ecosystem that supports viable and genetically diverse fish with harvest and other societal benefits.

**OBJECTIVES**

- A stable, locally adapted Upper Columbia ecosystem that produces natural resident fish at pre-dam levels; and/or
- Reintroduce and build anadromous fish above blockages to historic levels.

**STRATEGIES**

- A comprehensive mitigation program of native resident fish restoration and non-native fish substitution as in Council program and MYIP; and/or
- Develop fish passage at Chief Joseph and Grand Coulee, concurrently re-introducing anadromous fish that genetically and behaviorally resemble former populations above those projects.

**MANAGEMENT ACTIONS**

None identified

**14. Jim Litchfield**

**GOAL**

Naturally spawning, sustainable and diverse f/w, balancing preservation of economic infrastructure including multipurpose river use.

**OBJECTIVES**

- Enhance core while protecting listed populations;
- Take actions with most biological benefit and least cost first;
- Through watershed audit, identify biological priorities for prime watersheds, production watersheds and watersheds unsuitable for fish;
- Establish population goals and harvest limits;
- Enhance production for harvest with no harm to natural production;

- Change dam configuration only where critical survival bottlenecks can't be addressed otherwise and costs are justified by probable biological benefits;
- Value over- more than under-escapement in harvest mgt;
- Manage flood events to facilitate scouring;
- Use watersheds as fundamental mtg. Unit;
- Regional council adopt top-down priorities, watersheds heavily involved in deciding how to implement them in balance with local priorities and;
- Modify laws accordingly, where needed;

**STRATEGIES**

- Scope is entire basin;
- Develop unified plan that classifies biological objectives developed by regional council;
- Incorporates a high degree of local control;
- Covers the whole life cycle, including the ocean and estuary; and
- Because dam effects are uncertain, conducts a fish mortality audit for adults and juveniles, to guide changes in dam configuration (correct highest mortalities first, especially adult mortality).

**MANAGEMENT ACTIONS**

None specifically identified

**15. Sun Mountain Reflections**

**GOAL**

Redesign hydro projects to mimic natural aquatic structure, improve water quality, restore habitat, restore harvestable populations and maintain integrity of dams.

**OBJECTIVES**

- Increase hydro production
- Increase salmon and steelhead
- Improve harvest, habitat and hatchery management
- Maintain existing irrigation and allow more consumptive water use
- Maintain navigation to river ports
- Experiment, gather useful data

**STRATEGIES**

- Redesign hydro projects to mimic natural bathymetric structure using Wheels, Pools and Falls approach (on the basis of various studies comparing current conditions to historic conditions).
- Develop diverse funding sources including public agencies, tribes, commercial interests and the public.

**MANAGEMENT ACTIONS**

- Change policies from problem-specific management to resolution of underlying ecological problems that preclude multi-species recovery. View recovery investment as a regional economic benefit rather than a hydropower expense.

**16. Rachel Stein**

**GOAL**

Prevent further degradation, then improve environmental condition; ensure resilient social and economic systems

**OBJECTIVES**

- Establish baseline information;

- Identify human actions that affect ecosystem;
- Create scale to identify ecological tolerance;
- Define activities that can change;
- define surrogate measure for baseline;
- Standardize data and surrogate measurement; and
- Measure change

**STRATEGIES**

- Use ICBMP to establish baseline
- Use law and other values to establish scale of ecological tolerance
- Work within existing social structures to change human activities
- Define surrogate measures and use them in evaluation.

**MANAGEMENT ACTIONS**

None identified.

**17. Oregon Water Trust**

**GOAL**

Provide instream flows to support naturally functioning small streams

**OBJECTIVES**

- Restore flows in small tributaries to improve aquatic habitat and improve water quality.

**STRATEGIES**

- Buy senior water rights and dedicate them to streams.

**MANAGEMENT ACTIONS**

None identified

**18. William K. Watson**

**GOAL**

Salmon restoration

**OBJECTIVES**

None identified

**STRATEGIES**

- Improve dam passage;
- Find ways to artificially produce flow at edges of reservoirs; and
- Find ways to artificially clean reservoir gravels.

**MANAGEMENT ACTIONS**

- At a low dam in the lower river, experiment with new ladders;
- At the shortest reservoir on the river, experiment with ways to artificially produce flow at edges of reservoirs; and
- At the shortest reservoir on the river, find ways to artificially clean reservoir gravels.

**19. Phillip R. Mundy**

**GOAL**

Establish comprehensive fisheries management system that protect ecosystem functions, harvest, and other human uses.

**OBJECTIVES**

- Protect wild salmon and habitat;
- Maintain salmon escapements to protect potential salmon production and maintain ecosystem functions;
- Harvest salmon consistent with uncertainty regarding status of the resource;
- Control human activities that affect salmon;
- Build public support for salmon.

**STRATEGIES**

- Develop and implement a program of goals and objectives and enact them into law at national, state and local levels;
- Develop and implement tests or criteria to define objectives, measure progress, and adapt program with new information.

**MANAGEMENT ACTIONS**

- Use framework process and NPPC to develop goals and objectives;
- Enlist a regional forum of federal, state and local law makers to work on implementing legislation;
- Define objectives in terms that can be used in evaluating progress;
- Adapt management measures according to monitoring information.

**20. Public Power Council**

**GOAL**

Best possible balance between biological integrity, genetic diversity and sustainable, naturally reproducing fish and wildlife, with due consideration for economic and social constraints.

**OBJECTIVES**

- Institute effective governance;
- Develop a unified plan;
- Establish fish and wildlife objectives
- Protect the environmental
- Foster economic and social vitality.

**STRATEGIES**

- **Management:** Top-down decision making by federal, state and tribal entities coordinated with bottom-up input in planning and management, especially on habitat; decisions incorporate performance measure.
- **Fish and wildlife generally:** Clarify purpose of mitigation; consider entire life cycle and ecosystem; take actions with measurable results; and balance resident fish and wildlife values.
- **Naturally spawning fish and wildlife:** set escapement for watershed populations; use metapopulations as level of organization; expand from existing, strong core populations, giving lower priority to weaker populations; emphasize areas with highest potential for increasing numbers of fish and most native species; give more attention to ocean and estuary; ensure natural escapement; protect good habitat and restore degraded habitat; minimize hydro impacts.
- **Harvest:** manage to minimize impacts to natural fish and coordinate management regionally and internationally.
- **Environment:** view actions globally and recognize trade-offs.
- **Economic and social:** emphasize actions that promise most benefit, cost less, disrupt less, use existing institutions, have performance goals and end points, and are most efficient. Compensate adversely affected parties.

**MANAGEMENT ACTIONS**

None identified.

**21. Port of Vancouver and Shaver  
Transportation Co.**

**GOAL**

Maintain navigability

**OBJECTIVES**

- Improve quantity and quality of habitat (culverts at road crossings, removing obsolete structures like Condit);
- Don't draw down any mainstem dams; and
- Reduce predation by, i.e., terns.

**STRATEGIES**

None identified

**MANAGEMENT ACTIONS**

None identified

**22. Melo Maiolie**

**GOAL**

Use mitigation funds for problems caused by the federal hydro system;

Focus recovery efforts where hydro impacts are greatest

Make recovery long lasting

Operate hydro system so anadromous and resident species are not in competition.

**OBJECTIVES**

- Put 70% of total funds into on-the-ground activities and limit monitoring and evaluation to 15-25% of budget
- 80% or more of recovery efforts should mitigate direct effects of the hydro system
- Recovery efforts should match hydro impacts
- 70% of funds should go to long-lasting solutions for hydro problems
- Improve anadromous and resident species to at least 75% of historic levels
- Put priority on restoring production in natural lakes.

**STRATEGIES**

- Streamline BPA, NPPC, CBFWA and ISRP to use less than 5% of funds; and impose maximum of 25% overhead on individual projects;
- Put low priority on projects with high monitoring costs
- TBFWA develop formula for recovery efforts based on miles of rivers impacted, acres of reservoir created, wildlife units lost, and allocate funds accordingly
- Put highest priority on protecting fish that reproduce in the wild, lower priority on hatchery supplementation, and lowest priority to long-term hatchery programs with low potential to be self-sustaining;
- Consider all fish populations together when considering changes in hydro operations to avoid helping one and hurting another.

**MANAGEMENT ACTIONS**

None identified.

**23. John R. Skalski, University of Washington**

**GOAL**

An experimental approach to stream recovery that uses best technology across a range of conditions, using individual streams as replicate experimental units, with monitoring and

evaluation to improve recovery strategies.

**OBJECTIVES**

- Stream-wide recovery measured by adult salmon returns, spawner-recruit ratios and fingerling-adult ratios (integrated responses of fecundity and survival) in an adaptive management framework
- Using field trials to assess whether remediation actions enhance responses over untreated streams
- Using a stair-step design to test progressively better strategies.

**STRATEGIES**

- With a large number of candidate streams and annual resources to address only a fraction each
- Year
- Aim for replication and randomization
- Evaluate survival and fecundity
- Systematically measure water quality, biotic responses of invertebrates and habitat quality.

**MANAGEMENT ACTIONS**

- Best available technology used to improve stream quality in randomly selected streams, via
- fencing, reducing irrigation withdrawal, enhancing riffles and gravels, returning nutrients via
- carcasses.
- Measure results annually using pre-established decision rules and time frames.
- Use different actions in different subsets of streams to compare strategies and cost-effectiveness.

**24. Scott O’Daniel, Confederated Tribes of Umatilla Indian Reservation**

**GOAL**

Improve land management decisions by analyzing and maintaining watershed and sub-watershed data.

**OBJECTIVES**

- Construct a suite of coarse scale ecological characterizations for each watershed;
- Identify relevant, available data;
- Develop functional thresholds that characterize significant, measurable changes;
- Review and publish case studies that link abstract and empirical models; and
- Target ecological functions and patterns at critical/ESA spatial scales.

**STRATEGIES**

None identified

**MANAGEMENT ACTIONS**

None identified

**25. Columbia River Alliance**

**GOAL**

Rebuilt salmon and steelhead hurt by human activity; maintain multiple purpose benefits of river; develop detailed subbasin plans using best science in most cost-effective way.

**OBJECTIVES**

- Develop/implement a plan to increase spawning runs of salmon and steelhead, complying with federal law and maintaining resident fish and wildlife populations;
- improve passage at dams;
- provide more scientific certainty to mitigation;

- implement measures with least cost, highest biological benefit;
- expand monitoring and evaluation;
- maintain river's public benefits: hydropower, irrigation and increased consumptive use, navigation to existing ports, recreation and flood control.

#### **STRATEGIES**

- **Immediate actions:**
  - maximize transportation and reduce ineffective spill;
  - investigate surface collection;
  - reduce predation in mainstem and estuary;
  - expand genetic diversity by increasing escapement to allow fully-seeded habitat;
  - reduce mixed stock fishery, mark all hatchery fish;
  - complete subbasin plans and use watershed councils, CRP and incentives for landowners and others to improve riparian habitat
- **Basin-wide salmon management:**
  - establish a regional entity to design and manage salmonid recovery;
  - use research and monitoring to improve models for analysis and prediction;
  - chose cost-effective measures;
  - decentralize habitat decisions to watersheds, categorize habitat into "nature preserve" and "production/supplementation;" manage harvest to protect weak stocks;
  - use models to predict extinction prospects for listed stocks;
  - restructure hatchery management;
  - link habitat restoration and stock management to fully seed "nature preserve" areas and report results.

#### **MANAGEMENT ACTIONS**

None identified.

### **26. Murphy & Buchal: Goldendale, Kaiser, Northwest & Reynolds Aluminum**

#### **GOAL**

Increase multiple benefits of dams and river through common sense application of quantifiable data.

#### **OBJECTIVES**

- Increase hydro production
- Increase salmon and steelhead
- Improve harvest, habitat and hatchery management
- Maintain existing irrigation and allow more consumptive water use
- Maintain navigation to river ports
- Experiment, gather useful data.

#### **STRATEGIES**

- **Generally:**
  - Quantify benefits and costs of proposed measures;
  - implement f/w measure based on cost-effectiveness;
  - improve measurements of survival to identify high mortality areas;
  - use computer models to organize data and depict relationships to enable prediction;
  - use metapopulation models to predict extinction prospects for listed stocks.
- **Reorient management to meet legal requirements:**
  - Manage harvest to protect weak stocks;
  - manage hatcheries to achieve objectives;
  - sort habitat into "nature preserve" and production categories;
  - decentralize habitat decisions, focus regional decisions on interjurisdictional issues, limit hydropower funding to offsetting effects of hydropower.

#### **MANAGEMENT ACTIONS**

- **Mainstem:**
  - Focus on “hot spots” of mortality;
  - abandon spring flow augmentation and real-time flow management;
  - experiment with late summer/fall flow augmentation in low water years, using BPA contingency fund; maximize transportation, reduce spill at collector facilities, experiment with release sites;
  - optimize project-specific spill at non-collector facilities;
  - reactivate sluiceway passage, expand surface collection; replace old turbines with fish-friendly turbines;
  - assess natural mortality to distinguish human mortality
- **Hatcheries:**
  - unify reporting and measure success by returns to watersheds;
  - mark all hatchery fish;
  - fund genetic research to increase fish size, improve disease resistance, adapt to warm temperatures, increase abundance;
  - install spawning channels below tailraces;
  - expand existing mainstem spawning areas;
  - share tag revenues with hatcheries that return fish to watersheds;
  - move management to tribes;
  - declare some tributaries off limits to hatchery production and others as production/supplementation watersheds.
- **Harvest:**
  - Stop wild harvest, adopt tributary-specific escapement goals;
  - eliminate ocean harvest;
  - redirect lower river mixed stock harvest to terminal areas;
  - redirect tribal mixed stock harvest to ladder and tributary fishing;
  - buy selective gear for harvesters;
  - unify policing under US v. OR.
- **Habitat:**
  - Leave habitat issues to local level; abandon wildlife mitigation;
  - BPA Environmental Foundation fund habitat; evaluate cost-effectiveness of natural vs. artificial production.
- **Generally:**
  - Target research on project-specific effects;
  - expand passage models to whole life cycle;
  - build metapopulation models;
  - introduce mammalian predators to control terns;
  - allow limited marine mammal hunting.

#### **27. Northwest Irrigation Utilities & Pacific Northwest Waterways Association**

##### **GOAL**

Strong anadromous metapopulation that allow harvest; sustained resident fish; rebuilt weak stocks where cost is justified; river supports full spectrum of uses; hydro system is maintained and improved and supports ecosystem recovery consistent with integrated plan; and region has an effective governance mechanism that operates to protect the river system, treaty rights and state water rights.

##### **OBJECTIVES**

- **Funding:** Dependable, long-term PMA and other funding for ecosystem recovery;
- **Management:** Existing entities coordinate efforts assume accountability and put a new system of financial management in place. Federal, state and tribal authorities maintained, stipulating that plan compliance satisfies ESA and Clean Water Act.

- **Ocean & estuary:** Maximize survival below Bonneville, emphasize actions with clear and immediate benefit for fish, including reduced ocean harvest and bird predation, and improve understanding of estuary.
- **Hatcheries:** Use to recover natural populations and provide harvest while protecting genetic diversity.
- **In-river harvest:** Optimize harvest while ensuring long-term viability of natural stocks.
- **Habitat:** Improve tributary habitat, providing financial incentives to landowners.
- **Water management:** Improve biological benefits, reduce societal costs, respect state law, emphasize watershed efforts and water transfers.
- **Hydro system:** Selectively improve system and operations, expand transportation

#### **STRATEGIES**

- **Funding:** Maintain regional influence over PMA to assure adequate funding, promote other funding.
- **Management:** Use NPPC or a successor to oversee plan, clarify authority with other jurisdictions. Once plan is developed, develop an executive order stipulating ESA and Clean Water compliance.
- **Ocean & estuary:** improve survival below Bonneville including selective decreases in ocean and estuary harvests.
- **Hatcheries:** Emphasize wild fish and supplementation in selected tributaries using production to support terminal harvest, not as replacement for natural spawners, and minimizing impacts on wild stocks.
- **In-river Harvest:** Reduce mixed-stock fisheries, ensure natural escapement, increase fishing and catch value; reduce fishery capitalization.
- **Habitat:** Substantially expand funding for spawning, rearing and migration habitat.
- **Water management:** Restructure BiOp flow program to protect mainstem fish while spending more on tributary mitigation with comparable biological benefits and using incentives for collaboration.
- **Hydro system:** Increase transportation and mix with spill, passage, and turbine passage improvement.

#### **MANAGEMENT ACTIONS**

- **Funding:** Commit up to \$500 million/yr. From BPA over 10-year period; assure continued availability of BPA contingency fund; protect BPA or create a regional entity to assume its role; leverage private and other funds.
- **Management:** Create entity with full regional support and tribal representation to pursue recovery in cooperation with governments and participation by interest groups; allocate funds between foregone revenues and expenditures; develop criteria for projects, monitoring and evaluation based on integrated plan, best science, judgment and balancing diverse uses; decisions not bound by operating agencies' perspectives; and consider a 3<sup>rd</sup>-party fiduciary to manage funds.
- **Ocean & estuary:** increase use of estuary for acclimation of transported fish; increase use of Young's Bay for terminal fishing; discourage terms on Rice Island; selectively decrease ocean harvest, providing incentives not to fish during return periods for certain stocks; research on ocean effects.
- **Hatcheries:** Set performance standards based on returns, emphasizing wild fish; use innovative release strategies to provide harvest; develop comprehensive plan for basin; close won under-performing facilities; implant hatchery releases to reduce mixed-stock fishing; supplement under-seeded spawning areas; centralize incubation and rearing while increasing acclimation facilities; use low-cost, low technologies.
- **In-river harvest:** manage for escapement to spawning grounds; protect treaty rights and Zone 6 harvest; develop terminal fisheries; buy back commercial license; improve selective gear; provide incentives for reduced commercial fishing; provide sport fishing; use in-season

stock assessment to manage fisheries; mark all hatchery fish; augment below-Bonneville releases with upriver fish.

- **Habitat:** Support watershed processes in Oregon and Washington plans; endow trust to fund private, local and tribal improvements; develop partnerships with timber companies, farmers, ports, tribes, towns and others; coordinate with federal and state assistance programs.
- **Water management:** Eliminate BiOp spring-summer flow targets; evaluate biological benefits of Snake flow targets; fish managers establish flow augmentation for low water years, protect upstream resident species; priority on funding watershed capital improvements that help fish by improving stream conditions; respect hydrological conditions.
- **Hydro system:** various measures to increase transportation; bypass and turbine improvements at specific dams; moderated spill at collector projects, spill abatement measures

## **28. Clousten Energy Research**

### **GOAL**

Conservation of water taken for irrigation, stock watering and other purposes could be benefiting the habitat of multiple species. Application of existing technology and programs with innovative approaches when coordinated will provide improvements to water quality, affecting the aquatic environment of species throughout their life cycle. Conservation supports communities and economic development opportunities in some cases.

### **OBJECTIVES**

- Improve water quality and quantity
- Improve acceptance of installation of fish screens
- Improve conservation of natural resources

### **STRATEGIES**

- Apply conservation and enhancement measures for dams to water management activities and facilities, where applicable
- Establish adequate instream flow conditions for salmon by using, for example, the Instream Flow Incremental Methodology
- Undertake efforts to purchase or lease, from willing sellers and lessors, water rights necessary to maintain instream flows in accordance with appropriate state and federal laws
- Identify and use appropriate water conservation measures in accordance with state law
- Install totalizing flow meters at major diversion points. For water withdrawn from reservoirs, install gauges that identify the water surface elevation range from full reservoir to dead pool storage elevation. Additionally, if the reservoir is located in-channel, install gauges upstream and downstream of the reservoir
- Screen water diversions on all fish-bearing streams
- Incorporate juvenile and adult salmon passage facilities on all water diversions

### **MANAGEMENT ACTIONS**

- Support for pilot projects ought to be improved
- Cooperation with the private sector needs to be encouraged
- Conservation of natural resources is smart

**Fish and Wildlife Implementation Plan DEIS**

**Appendix D: Major Comment Issues/Framework Concept Papers**

**C. Framework Concept Papers By Action Areas**

The following table is a copy of the spreadsheet provided by the Framework workgroup. It shows the basic fish recovery elements of the different concept papers side by side.

ACTIVITY OR OBJECTIVE	CONCEPT PAPER NUMBER (See Table B above)																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
<b>HYDRO</b>																											
Breach Lower Snake Dams	X	X	X	X	X	X				X																	
Provide passage at Grand Coulee and Chief Joe							X						X														
John Day at spillway crest	X		X	X	X	X	X			X																	
John Day at MIP		X																									
Additional flows	X	X			X	X	X			X																	
Secure Canadian storage		X					X			X																	
End/reduce juvenile transportation	X	X	X		X																						
24 hr. spill from Priest downstream		X																									
Meet fish passage efficiency objectives							X								X												
Water temperature control	X		X				X	X	X	X																	
Install gas abatement facilities		X			X	X	X			X		X															X
Improve turbine efficiencies	X					X	X			X																	X
Improve adult/juvenile passage	X	X			X	X	X			X	X								X						X		X
Install fish-friendly turbines							X			X	X															X	
Implement IRC's/VARQ		X						X																			
Manipulate water levels to protect spawning		X					X					X															
Modify flood control operations		X								X																	
Stabilize reservoir levels				X																							
Maintain navigability (dams in)							X								X						X				X	X	
Maximize/increase juvenile transportation																									X	X	X
Expand surface collection							X																			X	

**Fish and Wildlife Implementation Plan DEIS**  
**Appendix D: Major Comment Issues/Framework Concept Papers**

ACTIVITY OR OBJECTIVE	CONCEPT PAPER NUMBER (See Table B above)																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Reduce reservoir drafts and improve refill								X																				
Transport only in low flow years					X																							
Reduce/optimize spill																										X	X	
Abandon/reduce spring flow augmentation																											X	X
Redesign hydro projects															X													
Eliminate flow augmentation		X																										
Increase hydro production											X																X	
<b>HATCHERIES</b>																												
Biological priorities for naturally spawning fish	X						X		X	X		X		X								X						X
Improve hatchery Operations/mgt.	X									X																X	X	
Use Supplementation	X		X	X	X																	X				X		X
Reduce use of hatcheries		X			X	X				X												X						X
Mark all hatchery fish										X																X	X	X
White sturgeon hatchery			X																									
Spawning channels below tailraces																											X	
<b>HABITAT</b>																												
Support normative river conditions	X	X	X	X	X	X		X	X	X											X							
Protect/restore/acquire habitat	X		X	X	X	X	X	X		X						X			X	X			X		X			X
Meet water quality standards	X		X							X					X													
Expand existing mainstem spawning areas		X								X																	X	
Screen diversions	X									X																		
Limit water diversions			X							X									X									
Restore tributary flows	X		X							X							X						X					
Reduce pollution			X							X																		
Reduce predation	X		X																		X					X	X	X
Control land use			X							X													X					

**Fish and Wildlife Implementation Plan DEIS**

**Appendix D: Major Comment Issues/Framework Concept Papers**

ACTIVITY OR OBJECTIVE	CONCEPT PAPER NUMBER (See Table B above)																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
Provide habitat incentives										X																X	X	X
Local watershed approach										X			X														X	X
Restore/consider estuary habitat	X		X							X										X		X						X
Delineate hatchery and natural production watersheds													X														X	
Conduct watershed audits										X																		
Clean reservoir spawning gravels																			X									
More consumptive water use																										X	X	
Abandon Wildlife mitigation																												
<b>HARVEST</b>																												
Insure harvestable stocks	X	X	X	X	X	X	X					X	X											X				X
Improve harvest management	X		X							X										X							X	
Protect/increase escapement	X					X				X			X						X	X						X		X
Develop known stock fisheries					X		X			X																	X	X
Manage to weak stocks				X						X																X	X	
Abundance based harvest			X		X	X				X														X		X	X	X
<b>OTHER</b>																												
Restore salmon to historic abundance			X																									
Recover ESA stocks		X				X			X	X			X															
Protect/expand metapopulations		X				X				X			X							X								X
Enforce existing laws (e.g. CWA)	X			X	X		X			X																		X
Changes in or new laws needed										X			X						X									
Multi-species approach/protection		X		X		X	X	X	X	X			X										X					
Lamprey research/restoration			X			X	X			X																		
Comprehensive native resident fish program		X								X		X	X		X													
Better cost effectiveness		X								X			X	X						X						X	X	X
Compensate adversely affected parties							X			X										X								
Prioritize cost-effective implementation										X								X								X		
Implement PATH results		X						X																				

**Fish and Wildlife Implementation Plan DEIS**  
**Appendix D: Major Comment Issues/Framework Concept Papers**

ACTIVITY OR OBJECTIVE	CONCEPT PAPER NUMBER (See Table B above)																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Diversify funding sources										X					X												X
"Reverse Staircase" approach						X																					
Establish genetic reservations								X		X																	
Reduce commodity subsidies	X																										
Maintain affordable, cost-based power	X	X			X						X				X												
Sustainable farming					X																						
Better governance structure											X				X						X					X	X
Establish a Biodiversity Institute											X																
Create artificial flows in reservoirs																											
Foster economic/social vitality																X					X					X	
Maintain irrigation					X																					X	X
Stipulate ESA & CWA compliance											X																X

## **Appendix E**

### **Regional Energy Generation Resources**

The following information is on regional electric energy resources. It is provided in two listings to address the existing generation and planned generation.

- Table A lists the existing generation by type of generation, date of energization, megawatt capacity, and location.
- Table B lists the planned generation by type of generation, date of proposed energization, megawatt capacity, and state.

Together, these tables should give a good idea of the energy resource picture for the region.

**Table A: Northwest Power Planning Council Power Plants in the Pacific Northwest**  
(Including Canadian hydropower projects in the Columbia R. Basin, April 2001)

<b>PROJECT</b>	<b>PRIMARY RESOURCE</b>	<b>INSTALLED CAPACITY</b>	<b>SERVICE DATE</b>	<b>SITE</b>	<b>COUNTY</b>	<b>STATE</b>
Aberfeldie	Hydro	5.0	1922	Bull R.		BC
Afton Generating Co. 1	Wood Residue	7.5	1983	Afton	Lincoln	WY
Akolkolex	Hydro	10.0	1995	Akolkolex R.		BC
Albeni Falls	Hydro	42.6	1955	Pend Oreille R.		ID
Alder	Hydro	50.0	1945	Nisqually R.		WA
Amalgamated Sugar (Nampa) 1 - 3	Coal	9.3	1968	Nampa	Canyon	ID
Amalgamated Sugar (Nyassa) 1 - 3	Coal	14.0	1942	Nyassa	Malheur	OR
Amalgamated Sugar (Paul)	Natural Gas	5.5		Paul	Minidoka	ID
Amalgamated Sugar (Twin Falls) 1-3	Coal	7.0	1994	Twin Falls	Twin Falls	ID
Amy Ranch	Hydro	0.7	1986	Deep Cr.	Butte	ID
Anderson Ranch	Hydro	40.0	1950	Boise R.	Elmore	ID
American Falls	Hydro	92.4	1978	Snake R.	Power	ID
Ashton	Hydro	7.4		Henrys Fk.		ID
Atlanta Power Station	Hydro	0.2	1910	Boise R, M Fk	Elmore	ID
Auberry Energy	Wood Residue	7.5	1985	Fresno		ID
Barber Dam	Hydro	3.7	1989	Boise R.		ID
Barney Creek	Hydro	0.1	1986	Barney Cr.	Park	MT
Beaver	Natural Gas	586.2	1977	Clatskanie	Columbia	OR
Bend Power	Hydro	1.1	1913	Deschutes R.	Deschutes	OR
Bethel 1	Fuel Oil	(56.7)	1973	Salem	Marion	OR
Bethel 2	Fuel Oil	(56.7)	1973	Salem	Marion	OR
BGI (Yellowstone Energy)	Pet Coke	64.0	1995	Billings	Yellowstone	MT
Big Cliff	Hydro	18.0	1954	N. Fk. Santiam R.	Linn	OR
Big Creek Lodge	Hydro	0.0	1964	McCorkle Cr.	Valley	ID
Big Elk Creek YMCA Camp	Hydro	0.0	1987	Big Elk Cr. Trib.	Bonneville	ID
Big Fork	Hydro	4.2	1910	Swan R.	Flathead	MT

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Big Hanaford	Natural Gas	248.0	2002	Centralia	Lewis	WA
Big Sheep Creek	Hydro	1.6	1985	Big Sheep Cr.	Stevens	WA
Biggs' Creek	Hydro	0.0	1987	Biggs Cr.	Clark	WA
Billingsley Creek	Hydro	0.3	1986	Billingsley Cr.	Gooding	ID
Biomass One	Wood Residue	25.0	1986	White City	Jackson	OR
Birch Creek	Hydro	2.7	1987	Birch Cr.	Clark	ID
Birch Creek A	Hydro	0.0	1984	Birch Cr.	Gooding	ID
Birch Creek B	Hydro	0.1	1984	Birch Cr.	Gooding	ID
Black Canyon	Hydro	10.0	1986	Payette R.	Gem	ID
Black Canyon No. 3	Hydro	0.1	1983	N. Gooding Main Cnl.		ID
Black Creek	Hydro	3.7	1994	Black Cr.	King	WA
Black Eagle	Hydro	16.8	1927	Missouri R.		MT
Blind Canyon	Hydro	1.2	1992	Blind Canyon Spr.	Gooding	ID
Bliss	Hydro	75.0	1949	Snake R.	Gooding	ID
Blue Mountain Forest Products	Wood Residue	(3.5)	1986	Long Creek	Grant	OR
Boardman	Coal	560.0	1980	Boardman	Morrow	OR
Boise Cascade (Emmett)	Wood Residue	14.0	1985	Emmett	Gem	ID
Boise Cascade (LaGrande)	Wood Residue	4.6		La Grande	Union	OR
Boise Cascade (Medford)	Wood Residue	(8.5)	1961	Medford	Jackson	OR
Boise Diversion	Hydro	1.5	1912	Boise R.		ID
Bonneville	Hydro	1050.4	1938	Columbia R.		OR/WA
Bonneville Fishway	Hydro			Columbia R.		OR/WA
Bonnington Falls	Hydro	16.0		Kootenay R.		BC
Boulder Creek	Hydro	0.4	1984	Boulder Cr.	Lake	MT
Boundary	Hydro	1039.8	1967	Pend Oreille R.		WA
Boundary	Fuel Oil	0.8		Boundary Dam	Pend Oreille	WA
Box Canyon	Hydro	0.6	1983	Box Canyon Spr.		ID
Box Canyon Dam	Hydro	60.0	1955	Pend Oreille R.	Pend Oreille	WA
Bozeman Woodwaste	Wood Residue	12.0	1985	Bozeman	Gallatin	MT

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BP Cherry Point lcs	Fuel Oil	26.0	2000	Blaine (Cherry Point Refinery)	Whatcom	WA
Bremerton Wastewater	Wastewater Gas	0.1		Bremerton	Kitsap	WA
Briggs	Hydro	(0.3)	1986	Teton Cnl.	Fremont	ID
Briggs Creek	Hydro	0.8	1985	Briggs Cr.	Gooding	ID
Brilliant	Hydro	129.0	1944	Kootenay R.		BC
Broadwater	Hydro	10.0	1989	Missouri R.		MT
Brownlee	Hydro	585.4	1958	Snake R.		ID/OR
Brunswick Creek	Hydro	0.0	1982	Brunswick Canyon Cr.	Washington	OR
Bull Run	Hydro	21.0	1912	Sandy R.	Clackamas	OR
Bull Run No. 1 (Portland Hydro)	Hydro	23.8	1981	Bull Run R.	Multnomah/Clackamas	OR
Bull Run No. 2 (Portland Hydro)	Hydro	11.9	1982	Bull Run R.	Multnomah/Clackamas	OR
Burnham Creek	Hydro	0.0		Burnham Cr.	Pacific	WA
Burrill Lumber	Natural Gas	1.5	1990	White City	Jackson	OR
Burton Creek	Hydro	0.8	1996	Burton Cr.	Lewis	WA
Bypass	Hydro	10.0	1988	N. Side Main Cnl.	Jerome	ID
C.J. Strike	Hydro	82.8	1952	Snake R.	Owyhee	ID
Cabinet Gorge	Hydro	231.3	1952	Clark Fork R.	Bonner	ID
Calispell Creek	Hydro	1.0		Calispell Cr.		WA
Canal Creek	Hydro	(1.1)	1984	Wallowa Valley Imp. Dist. Cnl.	Wallowa	OR
Canyon Creek	Hydro	0.1	1985	Canyon Cr.	Clackamas	OR
Canyon Ferry	Hydro	50.0	1953	Missouri R.	Lewis & Clark	MT
Carmen-Smith	Hydro	104.5	1963	McKenzie R.	Linn	OR
Cascade	Hydro	12.4	1926	Payette R. N. Fk.	Valley	ID
Cascade Creek	Hydro	0.1	1983	Cascade Cr.	Park	MT
Cedar Draw Creek	Hydro	2.9	1985	Cedar Draw Cr.	Twin Falls	ID
Cedar Falls (Masonry Dam)	Hydro	30.0	1905	Cedar R.	King	WA
Central Oregon Siphon	Hydro	5.5	1989		Deschutes	OR
Centralia 1	Coal	730.0	1971	Centralia	Lewis	WA

