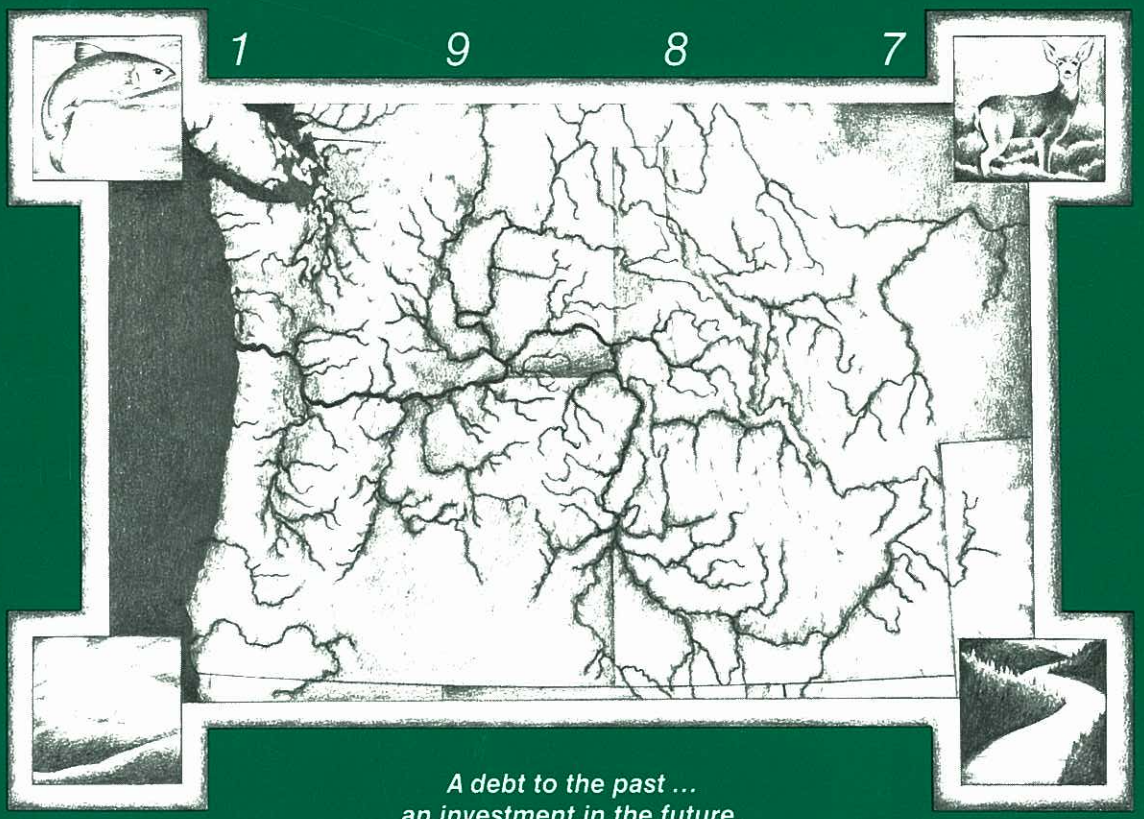

A debt to the past ...
an investment in the future.

COLUMBIA RIVER BASIN FISH AND WILDLIFE PROGRAM

NORTHWEST POWER PLANNING COUNCIL

1987
Columbia River Basin
Fish and Wildlife Program

Adopted November 15, 1982
Amended October 10, 1984
Amended February 11, 1987

Pursuant to Section 4(h) of the
Pacific Northwest Electric Power Planning
and Conservation Act of 1980 (P.L. 96-501)

NORTHWEST POWER PLANNING COUNCIL
850 S.W. Broadway, Suite 1100
Portland, Oregon 97205

To the People of the Pacific Northwest:

The Columbia River Basin