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Centralia 2	Coal	730.0	1972	Centralia	Lewis	WA
Cereghino (John Day Creek)	Hydro	1.1	1987	John Day Cr.	Idaho	ID
Champion International - Libby	Wood Residue	17.0	1960	Libby	Lincoln	MT
Champion International - Milltown (Bonner)	Wood Residue	2.2		Milltown	Missoula	MT
Chandler	Hydro	12.0	1956	Yakima R. (Off-stream)	Benton	WA
Chelan	Hydro	48.0	1928	Chelan R.	Chelan	WA
Chelan Ics	Fuel Oil	33.6	2001	McKenzie Switchyard	Chelan	WA
Chief Joseph	Hydro	2075.0	1955	Columbia R.	Douglas	WA
City of Albany	Hydro	0.5	1923	S. Santiam R.	Linn	OR
Clear Lake	Hydro	2.5	1937	Snake R. (Off-stream)	Gooding	ID
Clearwater 1	Hydro	15.0	1953	Clearwater R.	Douglas	OR
Clearwater 2	Hydro	26.0	1953	Clearwater R.	Douglas	OR
Clearwater Hatchery	Hydro	2.5		N.Fk. Clearwater R.	Clearwater	ID
Cline Falls	Hydro	1.0	1913	Deschutes R.	Deschutes	OR
Cochrane	Hydro	48.0	1957	Missouri R.	Cascade	MT
Coffin Butte	Landfill Gas	2.0	1995	Coffin Butte Landfill	Benton	OR
Collins Wood Products - Klamath Falls	Wood Residue	7.5		Klamath Falls	Klamath	OR
Colstrip 1	Coal	333.0	1975	Colstrip	Rosebud	MT
Colstrip 2	Coal	333.0	1975	Colstrip	Rosebud	MT
Colstrip 3	Coal	718.0	1984	Colstrip	Rosebud	MT
Colstrip 4	Coal	718.0	1986	Colstrip	Rosebud	MT
Columbia Generating Station (nee )WNP-2	Uranium	1216.0	1984	Hanford	Benton	WA
Company Creek	Hydro	0.2		Company Cr.	Chelan	WA
Condit	Hydro	14.7	1913	White Salmon R.	Klickitat	WA
Coos County MSW	MSW		1986		Coos	OR
COPCO 1	Hydro	20.0		Klamath R.	Siskiyou	CA
COPCO 2	Hydro	27.0		Klamath R.	Siskiyou	CA
Corra Linn	Hydro			Kootenay R. (Kootenay L.)		BC
Cougar	Hydro	25.0	1964	McKenzie R.	Lane	OR

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Cove	Hydro	0.0	1917	Bear R.	Caribou	ID
Cowiche Hydroelectric Project	Hydro	1.5	1986	Tieton R.	Yakima	WA
Cowlitz Falls	Hydro	70.2	1994	Cowlitz R.	Lewis	WA
Coyote Springs 1	Natural Gas	237.0	1995	Boardman	Morrow	OR
Coyote Springs 2	Natural Gas	280.0	2002	Boardman	Morrow	OR
Crater Lake Lumber Company	Wood Residue	2.5		Chiloquin	Klamath	OR
Crown Pacific (Formerly Gilchrist)	Wood Residue	1.5		Gilchrist	Klamath	OR
Crystal Mountain	Fuel Oil	2.8	1973	Crystal Mountain Ski Area	Pierce	WA
Cushman 1	Hydro	50.0	1926	Skokomish R. N. Fk.	Mason	WA
Cushman 2	Hydro	81.0	1930	Skokomish R. N. Fk.	Mason	WA
D.R. Johnson - Riddle (Cogen II)	Natural Gas	7.5	1987	Riddle	Douglas	OR
Daishowa	Fuel Oil			Port Angeles	Clallum	WA
DAW (Diamond Int.) Forest Products	Wood Residue	10.0	1960	Bend	Deschutes	OR
Deep Creek	Hydro	0.3	1983	Deep Cr.	Stevens	WA
Denny Creek	Hydro	0.1	1985	Denny Cr.	Klamath	OR
Detroit	Hydro	100.0	1953	N. Fk. Santiam R.	Linn	OR
Dexter	Hydro	15.0	1955	M. Fk. Willamette R.	Lane	OR
Diablo	Hydro	152.8	1936	Skagit R.		WA
Diamond Creek	Hydro	0.0	1988	Diamond Cr.	Whatcom	WA
Dietrich Drop	Hydro	4.8	1988	Milner-Gooding Cnl.		ID
Doug Hull	Hydro	0.3	1983	Twin Falls Cnl Lateral 28		ID
Dry Creek	Hydro	3.6	1987	Dry Cr.	Butte	ID
Dry Creek	Hydro	(0.0)	1980	Dry Cr.		MT
Duncan	Hydro	0.0	1967	Duncan R.		BC
Dworshak	Hydro	400.0	1974	Clearwater R.		ID
Dworshak (Clearwater Hatchery)	Hydro	2.9	2000	N.Fk. Clearwater R.	Clearwater	ID
Eagle Point	Hydro	2.8	1957	Little Butte Cr.	Jackson	OR
East Fork Ditch	Hydro	(2.5)	1994	E. Fk. Weiser R.		ID

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East Side	Hydro	3.2	1924	Klamath R.	Klamath	OR
Eastsound	Fuel Oil	1.3		Eastsound	San Juan	WA
Ebey Hill	Hydro	0.1	1992	Trib to N. Fk Stillaguamish	Snohomish	WA
EBR-II	Uranium			INEL		ID
Edward Hines Lumber	Wood Residue			Westfir	Lane	OR
Electron	Hydro	25.5	1904	Puyallup R.	Pierce	WA
Elk Creek	Hydro	2.3	1984	Elk Cr.	Idaho	ID
Elko	Hydro	12.0	1924	Elk R.		BC
Ellingson Lumber	Wood Residue	(2.8)		Baker City	Baker	OR
Eltopia Branch Canal 4.6	Hydro	2.2	1983	Eltopia Branch Cnl.		WA
Elwha Dam	Hydro	12.0	1913	Elwha R.		WA
Encogen 1-3	Natural Gas	160.0	1993	Bellingham	Whatcom	WA
Eugene/Springfield Wastewater	Wastewater Gas	0.8		Springfield	Lane	OR
Everett Cogeneration Project	Black Liquor	52.2	1995	Everett	Snohomish	WA
Evergreen Forest Products	Wood Residue	6.3	1983	New Meadows	Adams	ID
Fall Creek	Hydro	2.2	1910	Klamath R.	Siskiyou	CA
Fall River	Hydro	9.1	1993	Fall R.	Fremont	ID
Falls Creek	Hydro	0.0	1988	Falls Cr.	Clallum	WA
Falls Creek	Hydro	4.0	1984	Falls Cr.	Linn	OR
Faraday	Hydro	35.9	1907	Clackamas R.	Clackamas	OR
Farmers Irrigation District No. 2 (Copper Dam)	Hydro	3.0	1985	Farmers Ditch	Hood River	OR
Farmers Irrigation District No. 3 (Peters Drive)	Hydro	1.8	1986	Low Line Ditch	Hood River	OR
Faulkner	Hydro	0.9	1987	N. Side Main "Y" Cnl.	Gooding	ID
Felt	Hydro	7.5	1986	Teton R.	Teton	ID
Ferguson Ridge	Hydro	(1.9)	1984	Wallowa Valley Imp. Dist. Cnl.	Wallowa	OR
Fish Creek	Hydro	11.0	1952	Fish Cr.	Douglas	OR
Fisheries Development No. 1	Hydro	0.3	1990	Billingsley Cr.	Gooding	ID
Flint Creek	Hydro	1.1	1901	Georgetown Lk.	Granite	MT

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Flying W	Hydro	0.0	1979	Flying W. Irr. Ditch	Valley	ID
Foot Creek Rim I	Wind	41.4	1999	Arlington	Carbon	WY
Foot Creek Rim II	Wind	1.8	1999	Arlington	Carbon	WY
Foot Creek Rim IV	Wind	16.8	2000	Arlington	Carbon	WY
Ford (Jim Ford Creek)	Hydro	1.5	1987	Jim Ford Cr.	Clearwater	ID
Forgy	Hydro	0.1	1995	Unnamed Spring	Adams	ID
Fort Peck	Hydro	185.3	1943	Missouri R.	Valley/McCone	MT
Foster	Hydro	20.0	1968	S. Fk. Santiam R.	Linn	OR
Frank Bird	Natural Gas	(69.0)	1951	Billings	Yellowstone	MT
Frederickson 1	Natural Gas	85.0	1981	Parkland	Pierce	WA
Frederickson 2	Natural Gas	85.0	1981	Parkland	Pierce	WA
Fredonia 1	Natural Gas	123.6	1984	Burlington	Skagit	WA
Fredonia 2	Natural Gas	123.6	1984	Burlington	Skagit	WA
Galesville	Hydro	1.7	1987	Cow Cr.	Douglas	OR
Gem State	Hydro	22.3	1988	Snake R.	Bingham	ID
Geo-Bon No. 2	Hydro	1.1	1986	Little Wood R.		ID
Georgetown	Hydro	0.5	1985	Georgetown Cr.	Bear Lake	ID
Georgia-Pacific (Bellingham) lcs	Fuel Oil		2001	Bellingham (GP Mill)	Whatcom	WA
Georgia-Pacific (Camas)	Black Liquor	52.0	1995	Camas	Clark	WA
Georgia-Pacific (Lebanon)	Wood Residue	2.0		Lebanon	Linn	OR
Georgia-Pacific (Wauna)	Black Liquor	36.0	1996	Wauna	Clatsop	OR
Gillihan	Hydro	0.0		No Name Cr.	Valley	ID
Glines Canyon	Hydro	12.1		Elwha R.		WA
Goodrich	Hydro	0.1		Goodrich Cr.	Baker	OR
Gorge	Hydro	158.8	1924	Skagit R.		WA
Gorge Energy (SDS Lumber) 1	Wood Residue	3.5	1979	Bingen	Klickitat	WA
Gorge Energy (SDS Lumber) 2	Wood Residue	5.0	1985	Bingen	Klickitat	WA
Grace	Hydro	0.0	1923	Bear R.		ID
Grand Coulee	Hydro	6832.5	1941	Columbia R.		WA

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Grand Coulee (Pumped Storage)	Pmp Storage	314.4	1941	Columbia R.		WA
Grant Village	Fuel Oil	3.0		Yellowstone National Park	Yellowstone N.P.	WY
Great Western Malting	Natural Gas	(20.1)	1983	Vancouver	Clark	WA
Green Peter	Hydro	80.0	1967	M. Fk. Santiam R.	Linn	OR
Green Springs	Hydro	16.0	1960	Keene Cr.	Jackson	OR
Ground Water Pumping Station	Pmp Storage	4.5	1985	Bull Run (Offstream)	Multnomah	OR
Guy Bennett Lumber	Wood Residue			Clarkston	Asotin	WA
Hailey	Hydro	0.1	1985	Indian Cr.		ID
Hauser Lake	Hydro	17.0	1911	Missouri R.		MT
Hazelton A	Hydro	8.7	1990	N. Side Main Cnl.	Jerome	ID
Hazelton B	Hydro	7.6	1993	N. Side Main Cnl.	Jerome	ID
HE 257	Hydro	0.0		Francis Cr.	Douglas	OR
Helena Waste	MSW			Helena	Lewis & Clark	MT
Hellroaring (Big Creek)	Hydro	0.4	1916	Hellroaring Cr.	Lake	MT
Hell's Canyon	Hydro	391.5	1967	Snake R.		ID/OR
Henry M. Jackson (Culmback)	Hydro	111.8	1984	Sultan R.	Snohomish	WA
Hermiston Generating Project 1	Natural Gas	234.5	1996	Hermiston	Umatilla	OR
Hermiston Generating Project 2	Natural Gas	234.5	1996	Hermiston	Umatilla	OR
Hermiston Power Project 1 & 2	Natural Gas	536.0	2002	Hermiston	Umatilla	OR
Hettinger	Hydro	0.0	1960	Smith Cr.	Idaho	ID
Hills Creek	Hydro	30.0	1962	M. Fk. Willamette R.	Lane	OR
Holter	Hydro	38.4	1918	Missouri R.		MT
Hood Street	Hydro	0.9	1990	McMillan Reservoir	Pierce	WA
Horseshoe Bend	Hydro	9.5	1995	Payette R.	Boise	ID
Hugh Keenleyside	Hydro	0.0	1968	Columbia R.		BC
Hungry Horse	Hydro	428.0	1952	Flathead R.		MT
Husky Industries	Wood Residue	5.0	1989	White City	Jackson	OR
Ice Harbor	Hydro	603.0	1961	Snake R.		WA
Idaho Falls (City Plant)	Hydro	8.0	1982	Snake R.	Bonneville	ID

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Idaho Falls Lower	Hydro	11.0	1904	Snake R.	Bonneville	ID
Idaho Falls Upper	Hydro	8.0	1938	Snake R.	Bonneville	ID
Ingram Warm Springs Ranch A	Hydro	0.5	1986	Warm Spring Cr.	Custer	ID
Ingram Warm Springs Ranch B	Hydro	1.1	1986	Warm Spring Cr.	Custer	ID
IPC HQ PV	Solar	0.0	1994	Boise	Ada	ID
Iron Gate	Hydro	18.0		Klamath R.		CA
Island Park	Hydro	4.8	1993	Henrys Fk.	Fremont	ID
ITT Rayonier - Port Angeles	Black Liquor	13.0		Port Angeles	Clallum	WA
ITT Rayonier Greys Harbor Division	Wood Residue	(4.4)		Hoquiam	Grays Harbor	WA
J.E. Corrette	Coal	163.0	1968	Billings	Yellowstone	MT
James E. White (Derr Creek)	Hydro	0.3	1981	Derr Cr.	Bonner	ID
Jim Boyd	Hydro	1.2		Umatilla R.		OR
Jim Bridger 1	Coal	516.7	1974	Point of Rocks	Sweetwater	WY
Jim Bridger 2	Coal	516.7	1975	Point of Rocks	Sweetwater	WY
Jim Bridger 3	Coal	516.7	1976	Point of Rocks	Sweetwater	WY
Jim Bridger 4	Coal	516.7	1979	Point of Rocks	Sweetwater	WY
Jim Knight	Hydro	0.3	1984	S. Gooding Main Cnl.		ID
John C. Boyle	Hydro	80.0	1958	Klamath R.	Klamath	OR
John Day	Hydro	2160.0	1968	Columbia R.		OR/WA
John H. Koyle	Hydro	1.4	1983	Big Wood R.		ID
Kasel-Witherspoon	Hydro	1.4	1983	Snake R., Trib.		ID
Kaster Riverview	Hydro	0.4	1983	Box Canyon Spr.		ID
Kerr	Hydro	180.0	1938	Flathead R.		MT
Kettle Falls Generating Station	Wood Residue	57.0	1983	Kettle Falls	Stevens	WA
Kinzua	Wood Residue	10.0	1985	Heppner	Morrow	OR
Klamath Cogeneration Project	Natural Gas	484.0	2001	Klamath Falls	Klamath	OR
Koma Kulshan	Hydro	12.0	1990	Rocky Cr.		WA
Kootenay Canal	Hydro	559.0	1976	Kootenay Canal		BC
Lacomb	Hydro	1.0	1986	Lacomb Irr. Cnl.	Linn	OR

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LaGrande	Hydro	65.0	1912	Nisqually R.		WA
Lake	Fuel Oil	2.7	1967	Yellowstone National Park	Yellowstone N.P.	WY
Lake Creek A	Hydro	1.0	1917	Lake Cr.	Lincoln	MT
Lake Creek B	Hydro	3.5	1917	Lake Cr.	Lincoln	MT
Lake Creek No 1	Hydro	0.1	1984	Lake Cr.	Josephine	OR
Lake Oswego	Hydro	0.5	1910	Oswego Cr.	Clackamas	OR
Lane Plywood	Wood Residue	1.0	1982	Eugene	Lane	OR
Last Chance Canal	Hydro	1.7	1982	Bear R.		ID
Lateral No. 10	Hydro	2.9	1985	Lateral No. 10 Cnl.	Twin Falls	ID
Leaburg Dam	Hydro	15.0	1930	McKenzie R.	Lane	OR
Leishman Irrigation System	Hydro	0.0	1987	Irr. Collection System	Kittitas	WA
Lemolo 1	Hydro	29.0	1955	N. Umpqua R.	Douglas	OR
Lemolo 2	Hydro	33.0	1956	N. Umpqua R.	Douglas	OR
Lemoyne	Hydro	0.0	1985	Conyers Ditch	Gooding	ID
Libby	Hydro	525.0	1975	Kootenai R.		MT
Lilliwaup Falls	Hydro	1.8	1983	Lilliwaup Cr.	Mason	WA
Little Butte Ranch	Hydro	0.0		Little Butte Cr., N. Fk.	Jackson	OR
Little Falls	Hydro	32.0	1910	Spokane R.		WA
Little Gold	Hydro	0.5	1983	Little Gold Cr.	Granite	MT
Little Goose	Hydro	810.0	1970	Snake R.		WA
Little Mac	Hydro	1.6	1984	Cedar Draw	Twin Falls	ID
Little Wood R Ranch	Hydro	1.9	1986	Little Wood R.		ID
Little Wood Reservoir	Hydro	1.0	1988	Little Wood R.		ID
Long Lake	Hydro	71.0	1914	Spokane R.		WA
Longview Fibre - CR & Pwr Boilers 1-7	Black Liquor	72.0	1966	Longview	Cowlitz	WA
Longview Fibre - CT	Natural Gas	65.0	1995	Longview	Cowlitz	WA
Lookout Point	Hydro	120.0	1954	M. Fk. Willamette R.	Lane	OR
Lost Creek	Hydro	49.0	1977	Rogue R.	Jackson	OR
LOTT Wastewater	Wastewater Gas	0.5	1993	Olympia	Thurston	WA

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Louisiana-Pacific	Wood Residue	6.2		Missoula	Missoula	MT
Low Line Canal Drop	Hydro	8.0	1984	Low Line Cnl.	Twin Falls	ID
Lower Baker	Hydro	71.4	1925	Baker R.	Skagit	WA
Lower Bonnington	Hydro			Kootenay R.		BC
Lower Granite	Hydro	810.0	1975	Snake R.		WA
Lower Low Line No. 2	Hydro	2.8	1988	Low Line Cnl.	Twin Falls	ID
Lower Malad	Hydro	13.5	1905	Big Wood R.	Gooding	ID
Lower Monumental	Hydro	810.0	1969	Snake R.		WA
Lower Salmon Falls	Hydro	60.0	1910	Snake R.	Gooding	ID
LQ-LS Drains	Hydro	1.8	1984	LS Drain & LQ Drain	Twin Falls	ID
Lucky Peak	Hydro	101.3	1988	Boise R.		ID
Macks Creek	Hydro	0.0	1984	Macks Cr.	Boise	ID
Madison	Hydro	8.6	1907	Madison R.		MT
Magic Dam	Hydro	9.0	1989	Big Wood R.	Blaine	ID
Magic Valley	Natural Gas	10.0	1996	Rupert	Minidoka	ID
Magic West	Natural Gas	10.0	1996	Glens Ferry	Elmore	ID
Main Canal Headworks	Hydro	26.0	1986	Main Cnl.		WA
March Point 1	Refinery Gas	80.0	1991	Anacortes	Skagit	WA
March Point 2	Refinery Gas	60.0	1993	Anacortes	Skagit	WA
Marion Co. Resource Recovery	MSW	14.0	1986	Salem	Marion	OR
Marion Investment	Hydro	0.9		N. Santiam R.		OR
Marsh Valley	Hydro	1.7		Portneuf Marsh Valley Cnl.	Bannock	ID
Mayfield Dam	Hydro	162.0	1963	Cowlitz R.		WA
McKenzie	Hydro	4.0		McKenzie R.	Lane	OR
McNary	Hydro	980.0	1953	Columbia R.		OR/WA
McNary Dam Fish Attraction	Hydro	7.0	1997	Columbia R.	Benton	WA
Medford Wastewater	Wastewater Gas	0.7		Medford	Jackson	OR
Medite Corp.	Wood Residue	1.0		Medford	Jackson	OR
Merwin (Ariel dam)	Hydro	136.0	1931	Lewis R.		WA

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Meyers Falls	Hydro	1.2	1915	Colville R.	Stevens	WA
Mica	Hydro	1792.0	1977	Columbia R.		BC
Middle Fork Irrigation District 1	Hydro	0.6	1987	W. Evans Cr.	Hood River	OR
Middle Fork Irrigation District 2	Hydro	0.6	1987	Irr. Conduit	Hood River	OR
Middle Fork Irrigation District 3	Hydro	2.1	1987	Clear Branch	Hood River	OR
Mile 28	Hydro	1.8	1994	Milner-Gooding Cnl.	Jerome	ID
Mill Creek	Hydro	1.0	1984	Mill Cr.	Union	OR
Mill Creek	Hydro	0.6	1983	Mill Cr.		WA
Milltown	Hydro	4.0	1906	Clark Fork R.		MT
Milner A	Hydro	58.6	1993	Twin Falls Main Cnl.	Twin Falls	ID
Milner B	Hydro	0.8	1993	N. Side Main Cnl.	Twin Falls	ID
Minidoka	Hydro	27.6	1909	Snake R.	Minidoka	ID
Minikahda	Hydro	0.1		Minikahda Cr.	Clackamas	OR
Mink Creek	Hydro	3.1	1988	Mink Cr.	Franklin	ID
Mirror Lake	Hydro	1.0	1985	Nooksack R., M. Fk.		WA
Mitchell Butte	Hydro	1.9	1989	Mitchell Butte Lateral	Malheur	OR
Monroe Street	Hydro	14.8	1890	Spokane R.		WA
Montana One	Coal	43.7	1991	Colstrip	Rosebud	MT
Moroney	Hydro	45.0	1930	Missouri R.		MT
Morse Creek	Hydro	0.5	1988	Morse Cr.	Clallum	WA
Mossyrock	Hydro	300.0	1905	Cowlitz R.		WA
Mountain Home AFB PV	Solar	0.1	1995	Grasmere	Owyhee	ID
Moyie Falls 2 (Lower)	Hydro	0.2	1941	Moyie R.	Boundary	ID
Moyie Falls 1 (Upper)	Hydro	0.5	1921	Moyie R.	Boundary	ID
Moyie River	Hydro	1.5	1982	Moyie R.	Boundary	ID
Mt. Tabor	Hydro	0.2	1985	Mt. Tabor Res. No. 5	Multnomah	OR
Mud Creek A	Hydro	0.4	1982	Mud Cr.	Twin Falls	ID
Mud Creek B	Hydro	0.2	1982	Present Ditch	Twin Falls	ID
Mystic Lake	Hydro	10.0	1925	W. Rosebud Cr.	Stillwater	MT

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N-32 (Northside Canal)	Hydro	0.6	1985	N. 32 Lateral Cnl.		ID
Naches	Hydro	6.4	1909	Wapato Cnl.	Yakima	WA
Naches Drop	Hydro	1.4	1914	Naches R.	Yakima	WA
Newhalem Creek	Hydro	2.1	1921	Newhalem Cr.	Whatcom	WA
Nichols Gap	Hydro	0.9	1986	Nichols Branch, Trib.	Jackson	OR
Nicholson	Hydro	0.5	1986	Uncle Ike Cr.	Butte	ID
Nine Mile	Hydro	26.4	1908	Spokane R.		WA
Nooksack	Hydro	1.5	1906	N. Fk. Nooksack R.	Whatcom	WA
North Fork	Hydro	40.8	1958	Clackamas R.		OR
North Fork Sprague River	Hydro	1.2	1989	Sprague R., N. Fk.	Klamath	OR
North Powder	Wood Residue	7.0	1985	North Powder	Baker	OR
North Side	Landfill Gas	0.9	1998	North Side Landfill	Spokane	WA
North Willow Creek	Hydro	0.4	1988	N. Willow Cr.	Madison	MT
Northeast 1 & 2	Natural Gas	61.2	1978	Spokane	Spokane	WA
Noxon Rapids	Hydro	466.2	1960	Clark Fork R.		MT
O.J. Power Company	Hydro	0.2	1986	Mill Cr.	Oneida	ID
Oak Grove (Three Lynx, Timothy)	Hydro	40.8	1924	Clackamas R., Oak Grove Fk.		OR
Ochoco Lumber Company	Wood Residue			Prineville	Crook	OR
Odell Creek	Hydro	0.2	1984	Odell Cr.	Hood River	OR
Old Faithful 1	Fuel Oil	1.0	1979	Yellowstone National Park	Yellowstone N.P.	WY
Old Faithful 2	Fuel Oil	1.0	1979	Yellowstone National Park	Yellowstone N.P.	WY
Oneida Narrows	Hydro	30.0	1915	Bear R.		ID
Opal Springs	Hydro	4.3	1920	Crooked R.		OR
Orchard Avenue	Hydro	1.4	1986	Tieton R.		WA
Oregon City	Hydro	1.5		Willamette R.		OR
Owyhee Dam	Hydro	4.3	1985	Owyhee R.		OR
Owyhee Tunnel No. 1	Hydro	8.0	1993	Owyhee Lk.		OR
Oxbow	Hydro	190.0	1961	Snake R.		ID/OR

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Packwood Lake	Hydro	26.1	1964	Lake Cr.	Lewis	WA
Palisades	Hydro	118.8	1957	Snake R.	Bonneville	ID
Paris	Hydro	0.7	1910	Weilenmann Cnl.	Bear Lake	ID
Pelton	Hydro	97.2	1957	Deschutes R.	Jefferson	OR
Pelton Reregulation Dam	Hydro	18.9		Deschutes R.	Jefferson	OR
Philips Ranch	Hydro					
Philipsburg A	Hydro	0.1	1981	Fred Burr Cr.(Off-stream)	Granite	MT
Philipsburg B	Hydro	0.1	1981	Fred Burr Cr.	Granite	MT
Pine Creek	Hydro	0.4	1975	Pine Cr.	Park	MT
Pine Products Corporation	Wood Residue	5.7	1989	Prineville	Crook	OR
Pocatello Wastewater	Wastewater Gas	0.1	1985	Pocatello		ID
Point Whitehorn 1	Fuel Oil	(61.0)	1974	Ferndale	Whatcom	WA
Point Whitehorn 2	Natural Gas	85.0	1981	Ferndale	Whatcom	WA
Point Whitehorn 3	Natural Gas	85.0	1981	Ferndale	Whatcom	WA
Ponds Lodge	Hydro	0.3	1936	Buffalo R. (Henry's Fk. Snake)	Fremont	ID
Port Townsend Paper 2	Black Liquor	3.5	1929	Port Townsend	Clallum	WA
Port Townsend Paper 4	Black Liquor	3.5	1929	Port Townsend	Clallum	WA
Port Townsend Paper 5	Black Liquor	7.5	1986	Port Townsend	Clallum	WA
Port Townsend Paper 6	Hydro	0.4	1982	Big Quilcene R.	Clallum	WA
Portneuf River	Hydro	0.9	1993	Portneuf R.	Bannock	ID
Post Falls	Hydro	14.8	1906	Spokane R.	Kootenai	ID
Potholes East Canal 66.0	Hydro	2.4	1985	Potholes E. Cnl.	Franklin	WA
Potholes East Canal Headworks	Hydro	6.5	1990	Potholes E. Cnl.	Grant	WA
Potlatch - Lewiston 1	Black Liquor	10.0	1950	Lewiston	Nez Pierce	ID
Potlatch - Lewiston 2	Black Liquor	9.2	1977	Lewiston	Nez Pierce	ID
Potlatch - Lewiston 3	Black Liquor	28.8	1981	Lewiston	Nez Pierce	ID
Potlatch - Lewiston 4	Black Liquor	65.0	1991	Lewiston	Nez Pierce	ID
Powerdale	Hydro	6.0	1923	Hood R.	Hood River	OR

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Prairie Wood Products (Cogen I)	Natural Gas	7.5	1986	Prairie City	Grant	OR
Preston	Hydro	0.4	1987	Berquist Spr.	Franklin	ID
Priest Rapids	Hydro	855.0	1959	Columbia R.	Grant	WA
Pristine Springs	Hydro	0.1		Well	Gooding	ID
Prospect 1	Hydro	3.8	1912	Rogue R. (Off-stream)	Jackson	OR
Prospect 2	Hydro	32.0	1920	Rogue R.	Jackson	OR
Prospect 3	Hydro	7.2	1932	Rogue R., S. Fk.	Jackson	OR
Prospect 4	Hydro	1.0	1944	Rogue R. (Off-stream)	Jackson	OR
Quality Veneer & Lumber 1 (Omack Wood Products)	Wood Residue	5.0	1974	Omak	Okanogan	WA
Quality Veneer & Lumber 2 (Omack Wood Products)	Wood Residue	7.5	1974	Omak	Okanogan	WA
Quincy Chute	Hydro	7.8	1984	West Cnl.	Grant	WA
Rainbow	Hydro	36.5	1910	Missouri R.	Cascade	MT
Rathdrum 1	Natural Gas	83.5	1995	Rathdrum	Kootenai	ID
Rathdrum 2	Natural Gas	83.5	1995	Rathdrum	Kootenai	ID
Rathdrum Power Project	Natural Gas	270.0	2001	Rathdrum	Kootenai	ID
Rayonier (ex Wood Power, Inc.)	Wood Residue	(6.8)	1983	Plummer	Benewah	ID
Reeder Gulch	Hydro	0.8	1985	Ashland Cr.	Jackson	OR
Revelstoke	Hydro	1980.0	1984	Columbia R.		BC
Reynolds Irrigation District	Hydro	0.4	1985	Reynolds ID Main Cnl.	Owyhee	ID
Richland Sewer	Wastewater Gas			Richland	Benton	WA
Rim View	Hydro	0.3	2000	Niagara Springs	Gooding	ID
River Mill	Hydro	19.1	1911	Clackamas R.	Clackamas	OR
River Road	Natural Gas	248.0	1997	Vancouver	Clark	WA
Rock Creek	Hydro	0.8	1905	Rock Cr.	Baker	OR
Rock Creek #1	Hydro	2.5	1983	Rock Cr.	Twin Falls	ID
Rock Creek #2	Hydro	1.9	1988	Rock Cr.	Twin Falls	ID
Rock Creek Wastewater	Wastewater Gas	0.3		Hillsboro	Washington	OR
Rock Island	Hydro	622.5	1933	Columbia R.	Chelan	WA
Rocky Brook	Hydro	1.2	1985	Rocky Brook	Jefferson	WA

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Rocky Reach	Hydro	1213.2	1961	Columbia R.	Chelan	WA
Roosevelt Landfill	Landfill Gas	8.4	1999	Roosevelt (Allied Landfill)	Klickitat	WA
Roseburg Forest Products - Dillard	Natural Gas	45.0	1955	Dillard	Douglas	OR
Ross	Hydro	338.6	1952	Skagit R.	Whatcom	WA
Ross Creek	Hydro	0.5	1996	Ross Cr.	Gallatin	MT
Round Butte	Hydro	300.0	1964	Deschutes R.	Jefferson	OR
Roza	Hydro	11.3	1958	Yakima R.	Kittitas	WA
Russell D. Smith	Hydro	6.1	1982	Potholes E. Cnl.	Adams	WA
Ryan	Hydro	48.0	1916	Missouri R.	Cascade	MT
Sagebrush	Hydro	0.3	1985	S. Gooding Main Cnl.	Lincoln	ID
Salmon 1	Fuel Oil	2.8	1967	Salmon	Lemhi	ID
Salmon 2	Fuel Oil	2.8	1967	Salmon	Lemhi	ID
Savage Rapids Diversion	Hydro	1.3	1955	Rogue R.	Jackson	OR
Schaffner	Hydro	0.5	1986	Sandy Cr., W. Fk.	Lemhi	ID
Seven Mile	Hydro	594.0	1979	Pend d'Oreille R.		BC
Sharrott Creek	Hydro	(0.1)		Sharrott Cr.	Ravalli	MT
Shingle Creek	Hydro	0.2	1984	Shingle Cr., S. Fk.	Idaho	ID
Short Mountain	Landfill Gas	3.2	1992	Short Mtn. Landfill	Lane	OR
Shoshone	Hydro	0.9	1982	Little Wood R.		ID
Shoshone Falls	Hydro	12.5	1907	Snake R.	Jerome	ID
Shuffleton 1	Fuel Oil	(35.1)	1930	Renton	King	WA
Shuffleton 2	Fuel Oil	(35.1)	1930	Renton	King	WA
Simplot Pocatello	Natural Gas	15.9	1986	Pocatello	Power	ID
Skagit County Resource Recovery	MSW	(2.5)	1988	Mt. Vernon	Skagit	WA
Skookumchuck	Hydro	1.0	1990	Skookumchuck R.		WA
Skyview Ranch Power	Hydro	(0.0)	1983	Euchre Cr.	Curry	OR
Slaughterhouse Gulch	Hydro	(0.1)	1983	Slaughterhouse Gulch	Twin Falls	ID
Slide Creek	Hydro	18.0	1951	N. Umpqua R.	Douglas	OR
Smith Creek	Hydro	0.1		Smith Cr.	Whatcom	WA

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Smith Creek	Hydro	37.8	1990	Smith Cr.	Boundary	ID
Smurfit Newsprint	Natural Gas	15.0		Oregon City	Clackamas	OR
Snake River Pottery	Hydro	0.1	1984	Snake R. Trib.		ID
Snedigar Ranch	Hydro	0.2	1985	Coulee Cr.	Twin Falls	ID
Snoqualmie Falls 1	Hydro	11.9	1898	Snoqualmie R.	King	WA
Snoqualmie Falls 2	Hydro	30.1	1910	Snoqualmie R.	King	WA
Snow Mountain Pine	Wood Residue	(8.0)		Hines	Harney	OR
Soda Creek 4	Hydro	0.5	1988	Soda Creek	Caribou	ID
Soda Creek 5	Hydro	0.4	1988	Soda Creek	Caribou	ID
Soda Point Reservoir	Hydro	14.0	1925	Bear R.		ID
Soda Springs Dam	Hydro	11.0	1952	N. Umpqua R.	Douglas	OR
South Dry Creek	Hydro	1.8	1985	Rock Cr., Clear Cr. Ditch	Carbon	MT
South Fork Tolt	Hydro	16.7	1995	S. Fk. Tolt R.	King	WA
South Slocan	Hydro			Kootenay R.		BC
South Whidbey	Fuel Oil	(27.0)	1972	Langley	Island	WA
South Willow Creek A	Hydro	0.0	1986	Potosi Cr.	Madison	MT
South Willow Creek B	Hydro	0.3	1980	South Willow Cr.	Madison	MT
SP Newsprint	Natural Gas	40.0		Newberg	Yamhill	OR
Spencer Lake Hydro	Hydro	0.0	1983	Unnamed Outlet to Spencer Lk.	San Juan	WA
Spillimacheen	Hydro	4.0	1955	Spillimacheen R.		BC
Spokane MSW	MSW	23.0	1991	Airway Heights	Spokane	WA
Spokane Wastewater	Wastewater Gas	0.3		Spokane	Spokane	WA
Spring Creek	Hydro	0.0	1991	Spring Cr.	Klickitat	WA
Springfield ICs	Fuel Oil	26.7	2001	Springfield	Lane	OR
St Regis	Wood Residue	4.0		Klickitat	Klickitat	WA
St. Anthony	Hydro	0.5	1915	Henrys Fk.		ID
Stateline Phase 1	Wind	200.0	2001	Vansycle Ridge	Walla Walla	WA
Stayton	Hydro	(0.6)		Santiam Wtr. Cntrl. Dist. Cnl.	Marion	OR

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Steam Plant No. 2	MSW	38.0	1989	Tacoma	Pierce	WA
Stevenson No. 1	Hydro	0.1	1979	Snake R. Trib.	Gooding	ID
Stevenson No. 2	Hydro	0.1	1980	Snake R. Trib.	Gooding	ID
Stone Container Corp.	Black Liquor	10.9	1990	Missoula	Missoula	MT
Stone Creek	Hydro	12.0	1993	Clackamas R., Oak Grove Fk.	Clackamas	OR
Strawberry	Hydro	1.5	1951	Strawberry Cr.	Lincoln	WY
Strawberry Creek	Hydro	0.3	1987	Strawberry Cr.	Park	MT
Sumas Energy	Natural Gas	123.0	1993	Sumas	Whatcom	WA
Summer Falls	Hydro	92.0	1984	Main Cnl.		WA
Summit 1	Fuel Oil	(3.0)	1967	Government Camp	Clackamas	OR
Summit 2	Fuel Oil	(3.0)	1967	Government Camp	Clackamas	OR
Sunshine	Hydro	0.1	1987	Lake Cr.	Lemhi	ID
Swan Falls	Hydro	25.0	1910	Snake R.	Ada	ID
Swift 1	Hydro	240.0	1958	Lewis R.	Skamania	WA
Swift 2	Hydro	70.0	1958	Lewis R.	Cowlitz	WA
Swift Lower	Hydro	0.8		Swift Cr.	Lincoln	WY
Swift Upper	Hydro	0.8		Swift Cr.	Lincoln	WY
Sygitowicz Creek	Hydro	0.5	1986	Sygitowicz Cr.	Whatcom	WA
T.W. Sullivan	Hydro	15.3	1985	Willamette R.	Clackamas	OR
Tacoma Landfill	Landfill Gas	1.9	1998	Fircrest	Pierce	WA
Tacoma Power ICs	Fuel Oil	48.0	2001	Tacoma (Northeast Sub)	Pierce	WA
Telford	Hydro	0.2	1984	Bell Mountain Cr.	Butte	ID
Tenaska Washington I	Natural Gas	245.0	1994	Ferndale	Whatcom	WA
The Dalles	Hydro	1807.0	1957	Columbia R.		OR/WA
The Dalles North Fishway	Hydro	4.9	1991	Columbia R.	Klickitat	WA
Thompson Falls	Hydro	50.0	1915	Clark Fork R.		MT
Thompson's Mills	Hydro	0.1	1986	Calapooia R.	Linn	OR
Thousand Springs	Hydro	8.8	1912	Snake R. (Off-stream)	Gooding	ID

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Tillamook Lumber	Wood Residue	12.5	1978	Tillamook	Tillamook	OR
Toketee Falls Dam	Hydro	42.6	1950	N. Umpqua R.	Douglas	OR
Trail Bridge	Hydro	10.0	1963	McKenzie R.		OR
Trinity	Hydro	0.2	1923	Phelps Cr.		WA
Trojan	Uranium	(1216.0)	1975	Rainier	Columbia	OR
Troy	Wood Residue	2.1		Troy	Lincoln	MT
Tuttle Ranch	Hydro	1.1	1983	Big Wood R.	Gooding	ID
Twin Falls	Hydro	20.0	1990	Snoqualamie R., S. Fk.		WA
Twin Falls A & B	Hydro	52.7	1935	Snake R.	Twin Falls	ID
Twin Reservoirs	Hydro	2.1	1988	Mill Cr.		WA
University of Oregon	Wood Residue	5.5		Eugene	Lane	OR
University of Washington	Natural Gas	5.0		Seattle	King	WA
Upper Baker	Hydro	90.7	1959	Baker R.		WA
Upper Bonnington	Hydro			Kootenay R.		BC
Upper Falls	Hydro	10.0	1922	Spokane R.		WA
Upper Indian Creek	Hydro	(0.1)	1984	Indian Cr.	Union	OR
Upper Little Sheep Creek	Hydro	(4.3)	1984	Wallowa Valley Imp. Dist. Cnl.	Wallowa	OR
Upper Malad	Hydro	7.2	1948	Big Wood R.	Gooding	ID
Upper Pine Creek	Hydro	0.0	1985	Pine Cr.	Lincoln	MT
Upper Salmon 1 & 2 (A)	Hydro	18.0	1937	Snake R.	Twin Falls	ID
Upper Salmon 3 & 4 (B)	Hydro	16.6	1947	Snake R.	Twin Falls	ID
Upriver Dam A & B	Hydro	14.6	1983	Spokane R.		WA
Vaagen Brothers Lumber	Wood Residue	4.0	1980	Colville	Stevens	WA
Valmy 1	Coal	254.0	1981	Valmy	Humboldt	NV
Valmy 2	Coal	267.0	1985	Valmy	Humboldt	NV
Vansycle Wind Energy Project	Wind	24.9	1998	Helix	Umatilla	OR
W. I. Forest Products	Wood Residue	2.4		Peshastin	Chelan	WA
Wallowa Falls	Hydro	1.1	1921	Wallowa Cr., E. Fk.	Wallowa	OR
Walter Hardman (Coursier)	Hydro	8.0		Cranberry Cr.		BC

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Walterville	Hydro	8.0	1911	McKenzie R.	Lane	OR
Wanapum	Hydro	900.0	1963	Columbia R.	Grant	WA
Waneta	Hydro	386.0	1954	Pend d'Oreille R.		BC
Wapato Drop 2	Hydro	2.0	1942	Yakima R. (Off-stream)	Yakima	WA
Wapato Drop 3	Hydro	1.4	1932	Yakima R. (Off-stream)	Yakima	WA
Warm Springs Forest Products	Wood Residue	9.0	1960	Warm Springs	Wasco	OR
Warren	Hydro	0.0	1953	Slaughter Cr.	Idaho	ID
Washington State University	Coal	2.5		Pullman	Whitman	WA
Water Street	Hydro	0.2	1985	Stayton Power Cnl.	Marion	OR
Weeks Falls	Hydro	5.3	1985	Snoqualamie R., S. Fk.	King	WA
Wells	Hydro	774.3	1967	Columbia R.	Douglas	WA
West Boise Wastewater	Wastewater Gas	0.2	1991	Boise	Ada	ID
West Linn	Hydro	(3.6)		Willamette R.	Clackamas	OR
West Linn Paper Co.	Natural Gas			West Linn	Clackamas	OR
West Point Treatment Plant 1-3	Wastewater Gas	3.9	1982	Seattle	King	WA
West Side	Hydro	0.6	1908	Klamath R.	Klamath	OR
Weyerhaeuser (Everett)	Black Liquor	(12.5)		Everett	Snohomish	WA
Weyerhaeuser (Longview) 2	Black Liquor	5.0	1948	Longview	Cowlitz	WA
Weyerhaeuser (Longview) 4	Black Liquor	15.0	1954	Longview	Cowlitz	WA
Weyerhaeuser (Longview) 5	Coal	31.4	1976	Longview	Cowlitz	WA
Weyerhaeuser (Cosmopolis) 1	Fuel Oil	7.5	1957	Cosmopolis	Grays Harbor	WA
Weyerhaeuser (Cosmopolis) 2	Fuel Oil	7.5	1957	Cosmopolis	Grays Harbor	WA
Weyerhaeuser - North Bend	Wood Residue	(4.0)		Cottage Grove	Lane	OR
Weyerhaeuser - Cottage Grove	Wood Residue	4.0		Cottage Grove	Lane	OR
Weyerhaeuser (Springfield) 1	Black Liquor	7.5		Springfield	Lane	OR
Weyerhaeuser (Springfield) 2	Black Liquor	5.0	1949	Springfield	Lane	OR
Weyerhaeuser (Springfield) 3	Black Liquor	12.5	1953	Springfield	Lane	OR
Weyerhaeuser (Springfield) 4 (EWEB/WEYCO)	Black Liquor	51.2	1975	Springfield	Lane	OR
Whatcom Co. MSW	MSW	2.0	1986	Ferndale	Whatcom	WA

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Whatshan	Hydro	54.0	1972	Whatshan R.		BC
White Ranch	Hydro	0.3	1986	Mud Cr.	Twin Falls	ID
White River	Hydro	70.0	1912	Lake Tapps Flume	Pierce	WA
White Water Ranch A	Hydro	0.0	1985	Stoddard Cr.	Gooding	ID
White Water Ranch C	Hydro	0.1	1985	Stoddard Cr.	Gooding	ID
Whitefish	Hydro	0.2	1985	Haskill Cr., Trib.	Flathead	MT
Willamette Industries - Albany	Natural Gas	51.0	1995	Albany	Linn	OR
Willamette Industries - Dallas	Wood Residue	4.5		Dallas	Polk	OR
Willamette Industries - Foster	Wood Residue	4.5		Foster	Linn	OR
Willamette Industries - Sweet Home	Wood Residue	(6.0)		Sweet Home	Linn	OR
Willamette Steam 2 & 3	Natural Gas	25.0	1960	Eugene	Lane	OR
Willow Lake Wastewater	Wastewater Gas	0.8		Salem	Marion	OR
Wilson Lake	Hydro	8.4	1993	N. Side Main Cnl.	Jerome	ID
Winchester	Hydro	(1.3)	1983	N. Umqua R.		OR
Wisconsin-Noble	Hydro	0.5	1989	Noble Fk.	Madison	MT
Wolf Creek	Hydro	0.1	1987	Wolf Cr. (Off-stream)	Washington	OR
Wood River	Natural Gas	(50.0)	1974	Hailey	Blaine	ID
Woods Creek	Hydro	0.7	1982	Woods Cr., E. Fk.	Snohomish	WA
WTD Industries	Wood Residue	(6.0)		Chemult	Klamath	OR
Wynoochee	Hydro	12.8	1993	Wynooche R.	Grays Harbor	WA
Y-8 Hydroelectric Project (Northside Canal)	Hydro	0.1	1983	N. Side Main "Y" Cnl.	Gooding	ID
Yale	Hydro	134.0	1953	Lewis R.	Clark	WA
Yellowtail	Hydro	250.0	1966	Bighorn R.	Big Horn	MT
Yelm	Hydro	12.0	1930	Nisqually R.	Thurston	WA
Zena Creek Ranch	Hydro	0.0	1952	Zena Cr.	Valley	ID

**Table B: PROPOSED POWER PLANTS IN THE PACIFIC NORTHWEST (April 2001)**

<i>PROJECT</i>	<i>PRIMARY RESOURCE</i>	<i>INSTALLED CAPACITY</i>	<i>SERVICE DATE</i>	<i>STATE</i>
IDA WEST	Natural Gas	250	Jan-04	ID
KOOTENAI	Natural Gas	1300	Jun-05	ID
RATHDRUM I	Natural Gas	265	Aug-01	ID
RATHDRUM II	Natural Gas	500	Dec-04	ID
RATHDRUM III	Natural Gas	500	Dec-04	ID
RATHDRUM IV	Natural Gas	310	Dec-04	ID
BLK FEET (MERCHANT)	Natural Gas	160		MT
SILVER BOW	Natural Gas	400	Jun-03	MT
COBERG	Natural Gas	265	Aug-03	OR
COYOTE SPRINGS II	Natural Gas	260	Jun-02	OR
HERMISTON POWER PROJECT	Natural Gas	536	Sep-02	OR
KLAMATH	Natural Gas	200-250	May-01	OR
KLAMATH COGEN PROJECT	Natural Gas	500	May-01	OR
KLAMATH COGEN PROJECT	Natural Gas	50	Mar-02	OR
KLAMATH COUNTY	Natural Gas	450	Jun-04	OR
MADRAS, (at N. Grisely)	Natural Gas	1100	Jul-04	OR
MCNARY	Natural Gas	500	Jun-05	OR
UMATILLA @ McNary	Natural Gas	1000	Sep-03	OR
PORT WESTWARD	Natural Gas	330-660	Jan-04	OR
ST HELENS (Boise Cascade)	Natural Gas	170	Oct-01	OR
CLATSKANIE	Natural Gas	520	Nov-03	OR
TROUTDALE	Natural Gas	1100	Jun-04	OR
UMATILLA GENERATING PROJECT	Natural Gas	581	Dec-03	OR
WARM SPRINGS	Natural Gas	500		OR
ALCOA	Natural Gas	100	Jan-01	WA
ALCOA	Natural Gas	600	Jun-05	WA
CHERRY POINT	Natural Gas	700-1000	Feb-04	WA
CENTRALIA TRANSALTA	Natural Gas	248	Jun-01	WA
CHEHALIS GENERATING PROJECT	Natural Gas	660	Nov-03	WA
EVERETT DELTA I & II	Natural Gas	500	Sep-02	WA

<b>PROJECT</b>	<b>PRIMARY RESOURCE</b>	<b>INSTALLED CAPACITY</b>	<b>SERVICE DATE</b>	<b>STATE</b>
INTALCO FERNDALE	Natural Gas	500	Jun-05	WA
FREDRICKSON II	Natural Gas	249	Jan-03	WA
GOLDENDALE (GNA)	Natural Gas	180	Feb-02	WA
GOLDENDALE	Natural Gas	247	Jul-02	WA
GRANT COUNTY	Natural Gas	1300	Jun-05	WA
LONGVIEW GENERATION	Natural Gas	245	Jul-03	WA
LONGVIEW MINT FARM	Natural Gas	245	Jul-03	WA
LONGVIEW MINT FARM #2	Natural Gas	100-200	Feb-02	WA
MT VERNON	Natural Gas	600	Jun-05	WA
MERCER RANCH	Natural Gas	760	Oct-04	WA
NEWPORT GENERATION (Wallula)	Natural Gas	1300	Jul-04	WA
NEWPORT GENERATION (Intalco)	Natural Gas	1300	Jan-05	WA
NORDIC BARGE	Natural Gas	100	Aug-01	WA
SATSOP	Natural Gas	630	Jan-03	WA
SATSOP II & III	Natural Gas	1200	Jan-05	WA
STARBUCK	Natural Gas	1200	Oct-03	WA
SUMAS II	Natural Gas	660	Jan-02	WA

## Appendix F

# PACIFIC COAST SALMON - ENCYCLOPEDIA OF GLOBAL ENVIRONMENTAL CHANGE

**Article by**  
**David Welch<sup>1</sup>**

*The eight species of Pacific salmon (genus *Oncorhynchus*) form one of the most valuable fisheries resources in the world, and have high value to the peoples of the Pacific Rim as an indicator of the health of the natural ecosystem. Pacific salmon are particularly vulnerable to climate change because their complex life histories involve extended periods of life in both the freshwater and marine ecosystem, exposing them to climate disruptions in both habitats.*

*Climatic changes which disrupt the life cycle of Pacific salmon and reduce the chance of successfully breeding are especially serious because in most species adults die after breeding. This makes the persistence of populations dependent on successful completion of the life cycle to a much greater degree than in animals where adults have the opportunity to reproduce more than once. As a result, once sexual maturation starts and salmon begin their long migration back through the sea and up the rivers, events that disrupt breeding success leave no chance for the animals to leave and return to breed the next year. In addition, substantial differences in behavior between populations, such as in the timing of egg development, hatching, and spawning, as well as strong fidelity to the spawning grounds are believed to be inherited and the result of strong selection to their local environment. Such characteristics may be particularly vulnerable to disruption by climate change.*

All species of Pacific salmon begin life as fertilized eggs laid in nests dug out of the gravel or cobble bottoms of lakes and rivers. The embryos then develop over the winter before hatching. Following hatching, the fry emerge from the gravel in the spring. In pink and chum salmon the fry quickly leave freshwater and enter the ocean. In the remainder of the species the young salmon make much more extensive use of the freshwater habitat (rivers and lakes) for one or more years before migrating to the sea.

After entering the ocean, a period of time may be spent in estuaries or near-shore habitats where adaptation to the marine environment is completed and rapid growth begins. Most salmon then begin a rapid and highly directed northwards migration along the narrow continental shelf, where most eventually leave the coastal zone and remain in the open ocean for a period of several years. As sexual maturation begins, salmon begin directed homing migrations over long distances in both the ocean and freshwater. Much less is known of the marine phase of the life history than the freshwater phase, but evidence

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<sup>1</sup> This article, prepared by David Welch, is in press.

accumulated over the past decade suggests that changes in ocean survival have been at least as serious as changes in freshwater survival.

Most growth and approximately half of the mortality occurs in the ocean. As a result, climatic disruptions that happen at any point in the life history can result in severe impacts on survival rates. Freshwater migrations are affected by changes in water temperature, and rate and timing of river flow. Climate change projections generally indicate that winters will be warmer and wetter in future, while summers will be warmer and perhaps drier. With more precipitation falling as rain rather than snow, the spring run-off is expected to occur earlier and be more intense in future, while river flows in summer will probably be warmer and less rapid, providing less moderation of summer temperature extremes. Young fish migrating to sea may be affected by changed timing of river flows, or mismatch with peaks in ocean production. Adult salmon returning to breed may experience strong river flows and high water temperatures that drain their energy reserves to the point that they are unable to reach the spawning grounds. The unusual warming experienced in the 1990s saw much higher mortality of adult salmon returning to many parts of British Columbia's Fraser River. This was apparently a result of high temperature and stream flows increasing the energy demands on migrating adults, while reduced growth at sea resulted in them returning at smaller sizes and with reduced energy reserves than in the past.

In the North Pacific elevated temperatures may ultimately reduce salmon populations by limiting their ocean distribution. All species of Pacific salmon sharply avoid warmer temperatures at sea, effectively limiting them to a substantially smaller area of the open Pacific Ocean that they could otherwise occupy. Global warming models project temperature increases that could exclude several species of salmon from the Pacific Ocean within 50 years at expected rates of greenhouse gas increase. Increasing temperature may also change the structure of the ocean through warming of the surface layer. Warming will increase the temperature contrast with the deep ocean, and may reduce mixing and restrict the input of essential nutrients necessary to fuel the food chain. Such an effect has already been observed in the 1990s, with the thinning of the surface layer resulting in a switch to a nitrate-depleted ecosystem in the Gulf of Alaska for the first time on record.

Several lines of evidence suggest that salmon are strongly adapted to the climate of the relatively recent past. As concentrations of greenhouse gases increase to levels not seen for hundreds of thousands of years, current adaptations may not serve salmon as well in the future. Many critical aspects of the life cycle are completed during brief time periods (for example, timing of egg hatch, ocean entry for young salmon, breeding of adults). It is thought that evolutionary forces strongly selected for individuals with specific characteristics appropriate for each population, and that animals deviating from these characteristics did not survive to pass on different behaviors.

Climate change is unlikely to be favorable for most salmon populations, particularly at the southern end of their range where human populations are high and the value placed on persistence of salmon is greatest. Climate disruption is likely to exacerbate conflicts

with other resource users. Water draw-down to support agriculture and more restrictive land-use regulations on forestry or urban development to protect salmon brings these competing resource sectors into sharp conflict as Pacific salmon populations become less productive. Hydro-electric dams—one of the few energy sources that do not involve generation of greenhouse gases—have also been blamed for affecting salmon populations by changing the natural flow of rivers and affecting the survival of both young and mature salmon migrating past the dams. In addition, many fisheries have either explicit legal entitlements (such as treaty rights granted native fishermen) or implicit claims to the salmon resource based on past access.

Despite these concerns, changes in climate will not be uniformly bad for Pacific salmon. Continued warming, for example, will moderate the harsher climates in northern regions, likely improving conditions for salmon. A few sexually mature Pacific salmon have been reported from the Canadian high arctic in recent years, suggesting that the range of salmon is expanding to the north as climate has warmed. The productivity of many Alaskan salmon populations has also increased over the last few decades as salmon populations in southern regions have fallen. However, it is unlikely that the increased economic gain from the salmon catches in northern regions has outweighed the economic costs from trying to maintain salmon populations in southern regions. At least in North America, recent climate warming has had decidedly mixed effects, and the increasing disparity has resulted in bitter argument over salmon conservation.

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**Appendix F: Pacific Coast Salmon –**  
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*This is a good example of an unfished natural population responding in ocean climate change in the Atlantic– takes the argument out of just the usual Columbia River context.*

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## Appendix G

### HATCHERIES OF THE PACIFIC NORTHWEST (2/2001)

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Abernathy Salmon Culture Tech Center	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Elochoman
Alder Creek Pond	Unknown / Unspecified	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Alsea Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
American Falls Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Upper Snake
Arlington	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Ashton Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Upper Snake
Aumsville Ponds	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Willamette
Baker Lake Spawn Beach	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Bandon Fish Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	S Oregon Coast
Barnaby Slough Pond	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Barnhart Acclimation/ Release Site	Anadromous	Umatilla Confederated Tribes	Major	No	OR	Umatilla
Beaver Creek Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Elochoman
Beaver Slough Rearing Ponds	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Bellingham	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Big Beef Creek Hatchery / Field Station	Anadromous	National Marine Fisheries Service - Seattle Office	Minor	No	WA	Puget Sound Basin

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Big Canyon Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Big Canyon Satellite Facility	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Grande Ronde
Big Creek Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Estuary /Ocean
Big White Salmon Rearing Pond	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	White Salmon
Bingham Creek Hatchery	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Bogachiel	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Bonifer Acclimation Ponds	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Bonneville Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Lower Columbia
Butte Falls Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	S Oregon Coast
Cabinet Gorge Hatchery	Resident Fish	Idaho Department Of Fish & Game	Major	Yes	ID	Clark Fork
Captain John Rapids Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Snake Hells Canyon
Carson National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Wind
Cascade Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Gorge
Catherine Creek Acclimation Site	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Grande Ronde
Catherine Creek Trap	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Grande Ronde
Cedar Creek Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
Cedar Flats Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Cedar River	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Chambers Creek	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Chandler Juvenile Facility	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Cherrylane Tribal Hatchery	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Chewach Trap & Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Methow
Chiwawa Rearing Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Wenatchee
Clackamas Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Clark Flat Acclimation Site	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Clark Fork Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Clark Fork
Clatsop (Cedc) Ponds	Anadromous	Clatsop Economic Development Committee	Minor	Yes	OR	Youngs
Clearwater Hatchery	Mixed Anadromous / Resident Fish	Idaho Department Of Fish & Game	Minor	Yes	ID	Clearwater
Coeur d'Alene Trout Hatchery	Resident Fish	Coeur d'Alene Tribe Of Idaho	Major	Yes	ID	Coeur d'Alene
Cole M. Rivers Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq		No	OR	S Oregon Coast
Columbia Basin Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Crab Creek
Colville Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Upper Columbia
Colville Tribal Hatchery	Resident Fish	Colville Confederated Tribes	Major	Yes	WA	Upper Columbia
Corporation Direct Release Site	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Cottonwood Satellite Facility	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Grande Ronde
Coulter Creek	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Coweeman Ponds	Unknown / Unspecified	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Cowlitz Salmon Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Cowlitz
Cowlitz Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Creston National Fish Hatchery	Resident Fish	Us Fish And Wildlife Service - Portland Region	Major	Yes	MT	Flathead
Crooked River Satellite Facility	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Clearwater
Curl Lake Satellite Facility	Anadromous	Washington Department Of Fish & Wildlife	Major	Yes	WA	Lower Snake
Dayton Pond Satellite Facility	Anadromous	Washington Department Of Fish & Wildlife	Major	Yes	WA	Walla Walla
Dexter Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Dryden Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Wenatchee
Dungeness	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Dworshak National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	ID	Clearwater
Eagle Creek National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	OR	Willamette
Eagle Fish Health Laboratory	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Boise
East Fork Salmon River Satellite Facility	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Salmon
Eastbank Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Upper Mid-Columbia

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Easton Acclimation Site	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Eells Spring	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Elk River Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	S Oregon Coast
Elochoman Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Elochoman
Elwha Channel	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Entiat National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Entiat
Fall Creek Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
Fall River Hatchery	Resident Fish	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Deschutes
Fallert Creek Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Kalama
Flathead Lake Salmon Hatchery	Resident Fish	Montana Department Of Fish & Wildlife - Helena		Yes	MT	Flathead
Ford Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Spokane Lower
Forks Creek Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Fox Island Pens	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Fred Grey Pond	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Garrison	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
George Adams Hatchery	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Gnat Creek Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Estuary /Ocean

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Gobar Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Kalama
Goldendale Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Klickitat
Grace Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Upper Snake
Grays River Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Grays
Green River Hatchery	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Hagerman Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Middle Snake
Hagerman National Fish Hatchery	Mixed Anadromous / Resident Fish	Us Fish And Wildlife Service - Portland Region	Minor	Yes	ID	Middle Snake
Hayden Creek Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Salmon
Hayspur Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Upper Snake
Herman Creek Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Gorge
Hoodsport	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Humptulips	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Hungry Horse Hatchery	Resident Fish	Montana Department Of Fish & Wildlife - Helena		Yes	MT	Flathead
Hupp Spring	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Hurd Creek	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Icy Creek Pond	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Imeqes C Mem Ini Kem Juv Acclim Pond	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Imnaha Satellite Facility	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Imnaha
Irrigon Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Lower Mid-Columbia
Issaquah	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Jack Creek Acclimation Site	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Jocko River Trout Hatchery	Resident Fish	Montana Department Of Fish & Wildlife - Helena		Yes	MT	Flathead
Johnson Creek Hatchery	Anadromous	Nez Perce Tribe	Major	Yes	ID	Salmon
K Basin - Hanford	Anadromous	Yakama Nation	Major	Yes	WA	Lower Mid-Columbia
Kalama Falls Salmon Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Kalama
Kalispel Tribal Hatchery	Resident Fish	Kalispel Tribe Of Indians	Major	Yes	WA	Pend Oreille
Kendall Creek	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Klamath Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq		No	OR	Moyie
Klaskanine Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Estuary /Ocean
Klickitat Salmon Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Klickitat
Klickitat Tribal Hatchery	Anadromous	Yakama Nation	Major	Yes	WA	Klickitat
Kooskia National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	ID	Clearwater
Kootenai Tribal Hatchery	Resident Fish	Kootenai Tribe Of Idaho	Major	Yes	ID	Kootenai
Lake Aberdeen	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Lake Wenatchee Net Pens	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Wenatchee
Lake Whatcom	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Lakewood	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Leaburg Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Leavenworth National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Wenatchee
Lewis River Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Lewis
Little Sheep Creek Satellite Facility	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Imnaha
Little White Salmon National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Little White Salmon
Lookingglass Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Grande Ronde
Lostine Acclimation Site	Anadromous	Nez Perce Tribe	Major	Yes	OR	Grande Ronde
Lower Kalama Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Kalama
Luke's Gulch Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Lyons Ferry Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Major	Yes	WA	Lower Snake
Mackay Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Upper Snake
Magic Valley Hatchery	Mixed Anadromous / Resident Fish	Idaho Department Of Fish & Game	Minor	Yes	ID	Middle Snake
Makah National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region		No	WA	Washington Coast
Marblemount Hatchery	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Marion Drain Fish Hatchery	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Marion Forks Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Mc Call Hatchery	Mixed Anadromous / Resident Fish	Idaho Department Of Fish & Game	Major	Yes	ID	Payette
Mcallister	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Mckenzie Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Mckernan	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Meadow Creek Adult Trapping Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Merwin Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Lewis
Merwin Net Pens	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Lewis
Methow Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Methow
Methow Salmon Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Methow
Minter Creek Hatchery	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Minthorn Springs Acclimation Pond	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Minto Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Willamette
Mission Juvenile Acclimation Pond	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Mossyrock Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Mullen Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Coeur d'Alene

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Murray Springs Trout Hatchery	Resident Fish	Montana Department Of Fish & Wildlife - Helena		Yes	MT	Kootenai
Naches Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Yakima
Nampa Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Middle Snake
Naselle	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Nehalem Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
Nelson Springs Raceway	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Yakima
Nemah	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Newsome Creek Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Nez Perce Tribal Hatchery	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Niagara Springs Hatchery	Anadromous	Idaho Department Of Fish & Game	Minor	Yes	ID	Middle Snake
Niles Springs Ponds	Anadromous	Yakama Nation	Minor	Yes	WA	Yakima
Nisqually Fish Hatchery At Clear Creek	Anadromous	Us Fish And Wildlife Service - Portland Region		No	WA	Puget Sound Basin
North Fork Clackamas Reservoir Net Pens	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Willamette
North Lapwai Valley Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
North Toutle Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
NW Fisheries Science Cntr [Montlake Cr Fish Farm]	Anadromous	National Marine Fisheries Service - Seattle Office		No	WA	Puget Sound Basin
Oak Springs Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Deschutes

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Omak Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Okanogan
Oxbow Hatchery (Snake)	Anadromous	Idaho Department Of Fish & Game		Yes	OR	Middle Snake
Oxbow Springs Hatchery (Columbia)	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Columbia Gorge
Pahsimeroi Hatchery	Anadromous	Idaho Department Of Fish & Game	Minor	Yes	ID	Salmon
Parkdale Fish Facility	Anadromous	Warm Springs Tribes	Major	Yes	OR	Hood
Pelton Dam Fish Ladder (Hatchery)	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Deschutes
Pendleton Ponds Satellite Facility	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Pittsburg Landing Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Snake Hells Canyon
Powell Satellite Facility	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Clearwater
Powerdale Fish Trapping Facility	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Hood
Priest Rapids Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Lower Mid-Columbia
Prosser Dvr Dam / Chandler Canal Fish Trap	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Prosser Dvr Dam Acclimation Ponds	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Puyallup	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Quilcene National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region		Yes	WA	Washington Coast
Quinalt National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region		No	WA	Washington Coast
Rapid River Hatchery	Anadromous	Idaho Department Of Fish & Game	Minor	Yes	ID	Salmon

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Red River Satellite Facility	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Clearwater
Reiter Ponds	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Ringold Springs Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Lower Mid-Columbia
Roaring River Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Rock Creek Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq		No	OR	S Oregon Coast
Rock Creek Pens (32 Mi Abv Jd Dam)	Anadromous	Us Fish And Wildlife Service - Portland Region		Yes	WA	Lower Mid-Columbia
Rocky Reach Hatchery	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Upper Mid-Columbia
Round Butte Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Deschutes
Salmon River Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
Samish	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Sandpoint Hatchery	Resident Fish	Idaho Department Of Fish & Game		Yes	ID	Pend Oreille
Sandy Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Sandy
Satsop Springs	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Sawtooth Hatchery	Mixed Anadromous / Resident Fish	Idaho Department Of Fish & Game	Minor	Yes	ID	Salmon
Shale Creek	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Sherman Creek Hatchery	Resident Fish	Washington Department Of Fish & Wildlife	Major	Yes	WA	Upper Columbia
Similkameen Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Okanogan

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Simpson Hatchery	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Skamania Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Lower Columbia
Skookumchuck	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Social Security Pond/ Net Pens	Anadromous	Us Fish And Wildlife Service - Portland Region		Yes	OR	Lower Mid-Columbia
Sol Duc	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Washington Coast
Soos Creek	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
South Fork Salmon River Satellite Facility	Anadromous	Idaho Department Of Fish & Game	Major	Yes	ID	Salmon
South Santiam Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
South Toutle Trap	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Cowlitz
Speelyai Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Lewis
Spokane Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Spokane Lower
Spokane Tribal Hatchery	Resident Fish	Spokane Tribe Of Indians	Major	Yes	WA	Spokane Lower
Spring Creek National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	White Salmon
Stayton Rearing Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Willamette
Sweetwater Springs Tribal Hatchery	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater
Thornhollow Acclimation Pond	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Tokul	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Toutle Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Cowlitz
Trask River Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq		No	OR	N Oregon Coast
Trojan Rearing Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Lower Columbia
Tucannon Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Major	Yes	WA	Tucannon
Tucker Creek / Vanderveldt Ponds	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Youngs
Tumwater Falls	Anadromous	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Turtle Rock Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Upper Mid-Columbia
Twisp Trap & Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Methow
U Of Washington Teaching & Research Hatchery	Anadromous	University Of Washington		No	WA	Puget Sound Basin
Umatilla Hatchery	Anadromous	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Lower Mid-Columbia
Umatilla River / ODFW Site Rm 56.2	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Umatilla
Upper Grande Ronde Acclimation Site	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Grande Ronde
Upper Grande Ronde Trap	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Grande Ronde
Upper Snake River Tribal Hatchery	Resident Fish	Shoshone-Bannock Tribes	Major	Yes	ID	Upper Snake
Vancouver Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Lower Columbia
Voights Creek	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Wahkeena Pond	Anadromous	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Lower Columbia

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Walla Walla Hatchery	Anadromous	Umatilla Confederated Tribes	Major	Yes	WA	Walla Walla
Walla Walla River, South Fork Satellite	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Walla Walla
Wallace River	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Wallowa Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Major	Yes	OR	Grande Ronde
Wapato Canal Pen Rearing	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Wapato Dam Acclimation Pond	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Wapatox Dvr Dam Smolt Trap	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Warm Springs National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	OR	Deschutes
Washoe Park Trout Hatchery	Resident Fish	Montana Department Of Fish & Wildlife - Helena		Yes	MT	Clark Fork
Washougal Hatchery	Anadromous	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Washougal
Wells Hatchery	Mixed Anadromous / Resident Fish	Washington Department Of Fish & Wildlife	Minor	Yes	WA	Upper Mid-Columbia
West Fork Acclimation Site (Dry Run Bridge)	Anadromous	Umatilla Confederated Tribes	Major	Yes	OR	Hood
Weyco Pond	Anadromous	Washington Department Of Fish & Wildlife		Yes	WA	Columbia Estuary /Ocean
Whitehorse Pond	Unknown / Unspecified	Washington Department Of Fish & Wildlife		No	WA	Puget Sound Basin
Willamette [Oakridge] Hatchery	Mixed Anadromous / Resident Fish	Oregon Department Of Fish & Wildlife- Hq	Minor	Yes	OR	Willamette
Willard National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Little White Salmon
Winthrop National Fish Hatchery	Anadromous	Us Fish And Wildlife Service - Portland Region	Minor	Yes	WA	Methow

Hatchery	Type	Agency	BPA Funds	Columbia Basin	State	Subbasin
Wizard Falls Hatchery	Resident Fish	Oregon Department Of Fish & Wildlife- Hq		Yes	OR	Deschutes
Yakima Hatchery	Anadromous	Yakama Nation	Major	Yes	WA	Yakima
Yakima Trout Hatchery	Resident Fish	Washington Department Of Fish & Wildlife		Yes	WA	Yakima
Yoosa / Camp Creek Acclimation Facility	Anadromous	Nez Perce Tribe	Major	Yes	ID	Clearwater

**Sources** Web Pages of IDFG, WDFW, ODFW, MDFW, plus data from the BPA historic files, StreamNet, etc. Jan 2001.

**Complex:** refers primarily to groupings of Washington state hatcheries.

**BPA Funds:** *Major* = substantial support from BPA, *Minor* = some support for research, production, etc.

## Appendix H

### BPA FISH AND WILDLIFE PROJECTS 1978-2000 (UPDATED 2/2001)

Subbasin	Program	Title
Columbia Estuary /Ocean	Anadromous Fish	Columbia Estuary Migrational Characteristics
Columbia Estuary /Ocean	Anadromous Fish	Contributions To The Columbia River Estuary Atlas
Columbia Estuary /Ocean	Anadromous Fish	Juvenile Salmon In The Columbia Estuary
Columbia Estuary /Ocean	Anadromous Fish	DNA Variation In Coho - Lower Columbia
Columbia Estuary /Ocean	Anadromous Fish	Columbia River/Estuary Carrying Capacity Study
Columbia Estuary /Ocean	Anadromous Fish	Columbia River Terminal Fisheries Research - ODFW
Columbia Estuary /Ocean	Anadromous Fish	Columbia Select Area Fishery Evaluation - Cedc
Columbia Estuary /Ocean	Anadromous Fish	Columbia Select Area Fishery Evaluation - WDFW
Columbia Estuary /Ocean	Anadromous Fish	Avian Predation Technical Advisor
Columbia Estuary /Ocean	Anadromous Fish	Self Contained Sound System
Columbia Estuary /Ocean	Anadromous Fish	Consultant, Caspian Tern Survey, Alaska
Columbia Estuary /Ocean	Anadromous Fish	Marine Fish Predation On Juvenile Salmonids
Columbia Estuary /Ocean	Anadromous Fish	Assess Impacts Of Hydro Development On The Estuary
Columbia Estuary /Ocean	Anadromous Fish	Ocean Survival Of Salmonids
Youngs	Anadromous Fish	Young's Bay Terminal Fishery
Lewis	Anadromous Fish	Evaluate Lamprey Habitat/Population In Cedar Creek
Lower Columbia	Anadromous Fish	Avian Predation On Juvenile Salmonids
Lower Columbia	Anadromous Fish	Bonneville Captive Brood Facility Construction
Lower Columbia	Anadromous Fish	Salmon Spawning Below Lower Columbia Dams-ODFW
Lower Columbia	Anadromous Fish	Salmon Spawning Below Lower Columbia Dams-WDFW
Lower Columbia	Anadromous Fish	Salmon Spawning Below Lower Columbia Dams-USFWS
Lower Columbia	Anadromous Fish	Salmon Spawning Below Lower Columbia Dams-Doe-Pnrl
Lower Columbia	Anadromous Fish	Salmon Spawning Below Lower Columbia Dams-USGS
Lower Columbia	Wildlife	Vancouver Lowlands Wildlife Tract
Lower Columbia	Wildlife	Steigerwald / Burlington Northern
Sandy	Anadromous Fish	Video Of Wild Spring Chinook Spawning - Mt Hood NF
Sandy	Anadromous Fish	Sandy River Basin BPA Right-Of-Way Study
Sandy	Wildlife	Sandy River Wetlands Restoration & Evaluation
Willamette	Anadromous Fish	Fish / Wash Creeks Habitat Enhancement
Willamette	Anadromous Fish	Fish Cr, Lake Branch & Collawash Habitat Work
Willamette	Anadromous Fish	Willamette Spring Chinook Study
Willamette	Anadromous Fish	Little Fall Creek Passage Improvement And O & M

Subbasin	Program	Title
Willamette	Anadromous Fish	Provide O&M For Little Fall Creek Passage Project
Willamette	Anadromous Fish	Little Falls Creek Ladder Repair
Willamette	Anadromous Fish	Eagle Creek Hydro Project (Maintenance)
Willamette	Anadromous Fish	Construct Corvallis Fish Disease Laboratory
Willamette	Anadromous Fish	Evaluation Of Retrofitted Oxygen Supplementation
Willamette	Anadromous Fish	Spring Chinook Outmigration In The Willamette
Willamette	Anadromous Fish	Evaluate Springfield Production Facilities
Willamette	Anadromous Fish	Clackamas River Side Channel Improvement
Willamette	Anadromous Fish	Mckenzie Focus Watershed
Willamette	Anadromous Fish	Mohawk Watershed Planning And Coordination
Willamette	Anadromous Fish	Multnomah Channel Riparian Habitat Restoration
Willamette	Anadromous Fish	Assess Mckenzie Watershed Habitat & Prioritize Proj
Willamette	Resident Fish	Assess Bull Trout- Mf Willamette / Mckenzie Basins
Willamette	Wildlife	Willamette Hydro Projects Wildlife Loss Study
Willamette	Wildlife	Willamette Hydro Projects - Wildlife Mitigation
Willamette	Wildlife	Burlington Bottoms - Phase I
Willamette	Wildlife	Burlington Bottoms Land Purchase
Willamette	Wildlife	Amazon Basin (Willow Creek - Eugene Wetlands)
Willamette	Wildlife	Willamette Basin Mitigation
Willamette	Wildlife	Burlington Bottoms Bridge Construction
Willamette	Wildlife	Tualatin River National Wildlife Refuge Additions
Fifteenmile Creek	Anadromous Fish	Fifteenmile Creek Habitat Enhancement
Fifteenmile Creek	Anadromous Fish	Fifteenmile Creek Habitat Enhancement- Phase Iv, V
Fifteenmile Creek	Anadromous Fish	Fifteenmile Creek Habitat Improvement
Fifteenmile Creek	Anadromous Fish	15 Mile Creek Steelhead Smolt Production
Fifteenmile Creek	Anadromous Fish	15 Mile Creek Water Right Acquisition
Fifteenmile Creek	Anadromous Fish	Evaluate Habitat Work Conducted In 15 Mile Creek
Hood	Anadromous Fish	West Fork Hood River Passage
Hood	Anadromous Fish	Lake Branch Creek Habitat Improvement
Hood	Anadromous Fish	Hood River Production Program M & E - Ctwsir
Hood	Anadromous Fish	Hood River Production Program M & E - ODFW
Hood	Anadromous Fish	Hood River - Parkdale O & M - Wst
Hood	Anadromous Fish	Hood River Production - Pelton Ladder Hatchery
Hood	Anadromous Fish	Design & Construct Powerdale Dam Facilities (ODFW)
Hood	Anadromous Fish	Hood River Production - Pelton Dam Ladder O & M
Hood	Anadromous Fish	Hood River Fish Habitat
Hood	Anadromous Fish	Hood River Fish Habitat
Klickitat	Anadromous Fish	Evaluation Of River Water For Klickitat Hatchery

Subbasin	Program	Title
Klickitat	Anadromous Fish	Klickitat Tribal Hatchery Preliminary Engineering
Klickitat	Anadromous Fish	Klickitat Passage & Habitat Preliminary Design
Klickitat	Anadromous Fish	Lower Klickitat Habitat Enhancement
Klickitat	Anadromous Fish	Klickitat River Sub-Basin Assessment
Columbia Gorge	Anadromous Fish	Upriver Egg Take At Bonneville Dam
Columbia Gorge	Anadromous Fish	Bonneville Dam Juvenile Fish Sampling Facility
Columbia Gorge	Anadromous Fish	Eval Factors Limiting Col R Chum Salmon Population
Columbia Gorge	Resident Fish	Bull Trout Assessment In The Columbia River Gorge
Wind	Anadromous Fish	Wind River Watershed
WIND	Anadromous Fish	WIND RIVER WATERSHED - USGS
WIND	Anadromous Fish	WIND RIVER WATERSHED - WDF&W
WIND	Anadromous Fish	WIND RIVER WATERSHED - USFS
WIND	Anadromous Fish	WIND RIVER WATERSHED - UCD
Methow	Anadromous Fish	NEPA Studies For The Methow River Project
Methow	Anadromous Fish	Methow River Valley Irrigation District - Yn
Methow	Anadromous Fish	Yn-Coho Supplementation Mid-Columbia Construction
Methow	Anadromous Fish	Restore Early Winters Creek Salmonid Habitat
Methow	Anadromous Fish	Goat Creek Salmonid Habitat Restoration
Methow	Anadromous Fish	Measure Mine Drainage Effects Alder Cr / Methow R
Okanogan	Anadromous Fish	Enloe Dam Passage
Okanogan	Anadromous Fish	Okanogan Focus Watershed
Okanogan	Anadromous Fish	Salmon Creek Instream Flow & Habitat Survey
Okanogan	Anadromous Fish	Salmon Creek Fish Barrier Removal And Water Lease
Okanogan	Anadromous Fish	Anadromous Fish Habitat & Passage In Omak Creek
Okanogan	Anadromous Fish	Eval Reintroduction Of Sockeye Salmon Skaha Lake
Okanogan	Wildlife	Scotch Creek Wildlife Enhancement
Okanogan	Wildlife	Columbia Basin Habitat Unit Acquisition - WDF&W
Upper Mid-Columbia	Anadromous Fish	Monitoring Out Migrating Salmon At Wells Dam -1984
Upper Mid-Columbia	Anadromous Fish	Juvenile Salmonid Monitoring At Rock Island Dam
Upper Mid-Columbia	Wildlife	Douglas County Pygmy Rabbit Habitat Project
Wenatchee	Anadromous Fish	Tumwater Falls / Dryden Dams Passage Plans
Wenatchee	Anadromous Fish	Improve The Tumwater Dam Passage
Wenatchee	Anadromous Fish	Improve The Dryden Dam Passage
Wenatchee	Anadromous Fish	Tumwater/ Dryden Passage Environmental Assessment
Wenatchee	Anadromous Fish	Design & Construction Of Dryden Fish Screens
Wenatchee	Anadromous Fish	Coho Restoration Mid-Columbia River Tributaries
Wenatchee	Anadromous Fish	Yn - Coho Supplementation In Mid Columbia O&M/M&E
Wenatchee	Anadromous Fish	Replace Chumstick Creek Culvert

Subbasin	Program	Title
Wenatchee	Anadromous Fish	Remove Barriers/Restore Instream Habitat
Wenatchee	Program Coordination	Return Of The Salmon - Wenatchee River Festival
Spokane Lower	Resident Fish	Archaeological Survey - Galbraith Springs
Spokane Lower	Resident Fish	Spokane (Galbraith Springs) Tribal Hatchery
Spokane Lower	Resident Fish	Spokane Tribal Hatchery - Engineering Consultant
Spokane Lower	Resident Fish	Spokane Tribal Hatchery Equipment
Spokane Lower	Resident Fish	Spokane Tribal Hatchery Manager Training Program
Spokane Lower	Wildlife	Blue Creek Winter Range - Spokane Reservation
Upper Columbia	Resident Fish	Colville Tribal Hatchery Construction And O&M
Upper Columbia	Resident Fish	Colville Tribal Fish Cultural Training Program
Upper Columbia	Resident Fish	Lake Roosevelt Kokanee & Stream Projects M&E
Upper Columbia	Resident Fish	Construct Sherman Creek Kokanee Hatchery
Upper Columbia	Resident Fish	Sherman Creek Hatchery Equipment
Upper Columbia	Resident Fish	Spokane Tribal (Galbraith Springs) Hatchery - O&M
Upper Columbia	Resident Fish	Sherman Creek Hatchery - O&M
Upper Columbia	Resident Fish	Sherman Pass Scenic Byway Visitor's Center
Upper Columbia	Resident Fish	Lake Roosevelt Data Collection
Upper Columbia	Resident Fish	Lake Roosevelt Rainbow Trout Net Pens
Upper Columbia	Resident Fish	Chief Joseph Kokanee Enhancement Project
Upper Columbia	Resident Fish	Hydroacoustic And Sonic Tag Tracking
Upper Columbia	Resident Fish	Resident Fish Above Chief Joe & Grand Coulee Dams
Upper Columbia	Resident Fish	Lake Roosevelt Kokanee Net Pens
Upper Columbia	Resident Fish	Lake Roosevelt Kokanee Net Pens
Upper Columbia	Wildlife	Grand Coulee Wildlife Mitigation Plan
Upper Columbia	Wildlife	Chief Joseph Dam Wildlife Loss Study & Mitigation
Upper Columbia	Wildlife	Lake Roosevelt Peregrine Falcon Reintroduction
Upper Columbia	Wildlife	Colville Wildlife Mitigation Coordination
Upper Columbia	Wildlife	Colville Tribe Habitat Unit Acquisition
Upper Columbia	Wildlife	Spokane Tribe Grande Coulee Mitigation
Upper Columbia	Wildlife	Colville Confederated Tribe HEP Training
San Poil	Resident Fish	Habitat Projects - Lake Roosevelt Tributaries
San Poil	Wildlife	Hellsgate Big Game Winter Range - Colville Tribe
Bitterroot	Resident Fish	Painted Rocks Reservoir Water Management Plan
Clark Fork	Resident Fish	Cabinet Gorge Hatchery
Clark Fork	Resident Fish	Evaluate Kokanee Stocking & Cabinet Gorge Hatchery
Clark Fork	Resident Fish	Engineering Evaluation Of Cabinet Gorge Hatchery
Clark Fork	Resident Fish	Cabinet Gorge Hatchery Improvements
Clark Fork	Wildlife	Cabinet Gorge Eagle Study

Subbasin	Program	Title
Clark Fork	Wildlife	Video Of Cabinet Gorge Hatchery & Eagle Project
Clark Fork	Wildlife	Albeni Falls Wildlife Loss Study & Mitigation Plan
Flathead	Resident Fish	Effects Of Kerr & Hungry Horse Dams On Kokanee
Flathead	Resident Fish	Cumulative Impact Of Micro Hydro Sites, Swan R
Flathead	Resident Fish	Lower Flathead River Fisheries Study
Flathead	Resident Fish	Hungry Horse Reservoir Impacts On Resident Fish
Flathead	Resident Fish	Determine Fish Habitat Losses- South Fork Flathead
Flathead	Resident Fish	Flathead River Fish And Wildlife Film
Flathead	Resident Fish	Hungry Horse Fisheries Mitigation
Flathead	Resident Fish	Flathead Lake - Monitoring For Kokanee Success
Flathead	Resident Fish	Flathead River Fishery Monitoring & Enhancement
Flathead	Resident Fish	Fishery Habitat Improvements - Flathead Basin
Flathead	Resident Fish	Creston Nfh Production & Nonnative Fish Removal
Flathead	Resident Fish	Hungry Horse Selective Withdrawal Design
Flathead	Resident Fish	Hungry Horse - Excessive Withdrawal Mitigation
Flathead	Resident Fish	Flathead River Native Species - MFWP
Flathead	Resident Fish	Flathead River Instream Flow
Flathead	Resident Fish	Flathead Focus Watershed Coordination
Flathead	Resident Fish	Mit Excessive Drawdowns Hungry Horse/Libby Res
Flathead	Resident Fish	Mit Excessive Drawdowns Hungry Horse Component
Flathead	Wildlife	Flathead Lake Level Impact On Canadian Geese
Flathead	Wildlife	Hungry Horse & Clark Fork Dams' Effect On Wildlife
Flathead	Wildlife	Water Level Impacts On Flathead Geese
Flathead	Wildlife	Hungry Horse Dam Wildlife Habitat Enhancement
Flathead	Wildlife	Montana Wildlife Conservation Easement
Kootenai	Anadromous Fish	Flow Effects On Cottonwood Ecosystems
Kootenai	Resident Fish	Libby Reservoir Levels & Impacts On Resident Fish
Kootenai	Resident Fish	Kootenai River Tributaries Flow & Fish Study
Kootenai	Resident Fish	Experimental White Sturgeon Supplement Research
Kootenai	Resident Fish	Experimental Kootenai Sturgeon Hatchery & Research
Kootenai	Resident Fish	Kootenai River Fisheries Investigations
Kootenai	Resident Fish	Develop Breeding Plans For Kootenai Fish Species
Kootenai	Resident Fish	Mitigation For Excessive Drawdown -Libby Reservoir
Kootenai	Resident Fish	Kootenai River White Sturgeon - M & E
Kootenai	Resident Fish	Kootenai River Resident Fish Assessments
Kootenai	Resident Fish	Libby Reservoir Mitigation Plan
Kootenai	Resident Fish	Kootenai Focus Watershed Coordination
Kootenai	Resident Fish	Protect Wigwam R Bull Trout-Kooscanusa Reservation

Subbasin	Program	Title
Kootenai	Resident Fish	Eval Sediment Transport Spawn Habitat Kootenai Id
Kootenai	Wildlife	Ural-Tweed Bighorn Sheep Habitat Improvement
Kootenai	Wildlife	Ural-Tweed Bighorn Sheep Population Study
Kootenai	Wildlife	Video Production On Bighorn Sheep In Montana
Kootenai	Wildlife	Filming Of The Bighorn Sheep Project, Montana
Kootenai	Wildlife	Film Of West Montana BPA Fish & Wildlife Projects
Kootenai	Wildlife	Develop NW Montana Wildlife Enhancement Plans
Kootenai	Wildlife	Montana Wildlife Easements & Land Acquisition Plan
Kootenai	Wildlife	Libby Dam Wildlife Habitat Enhancement
Kootenai	Wildlife	Libby Dam Wildlife Enhancement Project
Kootenai	Wildlife	Boundary Creek Wildlife Mitigation
Pend Oreille	Resident Fish	Assess Fishery & Needs - Pend Oreille River
Pend Oreille	Resident Fish	Kokanee Impacts- Lake Pend Oreille
Pend Oreille	Resident Fish	Lake Pend Oreille Kokanee Mitigation Research
Pend Oreille	Resident Fish	Kalispel Tribe Resident Fish Project
Pend Oreille	Resident Fish	Kalispel Resident Fish Hatchery Construction
Pend Oreille	Resident Fish	Kalispel Bass Hatchery O&M
Pend Oreille	Resident Fish	Kalispel Resident Fish Habitat Improvement
Pend Oreille	Resident Fish	Kalispel Box Canyon Watershed Project
Pend Oreille	Wildlife	Kalispel - Pend Oreille Wetlands Acquisition
Pend Oreille	Wildlife	Kalispel - Pend Oreille Wetlands 2
Pend Oreille	Wildlife	Pend Oreille Wetlands - IDFG Phase I
Pend Oreille	Wildlife	Pend Oreille Wetlands - IDFG MOA
Pend Oreille	Wildlife	Pend Oreille Wildlife Mitigation O&M - IDFG
Pend Oreille	Wildlife	Albeni Falls Wildlife Mitigation Kootenai Tribe Id
Pend Oreille	Wildlife	Albeni Falls WI Mitigation - Coeur d'Alene Tribe
Pend Oreille	Wildlife	Little Pend Oreille River (Weir)
Coeur d'Alene	Resident Fish	Coeur d'Alene Reservation Fishery Enhancement
Coeur d'Alene	Resident Fish	Lake Creek Land Acquisition - Coeur d'Alene Basin
Coeur d'Alene	Resident Fish	Coeur d'Alene Trout Production Facility
Coeur d'Alene	Wildlife	Albeni Falls Dam W/L Mitigation - Kalispel Tribe
Asotin	Anadromous Fish	Southeast Washington Species Interaction Study
Asotin	Anadromous Fish	Eastern WA Model Watershed Development
Asotin	Anadromous Fish	Asotin Watering Troughs
Asotin	Anadromous Fish	Asotin Creek Model Watershed Placeholder
Asotin	Anadromous Fish	Asotin Creek Early Action Projects
Asotin	Anadromous Fish	Asotin Creek Upland Sedimentation Reduction
Asotin	Anadromous Fish	Asotin Creek Channel & Fish Habitat Restoration

Subbasin	Program	Title
Asotin	Anadromous Fish	Asotin Watershed Upland BMPs
Asotin	Anadromous Fish	Asotin Creek Riparian Fencing/Rock Blasting
Asotin	Anadromous Fish	Asotin Creek Woody Materials
Asotin	Anadromous Fish	Asotin Creek Fish/Structure Monitoring
Asotin	Anadromous Fish	Asotin Watershed Channel And Riparian Restoration
Asotin	Anadromous Fish	Asotin Creek Information And Education
Asotin	Anadromous Fish	Asotin Watershed Project Implementation
Asotin	Anadromous Fish	Asotin Creek Five Year Minimum Till Program
Asotin	Anadromous Fish	Asotin Creek Instream Project Monitoring
Asotin	Anadromous Fish	Asotin Creek Channel Restoration
Asotin	Anadromous Fish	Asotin Watershed Upland BMP Implementation
Asotin	Anadromous Fish	Asotin Watershed Yellow Star Thistle Control
Asotin	Anadromous Fish	Asotin Creek Native Tree Nursery
Asotin	Anadromous Fish	Asotin Cr Isco Water & Macro-Invertebrate Sampling
Asotin	Anadromous Fish	GIS Mapping Of Asotin Creek Watershed Habitat
Asotin	Anadromous Fish	Asotin Creek Riparian Planting
Asotin	Anadromous Fish	Asotin Creek Riparian Fencing Projects
Asotin	Anadromous Fish	Asotin Cr Channel, Floodplain Riparian Restoration
Snake Hells Canyon	Anadromous Fish	Study Of Fall Chinook Outplanted-Abv Lower Granite
Snake Hells Canyon	Anadromous Fish	M&E Of Yearling Fall Chinook Above Lower Granite
Snake Hells Canyon	Anadromous Fish	Pittsburg Landing Acclimation Facility - Snake R
Snake Hells Canyon	Anadromous Fish	Capt John Rapids Acclimation Facility - Snake R
Snake Hells Canyon	Resident Fish	Evaluate Snake River Sturgeon Population
Grande Ronde	Anadromous Fish	Peavine Creek Habitat Improvement
Grande Ronde	Anadromous Fish	Joseph Creek & Grande Ronde River Habitat Work
Grande Ronde	Anadromous Fish	Joseph Creek & Grande Ronde River Habitat Work
Grande Ronde	Anadromous Fish	NE Oregon Spring Chinook Outplanting/Facility
Grande Ronde	Anadromous Fish	NE Oregon Hatchery Master Plan - CTUIR
Grande Ronde	Anadromous Fish	NE Oregon Outplanting Facilities Plan - ODFW
Grande Ronde	Anadromous Fish	NE Oregon Outplanting Facilities Master Plan (NPT)
Grande Ronde	Anadromous Fish	Classify Ecosystem Types - Blue Mountains
Grande Ronde	Anadromous Fish	Grande Ronde Model Watershed Development
Grande Ronde	Anadromous Fish	Life Studies Of Spring Chinook -Grande Ronde River
Grande Ronde	Anadromous Fish	Land / Water Acquisition Legal Support
Grande Ronde	Anadromous Fish	Grand Ronde, Imnaha, & John Day Telemetry Tracking
Grande Ronde	Anadromous Fish	Grande Ronde Model Watershed Habitat Projects
Grande Ronde	Anadromous Fish	Catherine Creek Diversion Dam Replacement
Grande Ronde	Anadromous Fish	Fox Hill Road Improvements, Grande Ronde Basin

Subbasin	Program	Title
Grande Ronde	Anadromous Fish	Clearwater Ditch Diversion (Grande Ronde Basin)
Grande Ronde	Anadromous Fish	Lower Valley Consolidated Diversion- Wallowa River
Grande Ronde	Anadromous Fish	Upper Grande Ronde (Large Woody Debris)
Grande Ronde	Anadromous Fish	Minam / Mt Harris Road Improvement- Grande Ronde
Grande Ronde	Anadromous Fish	Technical Support - Grand Ronde Model Watershed
Grande Ronde	Anadromous Fish	Wallowa Basin Project Planning
Grande Ronde	Anadromous Fish	Camp Carson Mine Reclamation, Upper Grande Ronde
Grande Ronde	Anadromous Fish	Indian Creek Habitat Restoration (Grande Ronde)
Grande Ronde	Anadromous Fish	Bonneville Hatchery Captive Broodstock (NE Oregon)
Grande Ronde	Anadromous Fish	Lagrande USFS District Early Action Projects
Grande Ronde	Anadromous Fish	Boise Cascade Riparian Fencing- Grande Ronde
Grande Ronde	Anadromous Fish	Wallowa Valley USFS District Early Action Projects
Grande Ronde	Anadromous Fish	Etiology Of "Head Burns" In Adult Salmonids
Grande Ronde	Anadromous Fish	Catherine Creek Road Erosion, Grande Ronde Basin
Grande Ronde	Anadromous Fish	Lower Leap Range Improvement, Trout Creek Basin
Grande Ronde	Anadromous Fish	Bear Creek Road Resurfacing, Grande Ronde Basin
Grande Ronde	Anadromous Fish	Union County Swcd Early Action Projects
Grande Ronde	Anadromous Fish	Union County Swcd Old Projects
Grande Ronde	Anadromous Fish	Repair Damage From Lower Wenaha Flood
Grande Ronde	Anadromous Fish	Construct Tulley Hill Diversion, Wallowa Basin
Grande Ronde	Anadromous Fish	Wallowa Swcd - Old Projects
Grande Ronde	Anadromous Fish	Wallowa Swcd - Early Action Projects
Grande Ronde	Anadromous Fish	Union County Public Works - Old Projects
Grande Ronde	Anadromous Fish	Union County Public Works - Early Action Projects
Grande Ronde	Anadromous Fish	Grande Ronde Watershed Restoration - CTUIR
Grande Ronde	Anadromous Fish	Mccoy Meadows Watershed Restoration
Grande Ronde	Anadromous Fish	CTUIR - McIntyre Creek Road Relocation
Grande Ronde	Anadromous Fish	Union Wastewater Plant Improvements, Grande Ronde
Grande Ronde	Anadromous Fish	Streambank Restoration - Biomat Project
Grande Ronde	Anadromous Fish	Chicken Creek Habitat Improvement, Grande Ronde
Grande Ronde	Anadromous Fish	N Fk Clark Creek Large Woody Debris Addition
Grande Ronde	Anadromous Fish	South Fork Spring Creek Channel Rehabilitation
Grande Ronde	Anadromous Fish	Grande Ronde Valley Stream Gauging
Grande Ronde	Anadromous Fish	Birkmaier Streambank Protection
Grande Ronde	Anadromous Fish	Wallowa Swcd Streambank Protection
Grande Ronde	Anadromous Fish	Imnaha River Smolt Monitoring - Nez Perce Tribe
Grande Ronde	Anadromous Fish	Wallowa County/Nez Perce Salmon Habitat Recovery
Grande Ronde	Anadromous Fish	Phillips Creek Road

Subbasin	Program	Title
Grande Ronde	Anadromous Fish	Middle Fork Clark Creek
Grande Ronde	Anadromous Fish	Meadow Creek Enhancement Evaluation - OSU
Grande Ronde	Anadromous Fish	Meadow Creek Enhancement Evaluation - USFS
Grande Ronde	Anadromous Fish	Union County Watershed Projects - Swcd
Grande Ronde	Anadromous Fish	Upper Grande Ronde River Riparian Fencing
Grande Ronde	Anadromous Fish	Software For Grande Ronde Model Watershed
Grande Ronde	Anadromous Fish	Sheep Ranch Riparian Project
Grande Ronde	Anadromous Fish	Tybo Canyon Leafy Spurge Project
Grande Ronde	Anadromous Fish	Off-Site Water Developments
Grande Ronde	Anadromous Fish	Lower Five Points Off-Site Water Development
Grande Ronde	Anadromous Fish	Catherine Cr Riparian Pasture & Water Development
Grande Ronde	Anadromous Fish	Upper Grande Ronde & Sheep Cr Instream Structures
Grande Ronde	Anadromous Fish	Upper Grande Ronde Riparian Rehabilitation
Grande Ronde	Anadromous Fish	Upper Grande Ronde River Whole Tree Project
Grande Ronde	Anadromous Fish	Camp Cr Riparian Fence & Water Site Development
Grande Ronde	Anadromous Fish	Camp One Restoration
Grande Ronde	Anadromous Fish	Bear & Prairie Creeks Habitat Work
Grande Ronde	Anadromous Fish	Catherine Cr & Grande Ronde R Habitat Work
Grande Ronde	Anadromous Fish	Lostine & Hurricane Creeks Habitat Projects
Grande Ronde	Anadromous Fish	Lick Creek Water Gap li
Grande Ronde	Anadromous Fish	Bear Cr, R-Y Timber Grazing & Road Plan
Grande Ronde	Anadromous Fish	N Fork Clark Cr / Hindman Rd Crossing Improvement
Grande Ronde	Anadromous Fish	Hamilton Streambank Stabilization / Grande Ronde R
Grande Ronde	Anadromous Fish	Alicel Dike Improvement - Grande Ronde
Grande Ronde	Anadromous Fish	Troy Streambank Protection / Wallowa River
Grande Ronde	Anadromous Fish	Phillips Creek Stream Habitat Enhancement
Grande Ronde	Anadromous Fish	Warm Spring Creek Riparian Improvement
Grande Ronde	Anadromous Fish	Little Dark Canyon Creek
Grande Ronde	Anadromous Fish	Cottonwood Creek Riparian Enhancement/Wallowa
Grande Ronde	Anadromous Fish	Water Quality Monitoring For Grande Ronde Basin
Grande Ronde	Anadromous Fish	Catherine Creek State Park Interpretive Sign
Grande Ronde	Anadromous Fish	Construction Of Grande Ronde Satellite Facilities
Grande Ronde	Anadromous Fish	Grande Ronde Supplementation Facilities- O&M -NPT
Grande Ronde	Anadromous Fish	Grande Ronde Supplementation - O&M -CTUIR
Grande Ronde	Anadromous Fish	Grande Ronde Supplementation - O&M - ODFW
Grande Ronde	Anadromous Fish	Grande Ronde Supplementation - Design
Grande Ronde	Anadromous Fish	Grande Ronde Supplementation - Scientific Review
Grande Ronde	Anadromous Fish	Grande Ronde Captive Brood O&M / M&E

Subbasin	Program	Title
Grande Ronde	Anadromous Fish	Captive Broodstock Artificial Propagation
Grande Ronde	Anadromous Fish	Grande Ronde Mainstem Enhancement, USFS
Grande Ronde	Anadromous Fish	Grande Ronde Mainstem Enhancement - CTUIR
Grande Ronde	Anadromous Fish	Five Points Creek Whole Tree Additions
Grande Ronde	Anadromous Fish	Dark Canyon Watershed Restoration
Grande Ronde	Anadromous Fish	Mcintyre Creek Road Relocation - USFS
Grande Ronde	Anadromous Fish	Mcintyre Road Relocation - Union County
Grande Ronde	Anadromous Fish	Mcintyre Road Relocation - USFS
Grande Ronde	Anadromous Fish	Grouse Creek Culvert Replacement
Grande Ronde	Anadromous Fish	Meadow Creek/Cuna Ranches Riparian Restoration
Grande Ronde	Anadromous Fish	Joseph Creek Watershed Improvement
Grande Ronde	Anadromous Fish	Lookingglass Creek Road Obliteration
Grande Ronde	Anadromous Fish	Grande Ronde Nutrient Presentation
Grande Ronde	Anadromous Fish	Union County Technical Engineering Assistance
Grande Ronde	Anadromous Fish	Wallowa County Technical Engineering Assistance
Grande Ronde	Anadromous Fish	Water Temp Manipulation & Data Sharing Software
Grande Ronde	Anadromous Fish	Wet Meadow Inventory And Assessment
Grande Ronde	Anadromous Fish	Grande Ronde Basin Gauging Station Monitoring
Grande Ronde	Anadromous Fish	Grande Ronde Water Quality Monitoring
Grande Ronde	Anadromous Fish	Upper Grande Ronde & Catherine Cr/USFS Ws Rest
Grande Ronde	Anadromous Fish	Grande Ronde - Union Swcd Chan, Rd & Passage Rest
Grande Ronde	Anadromous Fish	Grande Ronde - Union Swcd Riparian, Upland Rest
Grande Ronde	Anadromous Fish	Grande Ronde - Union County Rd, Sediment Reduction
Grande Ronde	Anadromous Fish	Alpine Meadows - Trout Creek Restoration
Grande Ronde	Anadromous Fish	Grande Ronde Basin Temperature Assessment
Grande Ronde	Anadromous Fish	Grande Ronde River Basin Temperature Assessment
Grande Ronde	Anadromous Fish	Wallowa County Gauging Stations
Grande Ronde	Anadromous Fish	Hagedorn Road Relocation/Stream Restoration
Grande Ronde	Anadromous Fish	Wildcat Creek Culvert Replacement
Grande Ronde	Anadromous Fish	Grande Ronde Basin Tech Engineering Assistance
Grande Ronde	Anadromous Fish	Little Fly Meadow Headcut Rehabilitation
Grande Ronde	Anadromous Fish	Wallowa County Direct Seeding
Grande Ronde	Anadromous Fish	Crow Cr Star Thistle Containment & Riparian Enhance
Grande Ronde	Anadromous Fish	Beaver Creek Fish Passage
Grande Ronde	Anadromous Fish	Gordon Creek/Grand Ronde Streambank Stabilization
Grande Ronde	Anadromous Fish	East End Road Obliteration And Sediment Reduction
Grande Ronde	Anadromous Fish	Research/Evaluate Restoration Of NE Oregon Streams
Grande Ronde	Anadromous Fish	Research Stream Restoration (U Of O)

Subbasin	Program	Title
Grande Ronde	Anadromous Fish	Bear Gulch Restoration Watershed
Grande Ronde	Anadromous Fish	Upper Wildcat & Joseph Creek Watershed Improvement
Grande Ronde	Anadromous Fish	Meadow Cr Habberstad Property Instream Restoration
Grande Ronde	Anadromous Fish	Mccooy Cr Alta Cunha Ranches Instream Restoration
Grande Ronde	Anadromous Fish	Grande Ronde Culvert Replacement - USFS
Grande Ronde	Anadromous Fish	Grande Ronde River Fencing - USFS
Grande Ronde	Anadromous Fish	Lostine River Passage
Grande Ronde	Program Coordination	Cost Effectiveness Analysis & Model Enhancement
Grande Ronde	Wildlife	Nez Perce NE Oregon Wildlife Project: Helm Tract
Grande Ronde	Wildlife	CTUIR Habitat Units Acquisition
Grande Ronde	Wildlife	Ladd Marsh
Grande Ronde	Wildlife	WI Mitigation Sites Oregon, Wenaha Wma Additions
Grande Ronde	Wildlife	WI Mitigation Sites Oregon, Ladd Marsh Additions
Imnaha	Anadromous Fish	Imnaha River Smolt Monitoring Program
Imnaha	Anadromous Fish	NE Oregon Hatchery Master Plan - Nez Perce
Imnaha	Anadromous Fish	Imnaha Steelhead Rearing, Release And M&E
Imnaha	Anadromous Fish	Evaluate Supplementing Imnaha Summer Steelhead
Imnaha	Anadromous Fish	Bear Creek & Sheep Creek Habitat Projects (NPT)
Imnaha	Anadromous Fish	Nez Perce Master Contract
Imnaha	Anadromous Fish	Sheep Creek Watershed Restoration
Imnaha	Anadromous Fish	Marr Flat Allotment & Big Sheep/Imnaha Fisheries
Imnaha	Anadromous Fish	Imnaha/Parks Ditch Water Conservation Program
Clearwater	Anadromous Fish	Inventory Of Nez Perce Reservation Streams
Clearwater	Anadromous Fish	Nez Perce Tribal Hatchery
Clearwater	Anadromous Fish	Final Design - Nez Perce Tribal Hatchery
Clearwater	Anadromous Fish	Heath Farms Nez Perce Hatchery Site Investigation
Clearwater	Anadromous Fish	Nez Perce Tribal Hatchery Monitoring And Evaluation
Clearwater	Anadromous Fish	Nez Perce Tribal Hatchery Planning And Design
Clearwater	Anadromous Fish	Nez Perce Tribal Hatchery Construction
Clearwater	Anadromous Fish	Nez Perce Tribal Hatchery O & M
Clearwater	Anadromous Fish	Red River Fish Habitat Improvement
Clearwater	Anadromous Fish	Crooked River Passage
Clearwater	Anadromous Fish	Lolo, Crooked Fork & White Sands Cr Habitat Work
Clearwater	Anadromous Fish	Red & Crooked Rivers Habitat/ Passage Improvements
Clearwater	Anadromous Fish	Lolo, Crooked Fork & El Dorado Creeks Habitat Work
Clearwater	Anadromous Fish	Clearwater Basin Habitat Improvement Study
Clearwater	Anadromous Fish	Orofino Creek Passage Study
Clearwater	Anadromous Fish	Lower Clearwater Habitat Study

Subbasin	Program	Title
Clearwater	Anadromous Fish	Nez Perce Technical Support - IDFG
Clearwater	Anadromous Fish	Salmon Supplementation Studies In Idaho - USFWS
Clearwater	Anadromous Fish	Supplementation Of Steelhead Production In Idaho
Clearwater	Anadromous Fish	Law Enforcement Transition Funding - Shoban
Clearwater	Anadromous Fish	Little Ponderosa Ranch Purchase, Red River Meadow
Clearwater	Anadromous Fish	Red River Restoration (Little Ponderosa Ranch)
Clearwater	Anadromous Fish	Haysfork Gloryhole Rehabilitation
Clearwater	Anadromous Fish	Assess Chinook Restoration (Snake River Basin)
Clearwater	Anadromous Fish	Nez Perce NF Early Action Watershed Projects
Clearwater	Anadromous Fish	Meadow Creek Restoration - USFS
Clearwater	Anadromous Fish	Protect And Restore Lolo Creek Watershed
Clearwater	Anadromous Fish	Protect & Restore Squaw & Papoose Cr Watersheds
Clearwater	Anadromous Fish	Lower Eldorado Falls Fish Passage Improve Design
Clearwater	Anadromous Fish	Restore Mccommas Meadows - NPT
Clearwater	Anadromous Fish	Clearwater Focus Watershed - State Of Idaho
Clearwater	Anadromous Fish	Clearwater River Subbasin Ecosystem Assessment
Clearwater	Anadromous Fish	Clearwater Focus Watershed - Nez Perce Tribe
Clearwater	Anadromous Fish	Clearwater River Sub-Basin Assessment
Clearwater	Anadromous Fish	Gas Bubble Disease Clearwater River Resident Fish
Clearwater	Anadromous Fish	Review Of F&W Production Initiatives
Clearwater	Anadromous Fish	Big Canyon Acclimation Facility - Clearwater R
Clearwater	Anadromous Fish	Burgdorf Meadows
Clearwater	Anadromous Fish	Restore Anadromous Fish Habitat - Little Canyon Cr
Clearwater	Anadromous Fish	Restore Anadromous Fish Habitat - Nichols Canyon
Clearwater	Anadromous Fish	Protecting & Restoring Big Canyon Creek Watershed
Clearwater	Anadromous Fish	Rehabilitate Lapwai Creek
Clearwater	Anadromous Fish	Qualify/Quantify Residual Steelhead In Clearwater
Clearwater	Anadromous Fish	Meadow Creek Restoration Research - UI
Clearwater	Anadromous Fish	Eval Pacific Lamprey In Clearwater R Drainage IDFG
Clearwater	Anadromous Fish	Protect N Lochsa Face Analysis Area Watershed
Clearwater	Anadromous Fish	Rehabilitate Newsome Creek - S Fork Clearwater R
Clearwater	Anadromous Fish	Protect And Restore Mill Creek Watershed
Clearwater	Anadromous Fish	F&W Conservation Enforcement Nez Perce Watersheds
Clearwater	Resident Fish	Dworshak Resident Fish Study / IDFG
Clearwater	Resident Fish	Nez Perce Dworshak Model For Rainbow Trout & Bass
Clearwater	Resident Fish	Nez Perce Trout Ponds - Design, Construct And O&M
Clearwater	Resident Fish	Genetic Inventory - Westslope Cutthroat Trout
Clearwater	Wildlife	Dworshak Wildlife Mitigation And Enhancement Plan

Subbasin	Program	Title
Clearwater	Wildlife	Dworshak Wildlife Mitigation And Enhancement Plan
Clearwater	Wildlife	Dworshak Wildlife Mitigation & Enhancement
Clearwater	Wildlife	Lower Clearwater Aquatic Mammal Study
Clearwater	Wildlife	Purchase Dworshak Old Growth
Clearwater	Wildlife	Dworshak Wildlife Mitigation Trust
Salmon	Anadromous Fish	Bear Valley, Yankee & East Forks Habitat Work
Salmon	Anadromous Fish	Increase Alturas Lake Cr Flow / Busterback Ranch
Salmon	Anadromous Fish	Pole Creek Irrigation Diversion Screening
Salmon	Anadromous Fish	Camas Creek Riparian Protection
Salmon	Anadromous Fish	Marsh, Elk Creek & Upper Salmon River Habitat Work
Salmon	Anadromous Fish	Lemhi River Rehabilitation Study
Salmon	Anadromous Fish	Panther Creek Habitat Rehabilitation Study
Salmon	Anadromous Fish	Newsclips Of Idaho Salmon Habitat Projects
Salmon	Anadromous Fish	Evaluate Supplementing The Salmon And Clearwater
Salmon	Anadromous Fish	Salmon Supplementation Studies In Idaho- Nez Perce
Salmon	Anadromous Fish	Salmon Supplementation In Idaho- Shoshone-Bannock
Salmon	Anadromous Fish	Pit Tagging Wild Chinook
Salmon	Anadromous Fish	Snake River Sockeye Habitat & Limnological Study
Salmon	Anadromous Fish	Redfish Lake Sockeye Rearing And Trapping
Salmon	Anadromous Fish	Idaho Natural Production Monitoring And Evaluation
Salmon	Anadromous Fish	Genetics Literature Search - Snake River Salmonids
Salmon	Anadromous Fish	Model Watershed Studies - Lemhi River Basin
Salmon	Anadromous Fish	Develop Life Cycle Model & Apply To Idaho Salmon
Salmon	Anadromous Fish	Redfish Lake Sockeye Broodstock Rearing/Research
Salmon	Anadromous Fish	Mark Chinook- Rapid River / Pahsimeroi Hatcheries
Salmon	Anadromous Fish	S Fk Salmon River Anadromous Fish Enhancement
Salmon	Anadromous Fish	Upper Salmon River Anadromous Fish Passage
Salmon	Anadromous Fish	Idaho Fish Screening Improvement
Salmon	Anadromous Fish	Idaho Model Watershed Habitat Projects
Salmon	Anadromous Fish	Pahsimeroi River - Patterson / Big Springs Flow
Salmon	Anadromous Fish	East Fork Salmon/ Pahsimeroi Habitat (Custer Co)
Salmon	Anadromous Fish	Lemhi Habitat Enhancement Project
Salmon	Anadromous Fish	Salmon River Habitat Enhancement And O&M
Salmon	Anadromous Fish	Upper Salmon River Diversion Consolidation Program
Salmon	Anadromous Fish	Pit Tagging Rapid River & Pahsimeroi Chinook Stock
Salmon	Anadromous Fish	Johnson Creek Artificial Propagation Enhancement
Salmon	Anadromous Fish	Johnson Creek Scientific Review
Salmon	Anadromous Fish	Pre Design - Johnson Cr Artificial Propagation

Subbasin	Program	Title
Salmon	Anadromous Fish	Johnson Creek Wetlands Delineation
Salmon	Anadromous Fish	Johnson Creek Real Estate Services
Salmon	Anadromous Fish	Fish Habitat Improvement - Lemhi Swcd
Salmon	Anadromous Fish	Idaho Model Watershed Fish Habitat Improvement
Salmon	Anadromous Fish	Rehabilitation Of Johnson Creek / Cox Ranch
Salmon	Anadromous Fish	Idaho Chinook Salmon Captive Rearing
Salmon	Anadromous Fish	Listed Stock Adult Escapement Monitoring
Salmon	Anadromous Fish	Listed Stock Chinook Salmon Gamete Preservation
Salmon	Anadromous Fish	Salmon River Production Program
Salmon	Anadromous Fish	Idaho Captive Rearing Initiative -Salmon R Chinook
Salmon	Anadromous Fish	Restore Salmon River - Challis Area
Salmon	Anadromous Fish	Aquatic Ecosystem Review - Challis
Salmon	Anadromous Fish	Analyze Persistence/Dynamics Snake R Chinook
Salmon	Anadromous Fish	Aquatic Ecosystem Review - Salmon River
Salmon	Anadromous Fish	Protect Bear Valley Salmon & Steelhead Spawn Hab
Salmon	Wildlife	Craig Mountain (Dworshak Wildlife) Management
Salmon	Wildlife	Dworshak Wildlife Mitigation Agreement Mediation
Malheur	Resident Fish	Stinking Water Salmonid Project
Malheur	Resident Fish	N Fork Malheur Bull & Redband Trout Life History
Malheur	Wildlife	Burns-Paiute Tribe Fish And Wildlife Coordinator
Malheur	Wildlife	Logan Valley Wildlife Mitigation Project
Malheur	Wildlife	Acquisition Of Malheur Wildlife Mitigation Site
Middle Snake	Resident Fish	Snake River Native Salmonid Assessment
Middle Snake	Resident Fish	Sturgeon Study- Hells Canyon & Oxbow Reservoirs
Owyhee	Resident Fish	Duck Valley Resident Fish Project
Owyhee	Resident Fish	Duck Valley Resident Fish Stocking
Owyhee	Resident Fish	Lake Billy Shaw - Duck Valley Reservation
Owyhee	Resident Fish	Lake Billy Shaw Tribal Coordinator
Owyhee	Resident Fish	BOR Technical Review Billy Shaw Dam, Duck Valley
Owyhee	Resident Fish	Lake Billy Shaw Final Design, Duck Valley
Owyhee	Resident Fish	Lake Billy Shaw Research Development
Owyhee	Resident Fish	Billy Shaw Construction
Owyhee	Resident Fish	Lake Billy Shaw O&M
Owyhee	Resident Fish	Duck Valley Reservation Habitat Enhancement
Owyhee	Wildlife	Shoshone-Paiute Tribes - Wildlife Coordination
Payette	Wildlife	Black Canyon & Anderson Ranch Dams - Wildlife Loss
Upper Snake	Anadromous Fish	Protection Of Upper Snake Wild Adult Steelhead
Upper Snake	Anadromous Fish	Idaho Water Rental - Fish & Wildlife Impacts

Subbasin	Program	Title
Upper Snake	Resident Fish	Study Proposed Tribal Trout Hatchery (Snake Basin)
Upper Snake	Resident Fish	Habitat Improvement - Fort Hall Bottoms
Upper Snake	Resident Fish	Master Plan/ Sho-Ban & Sho-Paiute Trout Hatchery
Upper Snake	Wildlife	Wildlife Loss Assessment For Palisades Dam
Upper Snake	Wildlife	Upper Snake Hydro Projects Wildlife Mitigation
Upper Snake	Wildlife	Minidoka Wildlife Loss Study And Mitigation Plan
Upper Snake	Wildlife	Minidoka Dam Wildlife Mitigation Plan
Upper Snake	Wildlife	South Fork Snake Wildlife Riparian Project
Upper Snake	Wildlife	Camas Prairie Wildlife Mitigation Project Phase I
Upper Snake	Wildlife	South Fork Snake / Sand Creek Wildlife Projects
Upper Snake	Wildlife	South Idaho Wildlife Mitigation Projects -(IDFG)
Upper Snake	Wildlife	Southern Idaho Wildlife Mitigation - Shoban Tribes
Upper Snake	Wildlife	South Fork Snake (Soda Hills)
Upper Snake	Wildlife	Deer Parks Complex Wildlife Habitat
Upper Snake	Wildlife	Soda Springs Hills Wildlife Mitigation O&M
Systemwide	Anadromous Fish	Imprinting Of Salmon And Steelhead For Homing
Systemwide	Anadromous Fish	Genetic Identification Study
Systemwide	Anadromous Fish	Columbia Hatchery Contributions To Chinook Fishery
Systemwide	Anadromous Fish	Power Peaking Effects- Fall Chinook Egg Incubation
Systemwide	Anadromous Fish	Survey Fish Screens & Ladders At Water Withdrawals
Systemwide	Anadromous Fish	Smolt Monitoring Program
Systemwide	Anadromous Fish	Assemble & Analyze Anadromous Fishery Data
Systemwide	Anadromous Fish	Columbia River Coded-Wire Tag Recovery
Systemwide	Anadromous Fish	Barge Transportation Study
Systemwide	Anadromous Fish	Predation And Development Of Prey Protection
Systemwide	Anadromous Fish	Develop Effective Media For Juvenile Chinook
Systemwide	Anadromous Fish	Study Stress On Transported Chinook Smolts
Systemwide	Anadromous Fish	Snake River Fall Chinook Brood Program
Systemwide	Anadromous Fish	Bioenergetics Of Outmigrant Salmon
Systemwide	Anadromous Fish	Predation Index / Model & Harvest Option
Systemwide	Anadromous Fish	Coded-Wire Tag Recovery
Systemwide	Anadromous Fish	Coded Wire Tag - PSMFC
Systemwide	Anadromous Fish	Coded Wire Tag - ODFW
Systemwide	Anadromous Fish	Coded Wire Tag - USFWS
Systemwide	Anadromous Fish	Coded Wire Tag - WDFW
Systemwide	Anadromous Fish	Development Of New Concepts In Fish Ladder Design
Systemwide	Anadromous Fish	Rapid Diagnosis Of IHN Virus
Systemwide	Anadromous Fish	IHN Virus Control

Subbasin	Program	Title
Systemwide	Anadromous Fish	Ihn Virus Workshop
Systemwide	Anadromous Fish	Workshop On Small Hydropower Plants
Systemwide	Anadromous Fish	Smolt Marking - USFWS
Systemwide	Anadromous Fish	Idaho Habitat Evaluation/Offsite Mitigation Record
Systemwide	Anadromous Fish	Diagnosis Of 5 Pathogens
Systemwide	Anadromous Fish	Epidemiology And Control Of Infectious Diseases
Systemwide	Anadromous Fish	Pen Rearing And Imprinting Of Fall Chinook Salmon
Systemwide	Anadromous Fish	New Fish Tag System
Systemwide	Anadromous Fish	New Pit Tag Monitoring Equipment
Systemwide	Anadromous Fish	Columbia River Stock Assessment
Systemwide	Anadromous Fish	Low Cost Hatchery Facilities Design
Systemwide	Anadromous Fish	Develop Rations For Enhanced Survival Of Salmon
Systemwide	Anadromous Fish	Evaluate Low-Cost Salmon Production Facilities
Systemwide	Anadromous Fish	Survey Hatchery Production In Columbia Basin
Systemwide	Anadromous Fish	Investigate Process For Registration Of Squoxin
Systemwide	Anadromous Fish	Snake River Coho Brood Stock Program
Systemwide	Anadromous Fish	Columbia Chinook & Steelhead Stock Identification
Systemwide	Anadromous Fish	Water Budget Management
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Colville Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Spokane Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Nez Perce Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Yakima Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Warm Springs Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals - Umatilla Tribe
Systemwide	Anadromous Fish	Anadromous Fish Program Goals: Shoshone - Bannock
Systemwide	Anadromous Fish	Anadromous Fish Program Goals: Shoshone - Paiute
Systemwide	Anadromous Fish	Anadromous Fish Program Goal: Intertribe (CRITFC)
Systemwide	Anadromous Fish	Develop Nitrogen Gas Model (Gasspill)
Systemwide	Anadromous Fish	Smolt Monitoring At Federal Dams
Systemwide	Anadromous Fish	Fish Marking: Chinook And Steelhead (Idaho)
Systemwide	Anadromous Fish	Hydro-Cumulative Effects Methodology
Systemwide	Anadromous Fish	Adult Salmonid Accounting Procedures
Systemwide	Anadromous Fish	Evaluation Of A Subunit Vaccine Against Ihn
Systemwide	Anadromous Fish	Etiology Of Early Salmonid Lifestage Diseases
Systemwide	Anadromous Fish	Effect Of Nutrition On Immune Responses Of Salmon
Systemwide	Anadromous Fish	Develop Vaccine For Bacterial Kidney Disease -Bkd
Systemwide	Anadromous Fish	Quantify Loss Mitigation For Dam Operations
Systemwide	Anadromous Fish	Survey Of Artificial Salmon Production Facilities

<b>Subbasin</b>	<b>Program</b>	<b>Title</b>
Systemwide	Anadromous Fish	Workshop On Smoltification Research
Systemwide	Anadromous Fish	Influence Of Vitamin Nutrition On Immune Response
Systemwide	Anadromous Fish	Juvenile Radio Tag Studies
Systemwide	Anadromous Fish	Electrophoresis Demonstration Genetics Project
Systemwide	Anadromous Fish	Design Of Fish And Wildlife Mitigation Accounting
Systemwide	Anadromous Fish	Assist BPA Anadromous Fish Mitigation Analysis
Systemwide	Anadromous Fish	National Symposium - Small Hydro Plants & Fish
Systemwide	Anadromous Fish	Anadromous Fish Health Monitoring In Washington
Systemwide	Anadromous Fish	Anadromous Fish Health Monitoring (WDF)
Systemwide	Anadromous Fish	Downstream Migrant Monitoring
Systemwide	Anadromous Fish	Columbia Basin Habitat Improvement Evaluation
Systemwide	Anadromous Fish	Intertie Policy & Expansion Impacts (Fishpass)
Systemwide	Anadromous Fish	Facility Support For Bkd-Vaccine Testing
Systemwide	Anadromous Fish	Slide Show On Columbia Basin Habitat Enhancement
Systemwide	Anadromous Fish	Stream Habitat Enhancement Evaluation Workshop
Systemwide	Anadromous Fish	Alternative Fish Transportation Strategies
Systemwide	Anadromous Fish	Energy And Environmental Policy Intern Study
Systemwide	Anadromous Fish	Anadromous Fish Health Monitoring / Idaho
Systemwide	Anadromous Fish	Augmented Fish Health Monitoring / Oregon
Systemwide	Anadromous Fish	Augmented Fish Health Monitoring / USFWS
Systemwide	Anadromous Fish	Supplemental Oxygen Effectiveness Consultation
Systemwide	Anadromous Fish	Pit Tag Purchase Fy/87
Systemwide	Anadromous Fish	Non-Federal Smolt Monitoring (Fish Passage Center)
Systemwide	Anadromous Fish	Comparative Survival - Hatchery Pit Tagged Chinook
Systemwide	Anadromous Fish	Update Tensionsometer Equipment
Systemwide	Anadromous Fish	Freeze Brand Recovery Data (McNary Dam)
Systemwide	Anadromous Fish	Smolt And Adult A/V Monitoring Project
Systemwide	Anadromous Fish	Smolt Physiology - Travel Time And Survival
Systemwide	Anadromous Fish	Film BPA Fish Enhancement Activities In Idaho
Systemwide	Anadromous Fish	Literature Review Of Flow Fluctuations Effects
Systemwide	Anadromous Fish	Analysis Of Historic Data For Juveniles & Adult S
Systemwide	Anadromous Fish	Contractor For Water Budget Analysis
Systemwide	Anadromous Fish	Develop System For Removing Malachite Green
Systemwide	Anadromous Fish	Analyze Salmon & Steelhead Supplementation Efforts
Systemwide	Anadromous Fish	AFS Conference On Stream Habitat Rehabilitation
Systemwide	Anadromous Fish	Dworshak Photoperiod & Temperature Treatments
Systemwide	Anadromous Fish	Life Cycle Of IHN Virus
Systemwide	Anadromous Fish	Evaluation Of Oxygen Supplementation Equipment

Subbasin	Program	Title
Systemwide	Anadromous Fish	Effects Of Coded-Wire Tagging On Spring Chinook
Systemwide	Anadromous Fish	Elisa-Based Segregation Of Adult Chinook For Bkd
Systemwide	Anadromous Fish	Erythromycin Registration
Systemwide	Anadromous Fish	Analytical Methods For Malachite Green
Systemwide	Anadromous Fish	Assess Columbia Basin Anadromous Hatcheries
Systemwide	Anadromous Fish	Smolt Quality Assessment Of Spring Chinook
Systemwide	Anadromous Fish	Water Budget Technical Support
Systemwide	Anadromous Fish	Research On Anti-Fungal Compounds
Systemwide	Anadromous Fish	Annual Coded Wire Tag Program - USFWS Hatcheries
Systemwide	Anadromous Fish	Expand Coded Wire Tags - WA Columbia Hatcheries
Systemwide	Anadromous Fish	Expand Coded Wire Tags - Or Columbia Hatcheries
Systemwide	Anadromous Fish	Erythrocytic Inclusion Body Syndrome Etiology
Systemwide	Anadromous Fish	Modeling Optimized Hatchery Production
Systemwide	Anadromous Fish	Survey Of Salmon Cultural Research
Systemwide	Anadromous Fish	Genetic M&E Program For Salmon & Steelhead
Systemwide	Anadromous Fish	Epidemiological Salmonid Survival Studies
Systemwide	Anadromous Fish	Columbia River Salmon Passage (Crisp) Model
Systemwide	Anadromous Fish	Production Impacts Of Various Hatchery Stocks
Systemwide	Anadromous Fish	Fungal Infection: Spring And Summer Chinook Salmon
Systemwide	Anadromous Fish	Squawfish Management
Systemwide	Anadromous Fish	Squawfish Sport Rewards (PSMFC)
Systemwide	Anadromous Fish	Squawfish Management Evaluation
Systemwide	Anadromous Fish	Columbia Basin Pit-Tag Information System (Ptagis)
Systemwide	Anadromous Fish	Pit Tag Purchases
Systemwide	Anadromous Fish	Genetic Analyses Of Columbia & Snake Sockeye
Systemwide	Anadromous Fish	Evaluate & Implement Stream Habitat Improvements
Systemwide	Anadromous Fish	Snake Juvenile Wild Spring Chinook Mortality Study
Systemwide	Anadromous Fish	Elisa-Based Segregation Of Adult Chinook For Bkd
Systemwide	Anadromous Fish	Idaho Water Rental - Flows
Systemwide	Anadromous Fish	Evaluate River Flow Pertaining To Smolt Survival
Systemwide	Anadromous Fish	Genetic Consultation For BPA
Systemwide	Anadromous Fish	The Natures (Natural Rearing Enhancement Systems)
Systemwide	Anadromous Fish	Fish Habitat Project Field Reviews And Evaluations
Systemwide	Anadromous Fish	Rangeland Grazing Strategies Training Session
Systemwide	Anadromous Fish	Law Enforcement Protection Of Salmon Stocks
Systemwide	Anadromous Fish	Law Enforcement Protection- Salmon Stocks (CRITFC)
Systemwide	Anadromous Fish	Law Enforcement Protection Of Salmonids (Or)
Systemwide	Anadromous Fish	Law Enforcement Protection Of Salmonids (WDF)

Subbasin	Program	Title
Systemwide	Anadromous Fish	Law Enforcement Protection Of Salmonids (IDFG)
Systemwide	Anadromous Fish	Law Enforcement Interagency Task Force Coordin
Systemwide	Anadromous Fish	Law Enforcement Protection Of Salmonids (MTFW)
Systemwide	Anadromous Fish	Law Enforcement Transition Funding - Nez Perce
Systemwide	Anadromous Fish	Columbia Basin Regional Fish Screening
Systemwide	Anadromous Fish	Crisp.0 Model Development
Systemwide	Anadromous Fish	Fish Passage Evaluations - Lower Columbia River
Systemwide	Anadromous Fish	Integrated Hatchery Operations And Policy
Systemwide	Anadromous Fish	Passage, Spawning & Identity- Snake River Chinook
Systemwide	Anadromous Fish	Ecosystem Modeling For SOR/Afwg And Hybrid Crisp
Systemwide	Anadromous Fish	Hydropower Environmental Mitigation Study - Vol Ii
Systemwide	Anadromous Fish	Applications Of Sound To Modify Behavior Of Fish
Systemwide	Anadromous Fish	Tech Assistance Juv/Adult Migrant M&E Facilities
Systemwide	Anadromous Fish	Environmental Monitoring In The Snake River Basin
Systemwide	Anadromous Fish	Development Of Laser-Marking Of Salmonids
Systemwide	Anadromous Fish	Idaho Fish Screen Shop
Systemwide	Anadromous Fish	1992 Watershed Symposium
Systemwide	Anadromous Fish	Streamwalk Training
Systemwide	Anadromous Fish	E Washington Landowners Adopt-A-Stream Training
Systemwide	Anadromous Fish	Allowable Gas Supersaturation At Dams
Systemwide	Anadromous Fish	Non-Intrusive Gbd Monitoring Technologies
Systemwide	Anadromous Fish	Signs Of Gas Bubble Trauma (Gbd) In Salmonids
Systemwide	Anadromous Fish	Adult Upstream Survival - Biological Analysis
Systemwide	Anadromous Fish	Development And Implementation Of Harvest Projects
Systemwide	Anadromous Fish	Smolt Survival Estimates Through Dams & Reservoirs
Systemwide	Anadromous Fish	Technical Assistance With The Life Cycle Model
Systemwide	Anadromous Fish	Flow Volume Provisions / Support
Systemwide	Anadromous Fish	Water Acquisition Pilot Project
Systemwide	Anadromous Fish	Water Purchase Acquisition/Lease Fee/Purchase Opt
Systemwide	Anadromous Fish	Captive Salmonid Broodstock Technology Demo
Systemwide	Anadromous Fish	Comprehensive Analysis Of Salmonid Production
Systemwide	Anadromous Fish	Electrophoretic Analysis Of Snake River Sockeye
Systemwide	Anadromous Fish	Fish Passage Center
Systemwide	Anadromous Fish	Columbia Basin Ecosystem Management
Systemwide	Anadromous Fish	Audit Columbia Basin Anadromous Hatcheries (Ihot)
Systemwide	Anadromous Fish	Joint Culture Facility Scientific Review
Systemwide	Anadromous Fish	Reservoir Operations Committee Facilitator
Systemwide	Anadromous Fish	Path - Facilitation, Tech Assistance & Peer Review

Subbasin	Program	Title
Systemwide	Anadromous Fish	Path Transition Placeholder
Subbasin	Program	Title
Systemwide	Anadromous Fish	Path - Participation By State And Tribal Agencies
Systemwide	Anadromous Fish	Technical Support For Path - NMFS Staff
Systemwide	Anadromous Fish	Path - Participation By USFWS
Systemwide	Anadromous Fish	Review Proposed Projects & Gas Bubble Trauma
Systemwide	Anadromous Fish	Technical Support For The Path Process
Systemwide	Anadromous Fish	Pit Tagging Hatchery Spring/Summer Chinook - WDFW
Systemwide	Anadromous Fish	Pit Tagging Hatchery Spring/Summer Chinook - ODFW
Systemwide	Anadromous Fish	Pit Tagging Hatchery Spring/Summer Chinook - IDFG
Systemwide	Anadromous Fish	Pit Tagging Hatchery Spring/Summer Chinook - USF&W
Systemwide	Anadromous Fish	Gas Bubble Disease Research On Juvenile Salmonids
Systemwide	Anadromous Fish	Effects Of Dissolved Gas Supersat On Resident Fish
Systemwide	Anadromous Fish	Gas Bubble Disease Signs & Survival Of Smolts
Systemwide	Anadromous Fish	Salmonid Cumulative Exposure To Dissolved Gas
Systemwide	Anadromous Fish	Distribution Of Smolts & Gas Bubble Disease
Systemwide	Anadromous Fish	Manchester Spring Chinook Captive Brood
Systemwide	Anadromous Fish	Five Year Plan Watersheds (CRITFC)
Systemwide	Anadromous Fish	NEPA Studies For Model Watershed Projects
Systemwide	Anadromous Fish	NEPA - Watershed Management Program EIS
Systemwide	Anadromous Fish	Path Program Technical Support (UW)
Systemwide	Anadromous Fish	Incidental Expenses - Gas Bubble Disease Research
Systemwide	Anadromous Fish	Evaluation & Habitat Response To Recent Storms
Systemwide	Anadromous Fish	Hydro Regulator Model Development
Systemwide	Anadromous Fish	Peer Review For CRITFC Watershed Projects - 1
Systemwide	Anadromous Fish	Peer Review For CRITFC Watershed Projects -2
Systemwide	Anadromous Fish	Peer Review For CRITFC Watershed Projects -3
Systemwide	Anadromous Fish	Assess Impacts Of Hydro Dev On Mainstem Habitats
Systemwide	Anadromous Fish	Assess Population In Columbia River Chinook Salmon
Systemwide	Anadromous Fish	Review Columbia Basin Artificial Production
Systemwide	Anadromous Fish	Technical Support To Path (Dr. James Anderson)
Systemwide	Anadromous Fish	Analytical Support - Dr James Anderson
Systemwide	Anadromous Fish	Design/Construction Services Contractor Pool
Systemwide	Anadromous Fish	Tech Writer Sockeye/Chinook Oversight Committee
Systemwide	Anadromous Fish	Implement Wy-Kan-Ush-Mi Wa-Kish-Wit Watershed Plan
Systemwide	Anadromous Fish	Effect Of Grazing Exclosures On Stream Habitat
Systemwide	Anadromous Fish	Watershed Response Of Stream Habitat To Mine Waste

Subbasin	Program	Title
Systemwide	Anadromous Fish	Info-Artificial Production Mitigation Col R Basin
Systemwide	Anadromous Fish	NMFS Net Exchange Program
Systemwide	Anadromous Fish	Gillnet Mesh Selectivity Study
Systemwide	Anadromous Fish	Mesh Restriction Survey/Enhanced Law Enforcement
Systemwide	Anadromous Fish	NRCS Rosgen Training Support
Systemwide	Anadromous Fish	Nutrient Impact On Salmon Prod In Columbia R Basin
Systemwide	Anadromous Fish	Nutrient Use From Spawning Salmon By Juv Salmon
Systemwide	Anadromous Fish	Analytical Modeling Support - NMFS
Systemwide	Anadromous Fish	Training Support To NRCS/Wildland Hydrology
Systemwide	Anadromous Fish	Infrastructure For Fda Registration Erythromycin
Systemwide	Anadromous Fish	Recondition Wild Steelhead Kelts
Systemwide	Anadromous Fish	Law Enforcement Anadromous Salmonids In Mainstem
Systemwide	Anadromous Fish	Evaluate Hydraulic Turbulence On Migratory Fish
Systemwide	Anadromous Fish	Supersaturated Water Effect On Adult Salmonids
Systemwide	Anadromous Fish	Meadow Creek Riparian Pasture
Systemwide	Anadromous Fish	Conservation Reserve Enhancement Program Incentive
Systemwide	Anadromous Fish	Analyze Genetic & Behavioral Change Domestication
Systemwide	Anadromous Fish	Heritability Disease Resistance & Immune Function
Systemwide	Program Coordination	Fish And Wildlife Program Implementation
Systemwide	Program Coordination	Pacific Northwest Rivers Study, Develop Ned
Systemwide	Program Coordination	Formalize Procedures For Proposal Evaluations
Systemwide	Program Coordination	Technical Assistance For Fish & Wildlife Projects
Systemwide	Program Coordination	Annual Project Review
Systemwide	Program Coordination	Develop Contract Data Information System (Pmis)
Systemwide	Program Coordination	Clerk-Typist Services
Systemwide	Program Coordination	Clerk-Typist Contracts
Systemwide	Program Coordination	Facility Rental - Spokane Holiday Inn
Systemwide	Program Coordination	Facility Rental (Holiday Inn) For Project Review
Systemwide	Program Coordination	Facilitator For Annual Project Review Fy86
Systemwide	Program Coordination	Newsclips On Various BPA Fish & Wildlife Projects
Systemwide	Program Coordination	Technical Assistance- BPA Fish & Wildlife Program
Systemwide	Program Coordination	Fund (Twg) Technical Work Group- Research Emphasis
Systemwide	Program Coordination	Technical Assistance For BPA Fish & Wildlife
Systemwide	Program Coordination	Maintain Coordinated Information System (Cis)
Systemwide	Program Coordination	BPA- Coordinated Information System (USGS Mapping)
Systemwide	Program Coordination	Develop & Maintain Streamnet By Merger Of Cis /Ned
Systemwide	Program Coordination	BPA - Fish & Wildlife Program Internal Support
Systemwide	Program Coordination	Afs Bioengineering Symposium

Subbasin	Program	Title
Systemwide	Program Coordination	Parking Space For BPA Office At Yakima
Systemwide	Program Coordination	Workshop For Fish Survival
Systemwide	Program Coordination	Cbfga Coordination. & Scientific Review Group
Systemwide	Program Coordination	Annual Work Plan - Columbia Basin F&W Foundation
Systemwide	Program Coordination	Scientific Review Group Support - Doe
Systemwide	Program Coordination	Scientific Review Group Meeting Facilities
Systemwide	Program Coordination	Participation In Analytical Methods Coordination
Systemwide	Program Coordination	Analytical Methods Coordination - ODFW
Systemwide	Program Coordination	Analytical Methods Coordination - IDFG
Systemwide	Program Coordination	Analytical Methods Coordination - WDF
Systemwide	Program Coordination	Analytical Methods Coordination - PSMFC
Systemwide	Program Coordination	Division Retreat Meeting Facilities
Systemwide	Program Coordination	Consultant For ESA, SOR, & Other Concerns
Systemwide	Program Coordination	Write &Edit BPA's Comments- Integrated System Plan
Systemwide	Program Coordination	Program Support - Offsite Room Rentals
Systemwide	Program Coordination	CBFWA F&W Program Planning And Coordination
Systemwide	Program Coordination	Support For Habitat Education Activities
Systemwide	Program Coordination	Fish And Wildlife Public Education Project
Systemwide	Program Coordination	BPA Fish & Wildlife Internet Infrastructure
Systemwide	Program Coordination	PSMFC Educational Publications
Systemwide	Program Coordination	Watershed Education Interactive Display For OMSI
Systemwide	Program Coordination	Regional Habitat Education Support
Systemwide	Program Coordination	Technical Support For Variety Of Biological Issues
Systemwide	Program Coordination	Electronic Reference Library
Systemwide	Program Coordination	Cultural, Social, Institutional Impacts Of ESA
Systemwide	Program Coordination	Regional Analytical Coordination Group
Systemwide	Program Coordination	Native American Science Outreach Network Students
Systemwide	Program Coordination	F&W Newsletter Development Grant
Systemwide	Program Coordination	Energy Newsdata Demonstration Project (Fish.Net)
Systemwide	Program Coordination	BPA Technical Management Team Database Support
Systemwide	Program Coordination	Alternative Dispute Resolution Funding
Systemwide	Program Coordination	NEPA Studies For A Variety Of Projects: Or, Wa, Id
Systemwide	Program Coordination	Independent Scientific Review Panel
Systemwide	Program Coordination	Analytic Support Path/ESA Biology Assessment
Systemwide	Program Coordination	Electronic Fish And Wildlife Newsletter
Systemwide	Program Coordination	Assess Hydro And Habitat Impacts - USGS
Systemwide	Program Coordination	Regional Forum Facilitator
Systemwide	Program Coordination	Natural Heritage Program (NHP)

Subbasin	Program	Title
Systemwide	Program Coordination	Geographic Information System(GIS) Program
Systemwide	Program Coordination	Writer - Editor For ESA Meetings
Systemwide	Program Coordination	USF&WS Wildlife Coordination
Systemwide	Program Coordination	Multispecies Framework Process
Systemwide	Program Coordination	Redesign Of F&W Management Systems
Systemwide	Program Coordination	Washington Natural Heritage Information System
Systemwide	Program Coordination	Project Management Plan Templates
Systemwide	Program Coordination	Salmon Watch Program
Systemwide	Program Coordination	Capital Cost Review And Monitoring
Systemwide	Program Coordination	Habitat Concept Plan
Systemwide	Program Coordination	Federal Caucus/Unified Plan
Systemwide	Program Coordination	Hatchery & Harvest Project For The Federal Caucus
Systemwide	Program Coordination	Brian Blair - Watershed Coordinators Meeting
Systemwide	Program Coordination	Pacific Northwest National Laboratory
Systemwide	Program Coordination	NW Fishweb Online Guide
Systemwide	Program Coordination	Technical Services: Performance Measures
Systemwide	Program Coordination	Technical Support Project Placeholder
Systemwide	Program Coordination	Capital Placeholder Per NWPPC Guidance
Systemwide	Program Coordination	BPA Technical Support Placeholder
Systemwide	Program Coordination	CBFWA Placeholder
Systemwide	Program Coordination	Innovative Projects Placeholder
Systemwide	Program Coordination	Sub Basin Planning Placeholder
Systemwide	Program Coordination	Program Analysis Placeholder
Systemwide	Program Coordination	Subbasin Assessments
Systemwide	Program Coordination	Baseline Key Ecological Functions - NHI
Systemwide	Program Coordination	Baseline Key Ecological Functions - WDF&W
Systemwide	Program Coordination	Analytical Support For BPA
Systemwide	Resident Fish	Implementation Plan For MT Resident Fish Measures
Systemwide	Resident Fish	White Sturgeon Workshop
Systemwide	Resident Fish	Columbia River White Sturgeon Study
Systemwide	Resident Fish	Develop Work Plan For Sturgeon Research
Systemwide	Resident Fish	Evaluate Sturgeon Habitat Needs - Columbia & Snake
Systemwide	Resident Fish	White Sturgeon Life History And Genetics Study
Systemwide	Resident Fish	Document Native Wa Trout Populations
Systemwide	Resident Fish	Bull Trout Biological Assessment
Systemwide	Resident Fish	Assess Genetics Of Columbia Basin White Sturgeon
Systemwide	Wildlife	Columbia Basin Wildlife Mitigation Status Report
Systemwide	Wildlife	Montana Wildlife Habitat Protection

Subbasin	Program	Title
Systemwide	Wildlife	Montana Wildlife Trust
Systemwide	Wildlife	Lower Columbia Wildlife Mitigation Plan
Systemwide	Wildlife	Oregon Wildlife Trust Program Planning
Systemwide	Wildlife	Washington Coalition Wildlife Mitigation Agreement
Systemwide	Wildlife	Washington Wildlife Coordination
Systemwide	Wildlife	Umatilla Tribe Wildlife Coordination
Systemwide	Wildlife	Gap Analysis - ODFW
Systemwide	Wildlife	Wildlife Acquisition EIS
Systemwide	Wildlife	Oregon Wildlife Mitigation Sites
Systemwide	Wildlife	Oregon Wildlife Mitigation Sites - USFWS
Systemwide	Wildlife	Oregon Wildlife Mitigation Sites -Ctwsir
Systemwide	Wildlife	Oregon Wildlife Mitigation Sites - ODFW
Systemwide	Wildlife	Wildlife Plan: Standardize M & E
Systemwide	Wildlife	Wildlife Mitigation M & E
Systemwide	Wildlife	HEP Training
Crab Creek	Resident Fish	Assessment Of Fishery Improvement At Moses Lake
Crab Creek	Wildlife	Swanson Lakes Sharp Tailed Grouse Management
Crab Creek	Wildlife	Range Management -Swanson Lake Sharp-Tailed Grouse
Crab Creek	Wildlife	Razor Ranch Acquisition Crab Cr Ws Restoration
Yakima	Anadromous Fish	Yakima River Spring Chinook Enhancement Study
Yakima	Anadromous Fish	Predesign Screen / Ladder Studies, Yakima Basin
Yakima	Anadromous Fish	Estimated Screen Costs: Sunnyside And Wapato Dams
Yakima	Anadromous Fish	Fish Marking: Steelhead - Yakima Basin
Yakima	Anadromous Fish	Final Design Data For Sunnyside Dam Screens
Yakima	Anadromous Fish	Final Design- Sunnyside, Wapato, Richland Passage
Yakima	Anadromous Fish	Predesign Of Remaining 10 Yakima Screen Projects
Yakima	Anadromous Fish	Sunnyside Screens Construction
Yakima	Anadromous Fish	Horn Rapids Screen Construction
Yakima	Anadromous Fish	Wapato Screen And Ladder Construction
Yakima	Anadromous Fish	Toppenish Creek And Satus Unit Screens And Ladder
Yakima	Anadromous Fish	Horn Rapids Screen Construction
Yakima	Anadromous Fish	Improve Sunnyside Ladders And Screen
Yakima	Anadromous Fish	Evaluation Of Yakima Passage Improvements
Yakima	Anadromous Fish	Temporary Fish Passage On Toppenish Creek
Yakima	Anadromous Fish	Construct Security Fence - Sunnyside Right Bank
Yakima	Anadromous Fish	Cle Elum Lake Basin Sockeye Study
Yakima	Anadromous Fish	Construct Westside & Marion Drain Screen & Ladder
Yakima	Anadromous Fish	Little Naches Passage Improvement - Salmon Falls

<b>Subbasin</b>	<b>Program</b>	<b>Title</b>
Yakima	Anadromous Fish	Satus Creek Screen & Ladder Construction
Yakima	Anadromous Fish	Upper Toppenish Creek Screen Construction
Yakima	Anadromous Fish	Yakima Passage Predesign - Remaining Phase I Sites
Yakima	Anadromous Fish	Video Of Yakima Fish Passage Project
Yakima	Anadromous Fish	Construct Toppenish, Westside & Ellensburg Screens
Yakima	Anadromous Fish	Ellensburg Fish Screens Construction
Yakima	Anadromous Fish	Westside Ditch Screen Construction
Yakima	Anadromous Fish	Marion Drain Ladder Construction
Yakima	Anadromous Fish	Purchase Plaques -Audio/Visual Support Project
Yakima	Anadromous Fish	Yakima Fishery Film
Yakima	Anadromous Fish	Video Of Yakima Phase II Screen Project
Yakima	Anadromous Fish	Yakima Hatchery - Master Plan Development
Yakima	Anadromous Fish	Yakima Hatchery - Wapato Canal Pen Rearing
Yakima	Anadromous Fish	Film Yakima Fish Screen And Ladder Projects
Yakima	Anadromous Fish	Yakima Hatchery - Construction
Yakima	Anadromous Fish	Yakima Hatchery Acclimation Sites Groundwater
Yakima	Anadromous Fish	Yakima Hatchery - Cle Elum Well Field Development
Yakima	Anadromous Fish	Yakima Hatchery - Wells Ce5/Ce6 (Land Purchase)
Yakima	Anadromous Fish	Clark Flat Acclimation Site - Yakima Hatchery
Yakima	Anadromous Fish	Easton Acclimation Site - Yakima Hatchery
Yakima	Anadromous Fish	Jack Creek Acclimation Site - Yakima Hatchery
Yakima	Anadromous Fish	Yakima Hatchery Spring Chinook Acclimation Sites
Yakima	Anadromous Fish	Yakima Hatchery - Acclimation Site Construction
Yakima	Anadromous Fish	Yakima Hatchery Construction-River Water Cooling
Yakima	Anadromous Fish	Yakima Hatchery Construction-Housing Units Phase 2
Yakima	Anadromous Fish	YKFP - Design And Construction
Yakima	Anadromous Fish	Yakima Natural Production And Enhancement Program
Yakima	Anadromous Fish	Yakima/ Klickitat Fisheries Project Management
Yakima	Anadromous Fish	Yakima Engineer Assistance
Yakima	Anadromous Fish	Tribal Member For Yakima Species Interaction Study
Yakima	Anadromous Fish	Yakima Hatchery Training And Education
Yakima	Anadromous Fish	Yakima Fish Passage Video Monitoring
Yakima	Anadromous Fish	Yakima Tribal Fisheries Technicians (1993)
Yakima	Anadromous Fish	Yakima Spring Chinook Natural Production Objective
Yakima	Anadromous Fish	Yakama Tribal Fisheries Technician Activities
Yakima	Anadromous Fish	Yakima Steelhead & Fall Chinook Objectives
Yakima	Anadromous Fish	Chandler Juvenile Facility Monitoring & Evaluation
Yakima	Anadromous Fish	Monitoring & Evaluation-Yakima/Klickitat Fisheries

Subbasin	Program	Title
Yakima	Anadromous Fish	Interim O&M For Cle Elum (Yakima) Hatchery
Yakima	Anadromous Fish	YKFP - Management Data And Habitat
Yakima	Anadromous Fish	Yin Hatchery Training And Education
Yakima	Anadromous Fish	Yakima Hatchery - Coordination Irrigation District
Yakima	Anadromous Fish	Yakima Hatchery - Basin Water Analysis
Yakima	Anadromous Fish	Yakima Hatchery - Economic Study
Yakima	Anadromous Fish	Yakima Hatchery - Preliminary Engineering
Yakima	Anadromous Fish	Yakima Hatchery - Experimental Design - WDF
Yakima	Anadromous Fish	Yakima Hatchery - Experimental Design - WDW
Yakima	Anadromous Fish	Yakima/ Klickitat Salmonid Radio Telemetry Study
Yakima	Anadromous Fish	Yakima Phase II Screens - Pre-design Group I
Yakima	Anadromous Fish	Yakima Hatchery - Environmental Assessment Review
Yakima	Anadromous Fish	Yakima - Species Interaction Study
Yakima	Anadromous Fish	Yakima Hatchery - Project Leader Function
Yakima	Anadromous Fish	Chandler Juvenile Trap Calibration
Yakima	Anadromous Fish	Yakima Hatchery - Final Design
Yakima	Anadromous Fish	Technical Design For Yakima Salmon/Steelhead Prod
Yakima	Anadromous Fish	Yakima Hatchery Final Design/Well Field Development
Yakima	Anadromous Fish	Yakima Hatchery Final Design/Instrumentation/Serv
Yakima	Anadromous Fish	Yakima Hatchery Final Design/Acclimation Permits
Yakima	Anadromous Fish	Yakima Hatchery Final Design Acclimation Sites
Yakima	Anadromous Fish	Yakima Adult And Juvenile Trapping Design
Yakima	Anadromous Fish	Evaluate Impacts Of Yakima Production Project
Yakima	Anadromous Fish	Yakima Phase II Screens - Fabrication
Yakima	Anadromous Fish	Inventory Habitat & Food Abundance Data
Yakima	Anadromous Fish	Yakima Phase II Screens - Construction
Yakima	Anadromous Fish	Yakima Screens - Fogarty Land Acquisition
Yakima	Anadromous Fish	Yakima Screens - Moxee Hubbard Land Acquisition
Yakima	Anadromous Fish	Yakima Screens - Selah Moxee Land Acquisition
Yakima	Anadromous Fish	South Naches Fish Screens Land Acquisition
Yakima	Anadromous Fish	Yakima Screens - Phase II - O & M
Yakima	Anadromous Fish	Assistance For Yakima Supplementation Research
Yakima	Anadromous Fish	Assistance For Yakima M&E Program Development
Yakima	Anadromous Fish	Yakima Experimental Design Development
Yakima	Anadromous Fish	Wild Smolt Behavior And Physiology
Yakima	Anadromous Fish	Cascade Irrigation District Fish Screens
Yakima	Anadromous Fish	Bachelor-Hatten Fish Passage Land Acquisition
Yakima	Anadromous Fish	Yakima Biospecification Interface

Subbasin	Program	Title
Yakima	Anadromous Fish	Economic Impact Analysis For Yakima River Basin
Yakima	Anadromous Fish	Production Goals: Yakima Fall Chinook & Steelhead
Yakima	Anadromous Fish	Yakima Basin Fish Facilities O&M
Yakima	Anadromous Fish	Update Yakima Fisheries Project Economic Analysis
Yakima	Anadromous Fish	Yakima / Klickitat Fisheries Management
Yakima	Anadromous Fish	Yakima/Klickitat Monitoring And Evaluation Program
Yakima	Anadromous Fish	Chandler Juvenile Facility O&M
Yakima	Anadromous Fish	Lower Yakima River Predation Studies
Yakima	Anadromous Fish	Yakima Hatchery Fish Predation On Wild Smolts
Yakima	Anadromous Fish	Yakima Data Processing & Information Management
Yakima	Anadromous Fish	YKFP - Yakima / Klickitat Fisheries M & E
Yakima	Anadromous Fish	Yakima/ Klickitat Fisheries Scientific Management
Yakima	Anadromous Fish	Refinement Of Marking Methods For Yakima Fish
Yakima	Anadromous Fish	Upper Yakima River Species Interaction Studies
Yakima	Anadromous Fish	Yakima Spring Chinook Genetic Management Framework
Yakima	Anadromous Fish	Yakima Policy / Technical Involvement & Planning
Yakima	Anadromous Fish	Developing Nit/Lnit Rearing Strategies For Yakima
Yakima	Anadromous Fish	Monitoring Supplemental Response - Yakima Project
Yakima	Anadromous Fish	Roza Dam Juvenile Guidance Behavior -WDFW
Yakima	Anadromous Fish	YKRP Development Of Bird Predation Index -WDFW
Yakima	Anadromous Fish	Yakima Spring Chinook Salmon Interaction/Indices
Yakima	Anadromous Fish	Genetic Pathogens Of Yakima Spring Chinook (WDFW)
Yakima	Anadromous Fish	WDFW Coded-Wire Tag Of Upper Yakima Spring Chinook
Yakima	Anadromous Fish	WDFW/YKFP Supplementation Monitoring Activities
Yakima	Anadromous Fish	Policy/Technical Involvement And Planning For YKFP
Yakima	Anadromous Fish	Purchase Land At Cle Elum For The Yakima Hatchery
Yakima	Anadromous Fish	Yakama Tribe: Early Implementation Projects 1996
Yakima	Anadromous Fish	Yakima River & Marion Drain Fall Chinook Project
Yakima	Anadromous Fish	Yakima River Coho Restoration (Yn)
Yakima	Anadromous Fish	Fall Chinook Yakima River / Marion Drain O&M / M&E
Yakima	Anadromous Fish	Fall Chinook Yakima R/Marion Drain Construction
Yakima	Anadromous Fish	Yn - Coho Supplementation Yakima River O&M/M&E
Yakima	Anadromous Fish	Yn - Coho Supplementation - Yakima R Construction
Yakima	Anadromous Fish	YKFP O&M For Yakima River Fall Chinook And Coho
Yakima	Anadromous Fish	Yakima Indian Nation Watershed Restoration
Yakima	Anadromous Fish	Yakima Watershed Restoration - Satus Creek - Yin
Yakima	Anadromous Fish	Yakima Watershed Restoration - Wilson Creek
Yakima	Anadromous Fish	Materials/Supplies- Yakama Early Action Watershed

Subbasin	Program	Title
Yakima	Anadromous Fish	NEPA For Upper Wapato Irrigation Project
Yakima	Anadromous Fish	Yakima Cle Elum Hatchery O & M
Yakima	Anadromous Fish	YKFP - Operations And Maintenance
Yakima	Anadromous Fish	Yakima River Side Channel Survey & Rehabilitation
Yakima	Anadromous Fish	Teanaway River Instream Flow Restoration - BOR
Yakima	Anadromous Fish	Teanaway River Instream Flow Restoration - NRCS
Yakima	Anadromous Fish	Teanaway River Instream Flow Restoration - Kccd
Yakima	Anadromous Fish	Little Naches Riparian And Channel Enhancement
Yakima	Anadromous Fish	Yakima River Side Channels
Yakima	Anadromous Fish	Yakima Habitat Enhancement - Selah/Union Gap
Yakima	Anadromous Fish	Toppenish/Simcoe Instream Flow Restoration
Yakima	Anadromous Fish	Develop Yakima Natural Production Objectives
Yakima	Anadromous Fish	Upper Toppenish Creek Watershed Restoration
Yakima	Anadromous Fish	Establish Safe Access Tributaries -Yakima Subbasin
Yakima	Anadromous Fish	Coordinate Watershed Planning & Implementation
Yakima	Anadromous Fish	Ahtanum Creek Watershed Assessment
Yakima	Anadromous Fish	Yakima Basin Benthic Index Of Biotic Integrity
Yakima	Program Coordination	Off-Site Clerical Services - Yakima Project
Yakima	Program Coordination	Yakima Resource Newsletter
Yakima	Program Coordination	Environmental Awareness Project - Yakima Schools
Yakima	Program Coordination	Yakima Basin Environmental Education
Yakima	Program Coordination	Nelson Springs BPA Facility Janitorial Service
Yakima	Program Coordination	Educate/Support Yakima River Basin Groups
Yakima	Wildlife	Lower Yakima Valley Riparian/Wetlands - Phase I
Rock Creek	Anadromous Fish	Rock Creek Watershed Assessment & Restoration
Deschutes	Anadromous Fish	Baseline Information For Warm Springs Reservation
Deschutes	Anadromous Fish	Warm Springs Habitat / Production Assessment
Deschutes	Anadromous Fish	Deschutes River Spawning Gravel Study
Deschutes	Anadromous Fish	Trout Creek Habitat Enhancement Plan
Deschutes	Anadromous Fish	White River Falls Passage Study
Deschutes	Anadromous Fish	Coordination Of Trout Creek Restoration
Deschutes	Anadromous Fish	Implementation Of Trout Creek Habitat Restoration
Deschutes	Anadromous Fish	White River Falls Fish Passage Impact Study
Deschutes	Anadromous Fish	Trout Creek Benefit Cost Analysis Refinement
Deschutes	Anadromous Fish	Trout Creek Photomosaics & Benefit/Cost Analysis
Deschutes	Anadromous Fish	Trout Creek Presentation At BPA Project Review
Deschutes	Anadromous Fish	Produce Unified Trout Creek Project Report
Deschutes	Anadromous Fish	Hood River Production Program - Hatchery O&M

Subbasin	Program	Title
Deschutes	Anadromous Fish	Hood River - Powerdale/Oak Springs O&M - ODFW
Deschutes	Anadromous Fish	Pelton Dam Ladder Production
Deschutes	Anadromous Fish	Oak Springs Hatchery Modifications For Hood River
Deschutes	Anadromous Fish	Buck Hollow Watershed Enhancement (Swcd)
Deschutes	Anadromous Fish	Buck Hollow Watershed Enhancement (ODFW)
Deschutes	Anadromous Fish	Trout Creek Operation & Maintenance
Deschutes	Anadromous Fish	Warm Springs Habitat Enhancement And O&M
Deschutes	Anadromous Fish	Habitat & Passage Projects - Warm Springs Tribe
Deschutes	Anadromous Fish	Ctwsir Materials & Supplies: Watershed Projects
Deschutes	Anadromous Fish	Early Action Cooperative Funding Agreement - Ctwir
Deschutes	Anadromous Fish	Warm Springs River Stream Survey
Deschutes	Anadromous Fish	Warm Springs Reservation Watershed Enhancement
Deschutes	Anadromous Fish	Warm Springs Watershed Restoration Mat & Supplies
Deschutes	Anadromous Fish	Warm Springs Watershed Materials & Supplies #2
Deschutes	Anadromous Fish	Implement Trout Creek Watershed Enhancement
Deschutes	Anadromous Fish	Trout Cr Irrigation System Replacement-Willowdale2
Deschutes	Anadromous Fish	Middle Deschutes Watershed Coordination
Deschutes	Anadromous Fish	Bakeoven Riparian Assessment
Deschutes	Anadromous Fish	Warm Springs Reservation Watershed Enhancement
Deschutes	Resident Fish	Bull Trout Life History Project - NE Oregon
Deschutes	Resident Fish	Warm Springs Tribe Crayfish Study
John Day	Anadromous Fish	John Day River Wild Spring Chinook Study
John Day	Anadromous Fish	John Day River Habitat Improvement
John Day	Anadromous Fish	Murderers / Deer Creeks Habitat Improvement
John Day	Anadromous Fish	Clear / Granite Creeks Habitat Improvement
John Day	Anadromous Fish	North Fork John Day Habitat Improvement
John Day	Anadromous Fish	Cottonwood Creek Habitat Improvement
John Day	Anadromous Fish	North Fork John Day Habitat Improvement
John Day	Anadromous Fish	Mainstem & Middle Fork John Day Habitat Work
John Day	Anadromous Fish	Mainstem & Upper John Day Habitat Improvement
John Day	Anadromous Fish	South Fork John Day & Mainstem Habitat Improvement
John Day	Anadromous Fish	North Fork John Day Fish Habitat Enhancement
John Day	Anadromous Fish	Oregon Fish Screens Project
John Day	Anadromous Fish	Clear Cr & NF John Day Dredge-Tailings Restoration
John Day	Anadromous Fish	Monitoring Fine Sediment-Grande Ronde & John Day R
John Day	Anadromous Fish	Escapement /Productivity Spring Chinook - John Day
John Day	Anadromous Fish	Gravel Push-Up Dam Removal Lower N Fk John Day R
John Day	Anadromous Fish	Irrigation & Riparian Improvements - John Day R

Subbasin	Program	Title
John Day	Anadromous Fish	Pine Hollow Watershed Enhancement
John Day	Anadromous Fish	Acquire Oxbow Ranch Middle Fork John Day River
John Day	Anadromous Fish	Enhance North Fork John Day River Subbasin - CTUIR
John Day	Anadromous Fish	Upstream Migration Pacific Lampreys John Day River
John Day	Wildlife	Acquisition Of Pine Creek Ranch
Lower Mid-Columbia	Anadromous Fish	John Day Reservoir Requirements For Chinook Salmon
Lower Mid-Columbia	Anadromous Fish	Evaluate Salmonid Outmigration At McNary Dam
Lower Mid-Columbia	Anadromous Fish	Smolt Passage Behavior And Flow Relationships
Lower Mid-Columbia	Anadromous Fish	Radio Tracking Of Chinook - Bonneville To McNary
Lower Mid-Columbia	Anadromous Fish	Priest Rapids Summer Migration Monitoring
Lower Mid-Columbia	Anadromous Fish	Water Budget Management Positions
Lower Mid-Columbia	Anadromous Fish	Smolt Monitoring -Lower Monumental & Dalles Dams
Lower Mid-Columbia	Anadromous Fish	Acclimation Pond Search Above John Day Dam
Lower Mid-Columbia	Anadromous Fish	McNary Dam Juvenile Fish Collection Efficiency
Lower Mid-Columbia	Anadromous Fish	Post Release Survival Of Fall Chinook In Snake R
Lower Mid-Columbia	Anadromous Fish	Lower Columbia Fish Passage Evaluations
Lower Mid-Columbia	Anadromous Fish	Ringold Hatchery Water Supply
Lower Mid-Columbia	Anadromous Fish	Vernita Bar Redd Surveys
Lower Mid-Columbia	Anadromous Fish	Spawning Habitat Model - Snake River Fall Chinook
Lower Mid-Columbia	Anadromous Fish	John Day Dam Smolt Monitoring Facility
Lower Mid-Columbia	Anadromous Fish	K-Basin (Hanford Reach) Acclimation/ Propagation
Lower Mid-Columbia	Anadromous Fish	Hanford K-Basin Fall Chinook Acclimation (Yn)
Lower Mid-Columbia	Anadromous Fish	Hanford Reach K-Basin Master Plan (Yn)
Lower Mid-Columbia	Anadromous Fish	Hanford K-Basin Fall Chinook Rearing/Tagging
Lower Mid-Columbia	Anadromous Fish	Pit Tag System Improvements
Lower Mid-Columbia	Anadromous Fish	Evaluate Smolt Stranding In Hanford Reach
Lower Mid-Columbia	Anadromous Fish	McNary And Walla Walla Operations And Maintenance
Lower Mid-Columbia	Anadromous Fish	Hanford Reach Steelhead Stock Investigation
Lower Mid-Columbia	Anadromous Fish	Diet,Dist,History Of N. Mercedis In John Day Pool
Lower Mid-Columbia	Resident Fish	Film John Day Sturgeon Activities
Lower Mid-Columbia	Wildlife	Bonneville Dam Wildlife Loss Study
Lower Mid-Columbia	Wildlife	Lower Columbia Hydroprojects Wildlife Losses
Lower Mid-Columbia	Wildlife	Wanaket Wildlife Area (Conforth Ranch) Management
Lower Mid-Columbia	Wildlife	Conforth Ranch Land Purchase
Lower Mid-Columbia	Wildlife	Conforth Ranch Road Repair
Lower Mid-Columbia	Wildlife	Conforth Ranch - Hazardous Waste Disposal
Lower Mid-Columbia	Wildlife	Conforth Ranch: Clean Generator
Lower Mid-Columbia	Wildlife	Crate's Point Grounds Improvements

Subbasin	Program	Title
Lower Mid-Columbia	Wildlife	Wildlife Mitigation Sites Oregon, Irrigon Addition
Lower Mid-Columbia	Wildlife	Wildlife Mitigation Sites Oregon, Horn Butte
Lower Mid-Columbia	Wildlife	Eagle Lakes Ranch Acquisition And Restoration
Lower Snake	Anadromous Fish	Snake River Radio Tracking Of Chinook & Steelhead
Lower Snake	Anadromous Fish	Monitor Smolt Arrival At Lower Granite Dam
Lower Snake	Anadromous Fish	Evaluate Bypass Conduit Designs - Lower Snake Dams
Lower Snake	Anadromous Fish	Freeze Brand Salmonids At Lyons Ferry Hatchery
Lower Snake	Anadromous Fish	Lower Granite Pool Survival Study
Lower Snake	Anadromous Fish	Pit Tag Facilities Improvement
Lower Snake	Anadromous Fish	Documenting & Estimating Passage- Video Technology
Lower Snake	Anadromous Fish	Technical Assistance For Snake River Drawdown
Tucannon	Anadromous Fish	Improve Fish Passage At Starbuck Dam
Tucannon	Anadromous Fish	Tucannon River Bank Control
Tucannon	Anadromous Fish	Pataha Basin Habitat Improvements - Seven Sites
Tucannon	Anadromous Fish	Tucannon Habitat Improvements - Rubenser Site
Tucannon	Anadromous Fish	Tucannon Stream & Riparian Restoration
Tucannon	Anadromous Fish	Pataha Creek Stream & Cropland Restoration
Tucannon	Anadromous Fish	Pataha Creek Model Watershed Project
Tucannon	Anadromous Fish	Tucannon River Early Action Projects
Tucannon	Anadromous Fish	Tucannon Rootwad Collection
Tucannon	Anadromous Fish	Tucannon Large Woody Debris Manipulation
Tucannon	Anadromous Fish	Pataha Creek Early Action Projects
Tucannon	Anadromous Fish	Habitat Improvements, Ledgerwood Farms, Pataha Cr
Tucannon	Anadromous Fish	Tucannon River Watershed Fish Habitat Restoration
Tucannon	Anadromous Fish	Pataha Creek Stream Channel & Cropland Restoration
Tucannon	Anadromous Fish	Tucannon Watershed Project Implementation
Tucannon	Anadromous Fish	Pataha Watershed Project Planning & Implementation
Tucannon	Anadromous Fish	Tucannon River Watershed Fish Habitat Enhancement
Tucannon	Anadromous Fish	Pataha Watershed Riparian & Croplands Restoration
Tucannon	Anadromous Fish	Tucannon River Spring Chinook Captive Broodstock
Umatilla	Anadromous Fish	Design Bonifer Juvenile Imprinting / Release Site
Umatilla	Anadromous Fish	Restore & Enhance Salmon In The Umatilla Basin
Umatilla	Anadromous Fish	Bonifer Springs Acclimation Facility
Umatilla	Anadromous Fish	Umatilla River Channel Modification
Umatilla	Anadromous Fish	Operate And Maintain Umatilla Hatchery Satellites
Umatilla	Anadromous Fish	Umatilla Passage O & M
Umatilla	Anadromous Fish	Lower Umatilla Channel Modifications Assessment
Umatilla	Anadromous Fish	Umatilla Basin Salmon & Steelhead Restoration Plan

Subbasin	Program	Title
Umatilla	Anadromous Fish	Umatilla Hatchery
Umatilla	Anadromous Fish	Umatilla Hatchery - Cost Verification
Umatilla	Anadromous Fish	Umatilla Hatchery - Design Review
Umatilla	Anadromous Fish	Umatilla Hatchery - Tribal Fish Culture Training
Umatilla	Anadromous Fish	Review Of Umatilla Hatchery Oxygen Design
Umatilla	Anadromous Fish	Umatilla Hatchery - Design Change Order Consultant
Umatilla	Anadromous Fish	Umatilla Habitat Improvement/ USFS
Umatilla	Anadromous Fish	Umatilla Habitat Improvement / CTUIR
Umatilla	Anadromous Fish	Umatilla Fish Habitat Improvement / ODFW
Umatilla	Anadromous Fish	Umatilla Passage Improvements- Westland Diversion
Umatilla	Anadromous Fish	Umatilla Passage Improvements- Stanfield Diversion
Umatilla	Anadromous Fish	Improvements At Westland Diversion
Umatilla	Anadromous Fish	Replacement Pumping To Weid Main Canal
Umatilla	Anadromous Fish	Film Umatilla River And Three Mile Dam Enhancement
Umatilla	Anadromous Fish	Umatilla Hatchery - Master Plan
Umatilla	Anadromous Fish	Umatilla Passage Improvements - Maxwell Diversion
Umatilla	Anadromous Fish	Umatilla Passage Improvements - Cold Springs
Umatilla	Anadromous Fish	Hydraulic Review/Drilling, Westland Diversion
Umatilla	Anadromous Fish	Umatilla River Project Slide Show
Umatilla	Anadromous Fish	Umatilla River Basin Trap And Haul Program
Umatilla	Anadromous Fish	Weid Main Canal Pumping - Umatilla Basin
Umatilla	Anadromous Fish	Neoh Master Plan - CTUIR - Parametrix - Umatilla
Umatilla	Anadromous Fish	Evaluate Umatilla Project- Smolt Migration
Umatilla	Anadromous Fish	Umatilla - Columbia Water Exchange Project
Umatilla	Anadromous Fish	Stanfield/ Mckay Water Release Project
Umatilla	Anadromous Fish	Umatilla Hatchery -NEPA & Operations & Maintenance
Umatilla	Anadromous Fish	Umatilla Hatchery - M&E Projects
Umatilla	Anadromous Fish	Umatilla Basin Natural Production M&E
Umatilla	Anadromous Fish	Umatilla Satellites - Planning & Construction
Umatilla	Anadromous Fish	Law Enforcement Transition Funding - CTUIR
Umatilla	Anadromous Fish	Fred Grey Property Acquisition
Umatilla	Anadromous Fish	Pacific Lamprey Population Studies
Umatilla	Anadromous Fish	Umatilla River Riparian Corridor
Umatilla	Anadromous Fish	Nursery Bridge Local Cost Share
Umatilla	Anadromous Fish	Umatilla Basin Stream Habitat Enhancement
Umatilla	Anadromous Fish	CTUIR - Nursery For Fish Habitat Plants
Umatilla	Anadromous Fish	Umatilla River Basin Fish Passage Improvement
Umatilla	Anadromous Fish	Umatilla River Basin Fish Habitat Improvement

<b>Subbasin</b>	<b>Program</b>	<b>Title</b>
Umatilla	Anadromous Fish	Umatilla Basin Habitat Project Coordination
Umatilla	Anadromous Fish	Riparian Recovery: Plant Succession And Salmon
Umatilla	Wildlife	Squaw Creek Watershed Wildlife Project
Walla Walla	Anadromous Fish	Juvenile & Adult Passage- Walla Walla Basin
Walla Walla	Anadromous Fish	Little Walla Walla Screens And Trap
Walla Walla	Anadromous Fish	Garden City/Lowden 2 Diversion Screens
Walla Walla	Anadromous Fish	Burlingame Screens Construction Management
Walla Walla	Anadromous Fish	Hofer Dam Passage
Walla Walla	Anadromous Fish	Little Walla Walla Consolidation Milton/Eastside
Walla Walla	Anadromous Fish	Walla Walla Basin Anadromous Fish Passage
Walla Walla	Anadromous Fish	Walla Walla Basin Stream Habitat Enhancement
Walla Walla	Anadromous Fish	Walla Walla River Basin Fish Habitat Enhancement
Walla Walla	Anadromous Fish	Walla Walla River Basin Fish Habitat - Swcd
Walla Walla	Anadromous Fish	Walla Walla & Touchet Rivers & Mill Cr Restoration
Walla Walla	Anadromous Fish	Assess Salmonid Habitat Walla Walla Watershed - Wa
Walla Walla	Anadromous Fish	Assess Fish Habitat & Salmonoids In Walla Walla
Walla Walla	Anadromous Fish	Walla Walla River Fish Passage Operations
Walla Walla	Anadromous Fish	Design And Construct Neoh Walla Walla Hatchery
Walla Walla	Anadromous Fish	Walla Walla River Basin Monitoring And Evaluation
Walla Walla	Wildlife	Rainwater Wildlife Area Operations & Maintenance

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## Appendix I

### BUILD YOUR OWN ALTERNATIVE

#### A: "Build Your Own Alternative"

This appendix is designed to enable people throughout the region to build their own version of the "right" plan for the fish and wildlife mitigation and recovery effort. Subsequently, the different perspectives provided through the alternatives that people develop will help shape the ultimate Policy Direction that the BPA Administrator will select as the preferred alternative direction for BPA's unified planning approach. Recognizing that policies underpin the region's fish and wildlife mitigation and recovery choices, BPA has chosen to focus this EIS on a range of distinctly different, but reasonably foreseeable, policy directions (Chapter 3). One or more of these directions through mixing and matching will likely serve as the combination that will ultimately guide BPA's fish and wildlife program implementation and expenditures. To help in the development and understanding of building your own alternative, BPA has used the two major processes being followed under ESA, the NMFS 2000 Biological Opinion and USFWS 2000 Biological Opinion (BiOps), to illustrate how it is done from the information and data in this EIS (Section C below).

As you begin this procedure keep in mind the need to stay focused on the overall objective you are trying to accomplish with your proposal. It is easy to get mired down in details and exceptions to the rule. Since the science for fish and wildlife recovery is uncertain and still developing, much of the difficulty you will experience will be with conflicting social mandates, laws, and personal values (Chapter 2). This conflict and need for making trade-offs is the greatest challenge in making public policy. Remember, trying to accommodate too many values will likely lead to an outcome indicative of none.

There are three basic steps to building your own alternative:

**Step one: assess the status of the current fish and wildlife mitigation and recovery effort.** Review Section 2.4 in Chapter 2 to gain an understanding of the existing environmental conditions in the region where the fish and wildlife mitigation and recovery effort is underway.

**Step two: determine the actions that will best define the proposal for your fish and wildlife mitigation and recovery effort.** Review the tables of Sample Implementation Actions in Chapter 3, Section 3A. These tables will first give information about the current state of the mitigation and recovery effort (Status Quo) and then offer numerous examples of the types of actions that have been proposed throughout the region by individuals, interest groups, tribes, states, and federal agencies. The sample actions are sorted by Key Issue areas (Chapter 3, Section 3.1.2) and grouped into one of the five Policy Directions examined in this EIS (Chapter 3, Section 3.2). From these actions, select the ones that best represent your proposal for each of the Key Issue areas. Table A below is provided to help you track your choices of actions and get a visual

representation of your proposal. Section B shows several examples of these illustrations filled out for other proposals throughout the region (Tables B-K).

**Step three: determine the environmental consequences of your proposal.** Review Chapter 5, section 5.2, to get a general understanding of how and where fish, wildlife, and human effects occur with respect to any plan for fish and wildlife mitigation and recovery. Keep in mind that Section 5.2 is set up to provide checks and balances of the impact areas. The land, water, and fish/wildlife sections are presented from the fish and wildlife perspective because they are the main areas associated with their habitats and daily activities. The air, social, and economic sections are presented from the human perspective because these are the main areas of immediate concern to the daily lives of humans. Obviously, some of these categories effect both fish and wildlife and humans. The grouping was not meant to be exclusive, rather the objective was to ensure an understanding of how the activities and actions taken to help fish/wildlife or humans may impact the other.

Next, review Section 5.3 for an explanation of how the effects from the different sets of sample actions for each Policy Direction change in relationship to the Status Quo. An illustration based on the explanation is given for each environmental consequence. These illustrations are given to offer a visual cue of whether a set of actions is moving the effects in a more positive or negative direction as compared to Status Quo. Using these explanations and illustrations consider where your proposal lies in relationship to the different Policy Directions. Match the effects with your selected set of actions. Realizing that you probably mixed portions of some of the Policy Directions with one another, you will need to do the same with the environmental consequences areas in order to reflect your mix and match approach.

If you want to delve a little deeper into the effects assessment, Table L below is provided to help you understand where the Key Issue area actions and the environmental consequences intersect. From this intersection, you may develop your explanation of the changes from Status Quo to your proposal.

**Several cautions are in order for anyone wishing to "mix and match."**

- *Compatibility.* Not all combinations of actions are possible; some actions are mutually exclusive.
- *Consistency.* Choosing actions from several different Policy Direction implementation actions may result in a plan that is truly indicative of none.
- *Effectiveness.* A "scattershot" technique that tries to reach too many goals with too little money for each will likely dilute the desired effect.
- *Clarity and Coordination.* The more that different "pieces" of different Directions are mixed, the more likely that confusion might result in interpreting who does what and how.
- *Cause-and-Effect.* If you change or substitute an action, remember that you are also substituting the effects (natural resource and/or socioeconomic) of that action.

**Table A: Visual Aid for New Proposal Alternative**

Key Regional Issues	Proposal #1					Proposal #2				
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
<b>1 Habitat</b>										
1-1 Anadromous Fish										
1-2 Resident Fish										
1-3 Introduced Species										
1-4 Wildlife										
1-5 Pred. Anad. Fish										
1-6 Watersheds										
1-7 Tributaries										
1-8 Mainstem Col.										
1-9 Reservoirs										
1-10 Estuaries										
1-11 Water Quality										
<b>2 Harvest</b>										
2-1 Anadromous Fish										
2-2 Resident Fish										
2-3 Wildlife										
<b>3 Hatcheries</b>										
3-1 Anadromous Fish										
3-2 Resident Fish										
<b>4 Hydro</b>										
4-1 Dam Mod. & Facil.										
4-2 Hydro Operations										
4-3 Spill										
4-4 Flow										
4-5 Reservoir Levels										
4-6 Water Quality										
4-7 Juv. Fish Trans.										
4-8 Adult Fish Pass.										
4-9 Flood Control										
<b>5 Power</b>										
5-1 Existing Gen.										
5-2 New Energy Res.										
5-3 Trans. Reliability										
<b>6 Industry</b>										
6-1 Industrial Dev.										
6-2 Alum. and Chem.										
6-3 Mining										
6-4 Pulp and Paper										
<b>7 Transportation</b>										
7-1 Navigation										
7-2 Trucking & RR										
<b>8 Agriculture</b>										
8-1 Irrigation										
8-2 Pest./Ag. Practices										
8-3 Grazing										
8-4 Forestry										
<b>9 Commercial Fishing</b>										
<b>10 Resid./Comm. Dev.</b>										
<b>11 Recreation</b>										
<b>12 Tribes</b>										
12-1 Tribal Harvest										
12-2 Trad, Hlth, Spirit										

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**B: Illustrations of Proposals**  
**Table B: Visual Representation of Status Quo**

Key Regional Issues	Status Quo				
	BPA Alt. Policy Dir.				
	NF	WS	SU	SS	CF
<b>1 Habitat</b>					
1-1 Anadromous Fish			■		
1-2 Resident Fish			■		
1-3 Introduced Species		■			
1-4 Wildlife			■		
1-5 Pred. Anad. Fish			■		
1-6 Watersheds	■				
1-7 Tributaries			■		
1-8 Mainstem Col.				■	
1-9 Reservoirs		■			
1-10 Estuaries				■	
1-11 Water Quality	■				
<b>2 Harvest</b>					
2-1 Anadromous Fish				■	
2-2 Resident Fish			■		
2-3 Wildlife			■		
<b>3 Hatcheries</b>					
3-1 Anadromous Fish				■	
3-2 Resident Fish			■		
<b>4 Hydro</b>					
4-1 Dam Mod. & Facil.				■	
4-2 Hydro Operations			■		
4-3 Spill			■		
4-4 Flow			■		
4-5 Reservoir Levels				■	
4-6 Water Quality			■		
4-7 Juv. Fish Trans.			■		
4-8 Adult Fish Pass.				■	
4-9 Flood Control					■
<b>5 Power</b>					
5-1 Existing Gen.			■		
5-2 New Energy Res.				■	
5-3 Trans. Reliability			■		
<b>6 Industry</b>					
6-1 Industrial Dev.				■	
6-2 Alum. And Chem.				■	
6-3 Mining				■	
6-4 Pulp and Paper				■	
<b>7 Transportation</b>					
7-1 Navigation			■		
7-2 Trucking & Rail.			■		
<b>8 Agriculture</b>					
8-1 Irrigation			■		
8-2 Pest./Ag. Practices			■		
8-3 Grazing			■		
8-4 Forestry			■		
<b>9 Commercial</b>					
			■		
<b>10 Resid./Comm.</b>					
			■		
<b>11 Recreation</b>					
			■		
<b>12 Tribes</b>					
12-1 Tribal Harvest				■	
12-2 Trad, Hlth, Spirit			■		

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus .

**Table C: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Multi-Species Framework Alt. 1					Multi-Species Framework Alt. 2					Multi-Species Framework Alt. 3					Multi-Species Framework Alt. 4					Multi-Species Framework Alt. 5					
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	
<b>1 Habitat</b>																										
1-1 Anadromous Fish	■																									
1-2 Resident Fish						■																				
1-3 Introduced Species		■					■																			
1-4 Wildlife			■																							
1-5 Pred. Anad. Fish			■																							
1-6 Watersheds																										
1-7 Tributaries			■			■																				
1-8 Mainstem Col.	■																									
1-9 Reservoirs																										
1-10 Estuaries																										
1-11 Water Quality			■																							
<b>2 Harvest</b>																										
2-1 Anadromous Fish		■																								
2-2 Resident Fish																										
2-3 Wildlife																										
<b>3 Hatcheries</b>																										
3-1 Anadromous Fish		■																								
3-2 Resident Fish	■																									
<b>4 Hydro</b>																										
4-1 Dam Mod. & Facil		■																								
4-2 Hydro Operations																										
4-3 Spill				■																						
4-4 Flow																										
4-5 Reservoir Levels		■																								
4-6 Water Quality																										
4-7 Juv. Fish Trans.																										
4-8 Adult Fish Pass.		■																								
4-9 Flood Control																										
<b>5 Power</b>																										
5-1 Existing Gen.		■																								
5-2 New Energy Res.																										
5-3 Trans. Reliability																										
<b>6 Industry</b>																										
6-1 Industrial Dev.																										
6-2 Alum. and Chem.																										
6-3 Mining																										
6-4 Pulp and Paper																										
<b>7 Transportation</b>																										
7-1 Navigation																										
7-2 Trucking & RR																										
<b>8 Agriculture</b>																										
8-1 Irrigation				■																						
8-2 Pest./Ag. Practices		■																								
8-3 Grazing																										
8-4 Forestry																										
<b>9 Commercial Fishing</b>																										
<b>10 Resid./Comm. Dev.</b>																										
<b>11 Recreation</b>																										
<b>12 Tribes</b>																										
12-1 Tribal Harvest		■																								
12-2 Trad, Hlth, Spirit																										

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.



**Table E: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Spirit of the Salmon					Tribal Vision					Governors' Recommendations					Lower Col. River Estuary Program				
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
<b>1 Habitat</b>																				
1-1 Anadromous Fish		■						■					■							
1-2 Resident Fish																				
1-3 Introduced Species																		■		
1-4 Wildlife								■												
1-5 Pred. Anad. Fish													■							
1-6 Watersheds			■										■					■		
1-7 Tributaries																				
1-8 Mainstem Col.	■			■					■					■					■	
1-9 Reservoirs																				
1-10 Estuaries		■																	■	
1-11 Water Quality				■															■	
<b>2 Harvest</b>																				
2-1 Anadromous Fish				■				■												■
2-2 Resident Fish																				■
2-3 Wildlife									■											
<b>3 Hatcheries</b>																				
3-1 Anadromous Fish				■										■						
3-2 Resident Fish														■						
<b>4 Hydro</b>																				
4-1 Dam Mod. & Facil														■						
4-2 Hydro Operations																			■	
4-3 Spill																				
4-4 Flow										■										■
4-5 Reservoir Levels																				
4-6 Water Quality																				
4-7 Juv. Fish Trans.																				
4-8 Adult Fish Pass.					■															
4-9 Flood Control																			■	
<b>5 Power</b>																				
5-1 Existing Gen.																				
5-2 New Energy Res.																				■
5-3 Trans. Reliability																				
<b>6 Industry</b>																				
6-1 Industrial Dev.																				
6-2 Alum. and Chem.																				
6-3 Mining																				
6-4 Pulp and Paper																			■	
<b>7 Transportation</b>																				
7-1 Navigation																				
7-2 Trucking & RR																				
<b>8 Agriculture</b>																				
8-1 Irrigation				■						■										
8-2 Pest./Ag. Practices																				
8-3 Grazing																				
8-4 Forestry																				■
<b>9 Commercial Fishing</b>																				
10 Resid./Comm. Dev.																				
11 Recreation																				
12 Tribes																				
12-1 Tribal Harvest					■															
12-2 Trad, Hlth, Spirit																				

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

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**Table F: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 1					Framework Concept Paper 2					Framework Concept Paper 3					Framework Concept Paper 4					Framework Concept Paper 5					
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	
<b>1 Habitat</b>																										
1-1 Anadromous Fish																										
1-2 Resident Fish																										
1-3 Introduced Species																										
1-4 Wildlife																										
1-5 Pred. Anad. Fish																										
1-6 Watersheds																										
1-7 Tributaries																										
1-8 Mainstem Col.																										
1-9 Reservoirs																										
1-10 Estuaries																										
1-11 Water Quality																										
<b>2 Harvest</b>																										
2-1 Anadromous Fish																										
2-2 Resident Fish																										
2-3 Wildlife																										
<b>3 Hatcheries</b>																										
3-1 Anadromous Fish																										
3-2 Resident Fish																										
<b>4 Hydro</b>																										
4-1 Dam Mod. & Facil																										
4-2 Hydro Operations																										
4-3 Spill																										
4-4 Flow																										
4-5 Reservoir Levels																										
4-6 Water Quality																										
4-7 Juv. Fish Trans.																										
4-8 Adult Fish Pass.																										
4-9 Flood Control																										
<b>5 Power</b>																										
5-1 Existing Gen.																										
5-2 New Energy Res.																										
5-3 Trans. Reliability																										
<b>6 Industry</b>																										
6-1 Industrial Dev.																										
6-2 Alum. And Chem.																										
6-3 Mining																										
6-4 Pulp and Paper																										
<b>7 Transportation</b>																										
7-1 Navigation																										
7-2 Trucking & RR																										
<b>8 Agriculture</b>																										
8-1 Irrigation																										
8-2 Pest./Ag. Practices																										
8-3 Grazing																										
8-4 Forestry																										
<b>9 Commercial Fishing</b>																										
<b>10 Resid./Comm. Dev.</b>																										
<b>11 Recreation</b>																										
<b>12 Tribes</b>																										
12-1 Tribal Harvest																										
12-2 Trad, Hlth, Spirit																										

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Table G: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 6					Framework Concept Paper 7					Framework Concept Paper 8					Framework Concept Paper 9					Framework Concept Paper 10						
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>						
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF		
<b>1 Habitat</b>																											
1-1 Anadromous Fish		■																									
1-2 Resident Fish		■																									
1-3 Introduced Species																											
1-4 Wildlife									■																		
1-5 Pred. Anad. Fish	■																										
1-6 Watersheds																											
1-7 Tributaries									■																		
1-8 Mainstem Col.																											
1-9 Reservoirs																											
1-10 Estuaries									■																		
1-11 Water Quality																											
<b>2 Harvest</b>																											
2-1 Anadromous Fish		■																									
2-2 Resident Fish																											
2-3 Wildlife																											
<b>3 Hatcheries</b>																											
3-1 Anadromous Fish		■																									
3-2 Resident Fish																											
<b>4 Hydro</b>																											
4-1 Dam Mod. & Facil	■								■																		
4-2 Hydro Operations																											
4-3 Spill																											
4-4 Flow		■																									
4-5 Reservoir Levels																											
4-6 Water Quality																											
4-7 Juv. Fish Trans.																											
4-8 Adult Fish Pass.																											
4-9 Flood Control																											
<b>5 Power</b>																											
5-1 Existing Gen.																											
5-2 New Energy Res.																											
5-3 Trans. Reliability																											
<b>6 Industry</b>																											
6-1 Industrial Dev.																											
6-2 Alum. And Chem.																											
6-3 Mining																											
6-4 Pulp and Paper																											
<b>7 Transportation</b>																											
7-1 Navigation																											
7-2 Trucking & RR																											
<b>8 Agriculture</b>																											
8-1 Irrigation																											
8-2 Pest./Ag. Practices																											
8-3 Grazing																											
8-4 Forestry																											
<b>9 Commercial Fishing</b>																											
<b>10 Resid./Comm. Dev.</b>																											
<b>11 Recreation</b>																											
<b>12 Tribes</b>																											
12-1 Tribal Harvest																											
12-2 Trad, Hlth, Spirit																											

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

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**Table H: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 11					Framework Concept Paper 12					Framework Concept Paper 13					Framework Concept Paper 14					Framework Concept Paper 15					
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	
<b>1 Habitat</b>																										
1-1 Anadromous Fish																										
1-2 Resident Fish																										
1-3 Introduced Species																										
1-4 Wildlife																										
1-5 Pred. Anad. Fish																										
1-6 Watersheds																										
1-7 Tributaries																										
1-8 Mainstem Col.																										
1-9 Reservoirs																										
1-10 Estuaries																										
1-11 Water Quality																										
<b>2 Harvest</b>																										
2-1 Anadromous Fish																										
2-2 Resident Fish																										
2-3 Wildlife																										
<b>3 Hatcheries</b>																										
3-1 Anadromous Fish																										
3-2 Resident Fish																										
<b>4 Hydro</b>																										
4-1 Dam Mod. & Facil																										
4-2 Hydro Operations																										
4-3 Spill																										
4-4 Flow																										
4-5 Reservoir Levels																										
4-6 Water Quality																										
4-7 Juv. Fish Trans.																										
4-8 Adult Fish Pass.																										
4-9 Flood Control																										
<b>5 Power</b>																										
5-1 Existing Gen.																										
5-2 New Energy Res.																										
5-3 Trans. Reliability																										
<b>6 Industry</b>																										
6-1 Industrial Dev.																										
6-2 Alum. And Chem.																										
6-3 Mining																										
6-4 Pulp and Paper																										
<b>7 Transportation</b>																										
7-1 Navigation																										
7-2 Trucking & RR																										
<b>8 Agriculture</b>																										
8-1 Irrigation																										
8-2 Pest./Ag. Practices																										
8-3 Grazing																										
8-4 Forestry																										
<b>9 Commercial Fishing</b>																										
<b>10 Resid./Comm. Dev.</b>																										
<b>11 Recreation</b>																										
<b>12 Tribes</b>																										
12-1 Tribal Harvest																										
12-2 Trad, Hlth, Spirit																										

<sup>3</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Table I: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 16					Framework Concept Paper 17					Framework Concept Paper 18					Framework Concept Paper 19					Framework Concept Paper 20					
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	
<b>1 Habitat</b>																										
1-1 Anadromous Fish																										
1-2 Resident Fish																										
1-3 Introduced Species																										
1-4 Wildlife																										
1-5 Pred. Anad. Fish																										
1-6 Watersheds																										
1-7 Tributaries																										
1-8 Mainstem Col.																										
1-9 Reservoirs																										
1-10 Estuaries																										
1-11 Water Quality																										
<b>2 Harvest</b>																										
2-1 Anadromous Fish																										
2-2 Resident Fish																										
2-3 Wildlife																										
<b>3 Hatcheries</b>																										
3-1 Anadromous Fish																										
3-2 Resident Fish																										
<b>4 Hydro</b>																										
4-1 Dam Mod. & Facil																										
4-2 Hydro Operations																										
4-3 Spill																										
4-4 Flow																										
4-5 Reservoir Levels																										
4-6 Water Quality																										
4-7 Juv. Fish Trans.																										
4-8 Adult Fish Pass.																										
4-9 Flood Control																										
<b>5 Power</b>																										
5-1 Existing Gen.																										
5-2 New Energy Res.																										
5-3 Trans. Reliability																										
<b>6 Industry</b>																										
6-1 Industrial Dev.																										
6-2 Alum. And Chem.																										
6-3 Mining																										
6-4 Pulp and Paper																										
<b>7 Transportation</b>																										
7-1 Navigation																										
7-2 Trucking & RR																										
<b>8 Agriculture</b>																										
8-1 Irrigation																										
8-2 Pest./Ag. Practices																										
8-3 Grazing																										
8-4 Forestry																										
<b>9 Commercial Fishing</b>																										
<b>10 Resid./Comm. Dev.</b>																										
<b>11 Recreation</b>																										
<b>12 Tribes</b>																										
12-1 Tribal Harvest																										
12-2 Trad, Hlth, Spirit																										

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

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**Table J: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 21					Framework Concept Paper 22					Framework Concept Paper 23					Framework Concept Paper 24					Framework Concept Paper 25					
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	
<b>1 Habitat</b>																										
1-1 Anadromous Fish																										
1-2 Resident Fish																										
1-3 Introduced Species																										
1-4 Wildlife																										
1-5 Pred. Anad. Fish																										
1-6 Watersheds																										
1-7 Tributaries																										
1-8 Mainstem Col.																										
1-9 Reservoirs																										
1-10 Estuaries																										
1-11 Water Quality																										
<b>2 Harvest</b>																										
2-1 Anadromous Fish																										
2-2 Resident Fish																										
2-3 Wildlife																										
<b>3 Hatcheries</b>																										
3-1 Anadromous Fish																										
3-2 Resident Fish																										
<b>4 Hydro</b>																										
4-1 Dam Mod. & Facil																										
4-2 Hydro Operations																										
4-3 Spill																										
4-4 Flow																										
4-5 Reservoir Levels																										
4-6 Water Quality																										
4-7 Juv. Fish Trans.																										
4-8 Adult Fish Pass.																										
4-9 Flood Control																										
<b>5 Power</b>																										
5-1 Existing Gen.																										
5-2 New Energy Res.																										
5-3 Trans. Reliability																										
<b>6 Industry</b>																										
6-1 Industrial Dev.																										
6-2 Alum. And Chem.																										
6-3 Mining																										
6-4 Pulp and Paper																										
<b>7 Transportation</b>																										
7-1 Navigation																										
7-2 Trucking & RR																										
<b>8 Agriculture</b>																										
8-1 Irrigation																										
8-2 Pest./Ag. Pract.																										
8-3 Grazing																										
8-4 Forestry																										
<b>9 Commercial Fishing</b>																										
<b>10 Resid./Comm. Dev.</b>																										
<b>11 Recreation</b>																										
<b>12 Tribes</b>																										
12-1 Tribal Harvest																										
12-2 Trad, Hlth, Spirit																										

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Table K: Visual Crosswalk Between Chapter 3 Tables & Proposed Alternative Policy Directions**

Key Regional Issues	Framework Concept Paper 26					Framework Concept Paper 27					Framework Concept Paper 28				
	BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>					BPA Alt. Policy Dir. <sup>1</sup>				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
<b>1 Habitat</b>															
1-1 Anadromous Fish					■										
1-2 Resident Fish															
1-3 Introduced Spa.					■										
1-4 Wildlife					■										
1-5 Pred. Anad. Fish					■					■					
1-6 Watersheds					■										
1-7 Tributaries					■					■					
1-8 Mainstem					■					■					
1-9 Reservoirs					■										
1-10 Estuaries										■					
1-11 Water Quality										■					
<b>2 Harvest</b>															
2-1 Anadromous Fish					■		■			■					
2-2 Resident Fish															
2-3 Wildlife															
<b>3 Hatcheries</b>															
3-1 Anadromous Fish					■					■					
3-2 Resident Fish										■					
<b>4 Hydro</b>															
4-1 Dam Mod. & Facil					■										
4-2 Hydro Operations					■										
4-3 Spill										■					
4-4 Flow					■					■					■
4-5 Reservoir Levels															
4-6 Water Quality															
4-7 Juv. Fish Trans.					■					■					
4-8 Adult Fish Pass.															
4-9 Flood Control															
<b>5 Power</b>															
5-1 Existing Gen.					■										
5-2 New Energy Res.															
5-3 Trans. Reliability															
<b>6 Industry</b>															
6-1 Industrial Dev.															
6-2 Alum. and Chem.															
6-3 Mining															
6-4 Pulp and Paper															
<b>7 Transportation</b>															
7-1 Navigation					■										
7-2 Trucking & RR															
<b>8 Agriculture</b>															
8-1 Irrigation					■					■					■
8-2 Pest./Ag. Practices										■					
8-3 Grazing										■					
8-4 Forestry										■					
<b>9 Commercial Fishing</b>															
										■					
<b>10 Resid./Comm. Dev.</b>															
<b>11 Recreation</b>															
										■					
<b>12 Tribes</b>															
12-1 Tribal Harvest										■					■
12-2 Trad, Hlth, Spirit						■									■

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Table L: Suggested Review of Key Issues for Environmental Consequences**

<b>NATURAL ENVIRONMENT</b>	
<b><u>Environmental Effect</u></b>	<b><u>Associated Key Issues</u></b>
<i><u>Land Use</u></i>	
Upland	1-6, 5-2, 5-3, 6-1, 6-2, 6-3, 8-1, 8-2, 8-3, 8-4, 10, & 11
Riparian/Wetland	1-6, 1-7, 1-8, 1-9, 1-10, 4-2, 4-5, 4-9, 6-1, 6-3, 8-1, 8-2, 8-3, 8-4, & 10
<i><u>Water</u></i>	
Nitrogen Supersaturation	1-11, 4-2, 4-3, & 4-6
Non-Thermal Pollution	1-11, 4-6, 6-1, 6-2, 6-3, 6-4, 8-2, 8-3, & 10
Sedimentation	1-11, 4-2, 4-5, 4-6, 8-1, 8-2, 8-3, 8-4, & 10
Temperature/Dissolved Gas	1-11, 4-2, 4-3, 4-4, 4-5, 5-1, 5-2, 6-1, 6-2, 6-4, 8-1, 8-2, & 8-4
Instream Water Quality	1-6, 1-7, 1-8, 1-11, 4-3, 4-4, 4-5, 4-9, & 8-1
Amount of River Habitat	1-7, 1-8, 1-9, 1-10, 1-11, 4-2, 4-4, 4-5, 4-9, & 8-1
Reservoir Habitat	1-3, 1-9, 1-11, 4-2, 4-5, 4-6, & 8-1
<i><u>Fish &amp; Wildlife</u></i>	
Anadromous Fish	1-1, 1-3, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, 1-11, 2-1, 3-1, 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9, 9, & 12-1
Resident Fish	1-2, 1-3, 1-6, 1-7, 1-8, 1-9, 1-11, 2-2, 3-2, 4-1, 4-2, 4-5, 4-6, 4-9, & 12-1
Wildlife	1-4, 1-6, 2-3, 5-2, 5-3, 6-1, 8-1, 8-2, 8-3, 8-4, & 11
Air Quality	5-1, 5-2, 6-1, 6-2, 6-4, 7-2, & 10
<b>SOCIAL and ECONOMIC</b>	
<i><u>Commerce</u></i>	
Commercial Interests	2-1, 2-2, 2-3, 4-2, & all of 5-9
Recreation (fishing & hunting)	All of 2, 4-5, & 11
Economic Development	3-1, 3-2, 4-1, 5-1, 5-2, 5-3, & all of 6-10

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

Tribes

Fishing Harvest	2-1, 2-2, 3-1, 3-2, 9, & 12-1
Health, Spirituality, Tradition	1-1, 1-2, 1-4, 1-6, 1-7, 1-8, 1-9, 1-11, 2-3, 3-1, 3-2, 4-5, 10, & 12-2

Cost and Funding

All of 1 & 3, 4-1, 4-2, 4-3, 4-7, 4-8, 5-2, 5-3, all of 6-9 & 11

Other

Cultural Resources	4-3, 4-4, 4-5, 5-2, 5-3, 6-1, 10, & 12-2
Aesthetics	1-4, 1-6, 1-11, 4-1, 4-2, 4-3, 4-4, 4-5, 5-2, 5-3, 6-1, 7-2, 8-1, 8-3, 8-4, 10, & 12-2

**KEY**

**1 Habitat**

1-1 Anadromous Fish	1-2 Resident Fish	1-3 Introduced Species
1-4 Wildlife	1-5 Predator Anadromous Fish	1-6 Watersheds
1-7 Tributaries	1-8 Mainstem Columbia	1-9 Reservoirs
1-10 Estuary and Ocean	1-11 Water Quality	

**2 Harvest**

2-1 Anadromous Fish	2-2 Resident Fish	2-3 Wildlife
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**3 Hatcheries**

3-1 Anadromous Fish	3-2 Resident Fish
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**4 Hydro**

4-1 Dam Modifications and Facilities	4-2 Hydro Operations	4-3 Spill
4-4 Flow	4-5 Reservoir Levels	4-6 Water Quality
4-7 Juvenile Fish Migration & Transport	4-8 Adult Fish Passage	4-9 Flood Control

**5 Power**

5-1 Existing Generation	5-2 New Energy Resources	5-3 Transmission Reliability
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**6 Industry**

6-1 Industrial Development	6-2 Aluminum and Chemical	6-3 Mining
6-4 Pulp and Paper		

**7 Transportation**

7-1 Navigation	7-2 Trucking & Railroad
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**8 Agriculture**

8-1 Irrigation	8-2 Pest./Agricultural Practices	8-3 Grazing
8-4 Forestry		

**9 Commercial Fishing**

**10 Residential and Commercial Development**

**11 Recreation**

**12 Tribes**

12-1 Tribal Harvest	12-2 Health, Spirituality, & Tradition
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<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

### **C: Example Assessment - 2000 USFWS and NMFS Biological Opinions**

This section provides an example of how to complete an assessment when building your own alternative proposal. The 2000 USFWS and NMFS Biological Opinions have been used as the examples to illustrate the assessment. To give an understanding of how the BiOps actions were dispersed across the different Policy Directions evaluated in this EIS, Table M is given below. This table first shows the where the implementing actions were placed in relationship to the Policy Directions. The other half of the table gives an illustration of where the greatest alignment of actions is in relationship to a Policy Direction. Or, in other words, which Policy Direction represents the central theme of the actions being proposed. For both of the BiOps, it is evident that the Weak Stock and Sustainable Use Policy Directions make up the core of the actions. Since the current plan under both BiOps is not to breach dams initially, the central tendency leaned toward the Sustainable Use Policy Direction. As shown, however, there are a few actions that are outside either of those Policy Directions.

The reason for describing the central tendency of the Policy Direction for the two BiOps is twofold: 1) it is easier to determine if future implementing actions are consistent with previous actions and planning goals; and 2) to ensure that expenditures are made efficiently when trying to achieve the overall objective. For example, look at the areas under habitat (1) and hydro (4). Many of the boxes representing the recommended actions are filled in across the Policy Directions. Earlier in this Appendix and in Chapter 3 we explained how being spread across too many Policy Directions could cause confusion on the part of those who must implement actions in the future. It is much more difficult to determine whether future actions are consistent with the previous actions if the overall direction is unclear. Also, consider the time and money that can be spent trying to settle disagreements over what was intended by past actions if there is not a clear Policy Direction guiding the implementation of future actions.

Following the illustrations in Table M, we used the information from Chapter 5, sections 5.2 and 5.3, to complete the assessment. Note that the shading of the different BiOps was done in the same manner of the other chapters by comparing them to the Status Quo.

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Table M: Visual Representation of 2000 USFWS and NMFS Biological Opinions**

Key Regional Issues	ACTION PLACEMENT										CENTRAL POLICY DIRECTION									
	USFWS BiOp					NMFS BiOp					USFWS BiOp					NMFS BiOp				
	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF	NF	WS	SU	SS	CF
<b>1 Habitat</b>																				
1-1 Anadromous Fish																				
1-2 Resident Fish																				
1-3 Introduced Species																				
1-4 Wildlife																				
1-5 Pred. Anad. Fish																				
1-6 Watersheds																				
1-7 Tributaries																				
1-8 Mainstem Col.																				
1-9 Reservoirs																				
1-10 Estuaries																				
1-11 Water Quality																				
<b>2 Harvest</b>																				
2-1 Anadromous Fish																				
2-2 Resident Fish																				
2-3 Wildlife																				
<b>3 Hatcheries</b>																				
3-1 Anadromous Fish																				
3-2 Resident Fish																				
<b>4 Hydro</b>																				
4-1 Dam Mod. & Facil																				
4-2 Hydro Operations																				
4-3 Spill																				
4-4 Flow																				
4-5 Reservoir Levels																				
4-6 Water Quality																				
4-7 Juv. Fish Trans.																				
4-8 Adult Fish Pass.																				
4-9 Flood Control																				
<b>5 Power</b>																				
5-1 Existing Gen.																				
5-2 New Energy Res.																				
5-3 Trans. Reliability																				
<b>6 Industrv</b>																				
6-1 Industrial Dev.																				
6-2 Alum. and Chem.																				
6-3 Mining																				
6-4 Pulp and Paper																				
<b>7 Transportation</b>																				
7-1 Navigation																				
7-2 Trucking & RR																				
<b>8 Agriculture</b>																				
8-1 Irrigation																				
8-2 Pest./Ag. Practices																				
8-3 Grazing																				
8-4 Forestry																				
<b>9 Commercial Fishing</b>																				
<b>10 Resid./Comm. Dev.</b>																				
<b>11 Recreation</b>																				
<b>12 Tribes</b>																				
12-1 Tribal Harvest																				
12-2 Trad, Hlth, Spirit																				

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

**Environmental Consequences Assessment**



Effect Subcategory	Status Quo	NMFS & USFWS 2000 Biological Opinions
<b>Air Quality</b>		
<b>CO</b>		
<b>CO2</b>		
<b>Nox</b>		
<b>PM10</b>		
<b>Sox</b>		

EXPLANATION:

Air emissions may increase from operation changes causing the need for additional combustion turbines to replace any lost peaking capability. The air quality is expected to be degraded a small amount more than under Status Quo. If breaching or drawdown were needed in the long- term, the change in air emissions would considerably increase from the replacement power for lost hydropower and the prolonged operation of existing thermal resources. The air quality effects would be worse than under Status Quo, similar to the Weak Stock Focus.

EXAMPLES:

Should the current power emergency on the West Coast persist, the temporary water management actions foreseen by the BO, may cause a reevaluation of the policy direction or yield to new generation.

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon. (NMFS Biological Opinion Action Table Dec. 2000)

BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

<b>Land Habitat</b>		
<b>Upland habitat quality</b>		
<b>Upland habitat amount</b>		
<b>Riparian/ wetland habitat quality</b>		
<b>Riparian/ wetland habitat amount</b>		

EXPLANATION:

Immediate, substantial human intervention to preserve and restore lost habitat for weak native stocks, especially in areas designated critical habitat for threatened or endangered species. Mostly active and some passive habitat restoration used to obtain habitat features for weak stocks. Overall, much more habitat for weak native ESA listed species, and some habitat for non-listed species would be preserved and restored.

EXAMPLES:

- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000).
- The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other Federal agencies, states, Tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).
- In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000).
- BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- BPA shall fund actions to improve and restore tributary and mainstem habitat for CR chum salmon in the reach between The Dalles Dam and the mouth of the Columbia River. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

OTHER CONSIDERATIONS:

Due to the loss of available hydropower the need for new generation and transmission would accelerate planned development having some increase over Status Quo. The effects of building new generation and transmission would have land impacts that offset some of the habitat gains above. Overall the change in land habitat would be about the same as Status Quo, If breaching or drawdown occur in the future, the effects would lead to substantial trade-offs of land habitat for aquatic habitat leaving the overall land habitat worse than under Status Quo..

EXAMPLES:

- To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005. (NMFS Biological Opinion Action Table Dec. 2000)
- BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana. (NMFS Biological Opinion Action Table Dec. 2000).

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

<b>Water Habitat</b>		
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<b>Nitrogen Supersaturation</b>		
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EXPLANATION:

Spill and flow regimes would be balanced with local clean water standards. Nitrogen supersaturation, a problem even with improvements, would not be significantly better than Status Quo.

EXAMPLES:

- The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<b>Non-thermal Pollution</b>		
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EXPLANATION:

Increase enforcement of water quality standards for pollutants in critical habitat of weak stocks. Riparian land acquisition and active restoration would reduce up-slope non-point contribution. Use positive incentives, monitoring and enforcement to reduce point and non-point pollution.

Examples:

BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Sedimentation</b>		
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EXPLANATION:

No breaching in the short-term. Water erosion and sedimentation reduced throughout the basin as part of balanced and more active land use management.

Examples:

- The Action Agencies, in coordination with NMFS, USFWS, and other Federal agencies, Northwest Power Planning Council, states, and Tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000).

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

- The action agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005. (FWS Biological Opinion Dec. 2000)

<b>Temperature/ Dissolved Oxygen</b>		
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EXPLANATION:

Overall, temperature and dissolved gas would likely be about the same as Status Quo or slightly better.

EXAMPLES:

- By June 30, 2001, the action agencies shall develop and coordinate with FWS, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and State and Tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations. (FWS Biological Opinion Dec. 2000)
- The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Instream Water Quantity</b>		
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EXPLANATION:

Water withdrawals reduced primarily through management and positive incentives.

EXAMPLES:

- The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Amount of Stream/River Habitat</b>		
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EXPLANATION:

About the same as Status Quo because no major changes in river management.

EXAMPLES:

- BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

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improvements in three mainstem reaches. Results shall be reported annually. (NMFS Biological Opinion Action Table Dec. 2000)

- BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and Federal law to ensure that a reasonable portion of any water conserved will benefit listed species. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<b>Reservoir Habitat</b>		
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EXPLANATION:

About the same as Status Quo because no major changes in reservoir habitat would occur.

EXAMPLES:

- The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby. (NMFS Biological Opinion Action Table Dec. 2000)
- BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Fish and Wildlife</b>		
<b>Natural Spawning Native Anadromous Fish</b>		
<b>Hatchery Produced Native Anadromous Fish</b>		

EXPLANATION:

Full potential unknown; limited by existing dams and lack of spawning habitat. Population sizes vary substantially due to natural and human-caused factors. Harvest and hatcheries would be controlled to accommodate changes in population status. Less hatchery production and harvest overall. Natural and hatchery fish would increase with habitat, hatchery and harvest improvements.

EXAMPLES:

- In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall continue to fund studies that monitor survival, growth, and other early life history attributes of Snake River wild juvenile fall chinook. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

- The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts). (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses. (NMFS Biological Opinion Action Table Dec. 2000)
- The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River. (NMFS Biological Opinion Action Table Dec. 2000)
- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for hatchery and harvest measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Native Resident Fish</b>		
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EXPLANATION:

Emphasis remains on listed species, but non-listed native fish benefit from habitat and hydrosystem actions.

EXAMPLES:

- The action agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment. (FWS Biological Opinion Dec. 2000)
- Implement VarQ flood control/storage at Libby Dam by October 2001. (FWS Biological Opinion Dec. 2000)
- During water year 2001, (October 1, 2000 - September 30, 2001) the action agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or “tiered” approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River. (FWS Biological Opinion Dec. 2000)

<b>Non-native species</b>		
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EXPLANATION:

Emphasis remains on listed species. Non-native fish are actively managed and reduced to benefit listed species.

EXAMPLES:

- The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

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<b>Native Wildlife</b>		
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EXPLANATION:

Needs of the listed species balanced against the needs of all species. More habitat, better management. Approach should benefit wildlife species more than status quo.

EXAMPLES:

- The action agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005. (FWS Biological Opinion Dec. 2000)
- The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Commercial Interests</b>		
<b>Power</b>		

EXPLANATION:

Limits on generation at existing facilities. Use flow, spill, drawdowns, peak efficiency turbine operation, and facility modifications to improve in-river juvenile salmon survival; avoid fluctuations caused by power peaking operations. Some hydropower losses compared to Status Quo.

EXAMPLES:

- The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon. (NMFS Biological Opinion Action Table Dec. 2000)

<b>Transmission</b>		
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EXPLANATION:

Important transmission improvements required.

EXAMPLES:

- To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005. (NMFS Biological Opinion Action Table Dec. 2000)
- BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana. (NMFS Biological Opinion Action Table Dec. 2000).
- The action agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity. (FWS Biological Opinion Dec. 2000)

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

<b>Transportation</b>		
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EXPLANATION:

As there would be no immediate breaching, navigational effects would be delayed possibly indefinitely. Some increases in other transportation costs.

<b>Agriculture and Forestry</b>		
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EXPLANATION:

Land retirement, land management, technology applied to make agricultural and forestry practices more compatible with fish and wildlife. Some land retirement used where cost-effective. Not clear to what extent costs paid by landowners, ratepayers or taxpayers. Overall, similar to status quo.

EXAMPLES:

- BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001. (NMFS Biological Opinion 2000 Action Table Dec. 2000)
- By December 1, 2001, the action agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program. (FWS Biological Opinion Dec. 2000)

<b>Commercial Fish Harvest</b>		
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EXPLANATION:

Continued restrictions on any commercial harvest that may further endanger weak stocks. Possible increased harvest of other stocks as they recover. Increase in targeted/selective harvest. Direct harvest toward hatchery fish and away from healthier wild stocks. Overall, commercial value may increase relative to Status Quo.

EXAMPLES:

- The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target non-listed fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<b>Other industry (esp. mining, forest products, DSIs)</b>		
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EXPLANATION:

Industries affected by more expensive and slightly less reliable electricity. Incentives for environmentally friendly industry and development. Mine site active restoration. Increase in services and government employment to implement intensive programs. Overall effects are adverse.

<sup>2</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

<b>Recreation</b>		
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<b>Sport Fishing and Wildlife Harvest</b>		
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EXPLANATION:

Restrict methods that risk further degrading weak fish and wildlife species. Promote harvest of non-native species. Manage harvests for ecosystem benefits. Economic benefits to sport fishing and hunting industries may be better than status quo.

<b>Other Recreation</b>		
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EXPLANATION:

Actions to assist weak stocks will consider means to accommodate recreational needs. Other outdoor recreation might benefit from land acquisitions and management for habitat. Overall, about the same as Status Quo, but many losers and winners.

<b>Economic Development</b>		
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<b>Industrial, Residential &amp; Commercial Development</b>		
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EXPLANATION:

Encourage and promote development more compatible with fish and wildlife habitat. About the same as Status Quo

<b>Employment</b>		
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EXPLANATION:

Some loss through increased power costs, increased taxes and subsequently, reduced discretionary income. Employment benefit of new power capacity construction would come sooner than status quo. Increased employment in agricultural and forestry services associated with land management. Commercial fishing effects negative initially, positive later. Overall, decreased employment in sectors where power consumers and agriculture spend and increased employment where natural resource and land management services spend. Employment effects about neutral overall.

<b>Tribes</b>		
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<b>Fish Harvest</b>		
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EXPLANATION:

Tribal harvest would be allowed as long as weak stocks were not negatively affected.

EXAMPLES:

- The Action Agencies shall work with NMFS, USFWS, and Tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target non-listed fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way

<sup>3</sup>BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

and/or methods deployed by the 3-year check-in. (NMFS Biological Opinion 2000 Action Table Dec. 2000)

<b>Health</b>		
<b>Spirituality</b>		
<b>Tradition</b>		

EXPLANATION:

Some tribes would benefit from increased utilization opportunities, especially downriver. Upriver stocks may not be improved as much, but upriver fish and wildlife opportunities should increase overall. Reservation employment opportunities associated with active restoration might increase. Overall, more opportunities than Status Quo.

<b>Costs and Funding</b>		
<b>Ratepayers</b>		

EXPLANATION:

Additional fish recovery costs paid by ratepayers. Power rates would rise, but at slower pace than Weak Stock Focus. Amount of cost passed to ratepayers could be limited by maximum sustainable revenue. Adverse effects on ratepayers.

<b>Federal Taxpayers</b>		
<b>States</b>		
<b>Private/Commercial</b>		

EXPLANATION:

An increase in federal funding relative to Status Quo. Greater likelihood that the ratepayers and the region would be able to finance their share of the additional expenditures. Adverse effect compared to Status Quo.

<b>Other</b>		
<b>Cultural/Historical Resources</b>		

EXPLANATION:

Similar to Status Quo. Some historical structures might be removed.

<b>Aesthetics</b>		
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EXPLANATION:

Little exposure of reservoir bottoms, but maybe more than Status Quo. More land in native vegetation. About the same as Status Quo.

<sup>2</sup> BPA Alternative Policy Direction: NF = Natural Focus; WS = Weak Stock; SU = Sustained Use; SS = Strong Stock; CF = Commerce Focus.

## Appendix J

### TYPICAL ENVIRONMENTAL CONSEQUENCES OF POTENTIAL IMPLEMENTATION ACTIONS

The following two tables provide estimates of many of the environmental consequences of potential fish and wildlife mitigation actions and program activities. The actions and activities could be implemented to benefit fish and wildlife under one or more of the alternative Policy Directions considered in this document. It should be noted that these are sample implementation actions and effects only; that is, the list is not intended to be all inclusive.

Most of the information has been developed through attempts in other EISs and fish and wildlife documents to quantify the environmental consequences using appropriate units and measures. In many cases, ranges of values provide the best available estimates for activities with varying outputs and costs. The estimates should be used for comparative purposes only; actual consequences of individual projects may vary and are expected to change over time.

The actions and activities are aligned with the major categories of environmental consequences considered in Chapter 5 of this DEIS to make it easier to cross reference.

- Table A provides estimates of fish and wildlife benefits that could result from potential implementation actions. The table also provides typical social and economic costs that could accrue from the implementation actions.
- Table B gives the typical impacts from alternative methods of energy generation that could affect air, land, and water.

The estimated environmental consequences of sample actions and activities are useful for those who may want to build their own Policy Direction alternative. The intent of this Appendix is to provide the reader with information to better understand the tradeoffs among program elements.

**NOTE:** All dollar values are economic costs. Most of the values are based on information in the Northwest Power Planning Council's *Human Effects Analysis of the Multi-Species Framework Alternatives* (March 2000). That analysis was itself based on secondary information from recent environmental, economic, and policy analyses in the region. A range is provided where estimates were provided for more than one location, or where multiple references were available. Many of the estimates were derived from research conducted for the Lower Snake River Juvenile Migration Feasibility Study.

Cost information in the tables pertains to the costs of fish and wildlife recovery and mitigation actions. Most hydrosystem costs are expressed as the cost per dam affected. Costs are expressed in terms of their one-time cost and the annualized equivalent. The annual equivalent was calculated assuming 4.75 percent real interest. Payment periods vary depending on the type of action, but are generally 50 years or longer. Most hydrosystem data are from the Lower Snake River Juvenile Migration Feasibility Study, the John Day feasibility study, and from federal planning documents.

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**Appendix J: Typical Environmental Consequences of Potential Implementation Actions**

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Most habitat cost data are based on costs of agricultural and forestry practices provided by the USDA. Some habitat cost estimates are based on costs of projects funded by BPA. Cost data are generally expressed as cost per acre, though cost per mile is generally more appropriate for stream restoration practices. Cost per project is used where no better physical measure is possible.

Hatchery cost data are available from federal sources, and statistical summaries of these data yield cost per pound of fish produced. The range of costs may reflect the age and size of fish produced, different species, and different operators. Costs of actions to reduce harvest are generally based on lost net revenues in the fishing industry, but costs of targeted fisheries can be based on the costs of implementing the new practices.

The air, land, and water data came mainly from the BPA Business Plan FEIS and Resource Programs FEIS. The additional data on diesels and simple cycle combustion turbines was within the range of effects information provided in the BPEIS and has specifically been noted below to help the reader more easily see the effects.

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
<b>Social and Economic</b>				
Agriculture, Crop Switching on Irrigated Land		50-100	\$ cost/acre irrigated	
Agriculture, Crop Management (modified cultivation practices, conservation tillage, no-till agriculture, development of small ponds to retain water)	Not quantified, Potentially major		\$ cost/acre managed	
Agriculture, Erosion Management on Dry Land		10-30	\$ cost/acre managed	USDA 1996a, 1997
Agriculture, Fallow Irrigated Land		100-300	\$ cost/acre fallow	
Agriculture, Irrigation Water Management		10-100	\$ cost/acre irrigated	USDA 1996a, 1997
Agriculture, Nutrient/Pesticide Management: Irrigated Land		5-40	\$ cost/acre managed	USDA 1996a, 1997
Agriculture, Nutrient/Pesticide Management: Dry Land		5-10	\$ cost/acre managed	USDA 1996a, 1997
Agriculture, Retire Irrigated Land	2,000-5,000	95-240	\$ cost/acre retired	

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Agriculture, Retire Dry Land/Convert to Native Vegetation	500-1,000	25-50	\$ cost/acre retired	
Agriculture, Screen Irrigation Diversions		5-47	\$ cost/cfs diversion capacity screened	USDA 1996b
<b>Dam Breach Mainstem:</b> Hydropower Loss		55-66 (Lower Snake Dams) 215-250 (John Day)	Million \$ cost/dam breached	USACE 1999a, 1999c
Dam Breach Mainstem: Implementation	202(Lower Snake Dams); 2,500 (John Day)	10 (Lower Snake Dams); 120 (John Day)	Million \$ cost/dam breached	USACE 1999a, 1999b
Dam Breach Mainstem: Increased Transmission Cost	120-144 (Lower Snake Dams)	5-6 (Lower Snake Dams)	Million \$ cost/dam breached	USACE 1999a
Dam Breach Mainstem: Facilities Cost Savings		Some dam modification costs would be avoided by breaching if the costs would be required for the dams that are breached	Million \$ cost saved by breaching	
Dam Breach Mainstem: Navigation Loss		25 (4 Lower Snake Dams); 95 (John Day)	Million \$ loss/group of dams) breached	USACE 1999a, 1999b
Dam Breach Mainstem: Operations and Maintenance Cost Savings		34(4 Lower Snake Dams); 10 (John Day); 10 (McNary)	Million \$ cost saved by breaching	Anderson 1999
Dam Breach Mainstem: Other Recreation Loss		8 (Lower Snake Dams)	million \$ cost/dam breached	USACE 1999a, 1999d
Dam Breach Mainstem: Recreational Fishing Loss		0.4 (Lower Snake Dams)	million \$ cost/dam breached	USACE 1999a, 1999d

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

<b>Action/Activity</b>	<b>Environmental Effect</b>	<b>Annualized Environmental Effect</b>	<b>Unit of Measure</b>	<b>Reference</b>
Dam Breach Mainstem: Water Supply (Irrigation) Reduction	50-61 (Lower Snake Dams) 370 (John Day); 400 (McNary)	2 (Lower Snake Dams); 20 (John Day 20 (McNary)	million \$ cost/dam breached	USACE 1999a, 1999b
<b>Dam Breach Tributary:</b> Hydropower Loss (Net of Expected Costs)		About zero	million \$cost/dam	
Dam Breach Tributary: Implementation Costs	10-20	0.5-1.0	million \$ cost/dam	CBB 1999a
<b>Dam Modification:</b> Change Dam Operations (Spills and Flows)		Depends on specifications; Changes in power, recreation, flood control, and water supply may be important		
Dam Modification: Dissolved Gas and Temperature Control	5-32	0.3-2.1	million \$ cost/dam modified	Anderson 1999
Dam Modification: Other Juvenile Transport and Bypass System Improvements	5-116	0.3-5.8	Million \$ cost/dam modified	Anderson 1999
Dam Modification: Surface Bypass Systems	50-250	2.6-13	Million \$ cost/dam modified	Anderson 1999
Dam Modification: Turbine Improvements	2-10	0.1	Million \$ cost/turbine rehabilitated (Each dam has 6-22 turbines)	Kranda 1999

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

<b>Action/Activity</b>	<b>Environmental Effect</b>	<b>Annualized Environmental Effect</b>	<b>Unit of Measure</b>	<b>Reference</b>
<b>Education</b> , Public Environmental	1,000-100,000		\$ cost/educational event	
<b>Enforcement</b> , Fish and Wildlife Regulations	25,000-60,000		\$ cost/person/year	
<b>Forestry</b> , Controlled Burn	25-56	3-6	\$ cost/acre treated	ICBEMP 2000; USDA 1996c
Forestry, Eliminate Timber Harvest	125-1,500	6-71	\$ cost/acre not harvested	ICBEMP 1997; USDA 1996c
Forestry, Limit Size of Clearcuts	<125-1,500	<6-71	\$ cost/acre of deferred harvested	ICBEMP 1997; USDA 1996c
Forestry, Reforestation	300-500	15-24	\$ cost/acre reforested	USDA 1996c
Forestry, Shelterwood/ Group Selection Harvest	50-100 + net on deferred timber harvest	56-130	\$ cost/acre treated	ICBEMP 1997
Forestry, Thinning	81		\$ cost/acre thinned	ICBEMP 2000
<b>Habitat Improvement</b> , Active Meander Restoration	10,000–100,000	475– 4,750	\$ cost/acre restored	BPA 1999
Habitat Improvement, Channel Modification (Substrate, configuration, reconnect side channels, etc.)	9,000–100,000	475– 4,750	\$ cost/mile of stream modified	BPA 1999; ICBEMP 2000
Habitat Improvement, Construct/Restore Wetlands	2,000-10,000	100– 470	\$ cost/acre constructed	USDA 1996b

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

<b>Action/Activity</b>	<b>Environmental Effect</b>	<b>Annualized Environmental Effect</b>	<b>Unit of Measure</b>	<b>Reference</b>
Habitat Improvement, Dike Removal in Estuary	Not quantified, potentially significant		\$ cost/mile of dike removed	
Habitat Improvement, Floodplain Structure Buyback			\$ cost/property purchased	
Habitat Improvement, Instream Structures	30,000	1,425	\$ cost/mile of stream modified	BPA 1999
Habitat Improvement, Monitoring (Improve environmental data management systems)		25,000-60,000	\$ cost/person/year	
Habitat Improvement, Reconnect Aquatic Habitats	9,000–100,000	475– 4,750	\$ cost/project	BPA 1999; ICBEMP 2000
Habitat Improvement, Remove Passage Obstruction (Culverts, low-head dams, weirs)	5,000-50,000	240–2,400	\$ cost/obstruction removed	BPA 1999
Habitat Improvement, Research	10,000-300,000		\$ cost/research project	
Habitat Improvement, Riparian Restoration	300		\$ cost/acre of riparian area improved	ICBEMP 2000
Habitat Improvement, Road Management (Upgrades, maintenance, closing, and removing roads)	5,800		\$ cost/mile of road treated	ICBEMP 2000

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

Action/Activity	Environmental Effect	Annualized Environmental Effect	Unit of Measure	Reference
Habitat Improvement, Utility and Transportation Corridors (Adjust vegetation management and maintenance)	Not quantified, potentially significant		\$ cost/mile of corridor adjusted	
Habitat Improvement, Water Rights Purchase (1 Million Acre-Feet of Water from Upper Snake River)		75-85	Million \$ total cost	BOR 1999
Habitat Improvement, Wildlife Habitat (Seral stages, snags, downed wood, large trees, and preferred species)	44	2.3	\$ cost/acre treated	ICBEMP 2000
<b>Hatcheries</b> , Construct New Facilities	20-40	1-2	Million \$ cost/hatchery	Radtke & Davis 1997
Hatcheries, Demolition/Decommissioning	50,000-200,000	2.6-10.5	Thousand \$ cost/hatchery	
Hatcheries, Increase Fish Production in Existing Facilities		2-6	\$ cost/pound of smolts	Radtke & Davis 1997
Hatcheries, Increase Fish Production in New Facilities (including O&M)		7-10	\$ cost/pound of smolts	Radtke & Davis 1997
<b>Power</b> , Build Replacement Generation Facilities	Varies, may be significant	Varies, may be significant	\$/aMW	

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

<b>Action/Activity</b>	<b>Environmental Effect</b>	<b>Annualized Environmental Effect</b>	<b>Unit of Measure</b>	<b>Reference</b>
Power, New Transmission Line Right-of-Way	2.7-4.4		ha dedicated to ROW/km of transmission line	BPA 1993
<b>Rangeland</b> , Exclude Grazing from Riparian Zone		10-20	\$ cost/acre excluded	USDA 1996a
Rangeland, Improvements/Restoration	50		\$ cost/acre treated	ICBEMP 2000
Rangeland, Manage/ Eliminate Grazing (Seasonal or rotational grazing, reduced grazing intensity, deferred grazing)		1-5	\$ cost/acre excluded	USDA 1996b
Rangeland, Noxious Weed Treatments	30	2.4	\$ cost/acre treated	ICBEMP 2000
Rangeland, Retire Rangeland	100-500	5-47	\$ cost/acre retired	USDA 1996a, 1996b, 1997
<b>Recreation</b> , Controlled Recreation Intensity or Rotational Use	Varies, may be significant			
Recreation, Relocate Facilities Away from Sensitive Habitats	125-1,500	6-71	\$ cost/acre not used	
Recreation, River (Floating, viewing, hiking)	71-297		\$/river trip	Loomis 1999 in USACE 1999a

**Table A - Typical Fish and Wildlife Social and Economic Consequences, of Implementation Actions.**

<b>Action/Activity</b>	<b>Environmental Effect</b>	<b>Annualized Environmental Effect</b>	<b>Unit of Measure</b>	<b>Reference</b>
<b>Urban and Rural Development, Acquisition of Conservation Easements</b>	1-100	.05-47	Thousand \$/acre of easement acquired	
Urban and Rural Development, Improve Stormwater Treatment	1,000 - 3,000	50 – 150	\$ cost/acre-foot of water treated	
Urban and Rural Development, Improve Wastewater Treatment	0.01-10	0.0005-.5	Million \$/project	

**Table B - Typical Impacts to Air, Land, and Water from Alternative Methods of Energy Generation.**

Types of Energy Conservation and Generation	Air Emissions					PAHs	Water Consumed --yd <sup>3</sup> /aMW--	Land Area Consumed --ac./aMW--
	SO <sub>2</sub>	NO <sub>x</sub>	CO <sub>2</sub> -- tons/aMW --	Particulates	CO			
Energy Conservation <sup>a</sup>	0.0	0.0	0	0.0	0.0		0	0.0
Power Efficiency Improvements <sup>a</sup>	0.0	0.0	0	0.0	0.0		0	0.0
Renewable Energy <sup>a</sup>								
Geothermal	0.8 H <sub>2</sub> S	0.0	636	0.0	0.0		72,277	0.3
Solar	0.0	0.0	0	0.0	0.0		629	6.0
Wind	0.0	0.0	0	0.0	0.0		0	23.6
Hydro	0.0	0.0	0	0.0	0.0		0	0.0
Cogeneration <sup>a</sup>								
Solid Waste-Fired	13.6	70.2	13,256	3.0	2.7	+	0	2.0
Wood-Fired	0.5	9.0	11,959	1.7	17.0	+	87,604	2.6
Existing Natural Gas-Fired	0.0	5.3	3,542	0.0	2.0	+	5,486	0.2
Natural Gas Combustion Turbine <sup>ab</sup>								
Older	0.0-43.9	4.6-15.0	3,542-5,142	0.0-0.3	0.7-3.8	+	5,486	0.2
Newer	0.0-0.3	0.4-4.9	3,313	0.2	0.1-5.9	+	5,486	0.2
Natural Gas Reciprocating Engines (with NO <sub>x</sub> control) <sup>b</sup>	0.0	1.3-2.5	--	1.1-1.2	3.7-3.8	+	--	--
Large Stationary Diesel Engines <sup>c</sup>	1.9-47.2		7,713	1.4-4.7	2.5-39.7	+	--	--
Without NO <sub>x</sub> Control		149.6						
With NO <sub>x</sub> Control		14.3-88.8						
Stationary Dual Fuel (5% diesel, 95% natural gas uncontrolled for NO <sub>x</sub> ) Engines <sup>c</sup>	0.2	105.5	--	--	44.2	+	--	--
Nuclear Energy <sup>a</sup>	0.0	0.0	0	0.0	0.0		25,814	2.2
Coal <sup>a</sup>								
Common	8.6	21.6	8,843	1.3	1.5	+	17,247	1.3
Clean Fluidized-Bed Coal	3.1	5.3	8,052	0.6	1.4	+	26,507	1.6
Clean Gasification Coal	1.5	3.9	7,551	0.2	0.1	+	26,232	0.7
Fuel Switching (Gas water heaters and furnaces) <sup>a</sup>	0.0	2.4	2,550	0.0	1.1	+	0	0.0
Power Purchases (Assumed all combustion turbines) <sup>a</sup>	0.0	5.3	3,542	0.0	2.0	+	5,486	0.2

<sup>a</sup> BPA 1993; <sup>b</sup> EPA 2000; <sup>c</sup> EPA 1996

+ = Present in emissions from incomplete combustion

-- = No data

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**Appendix J: Typical Environmental Consequences of Potential Implementation Actions**

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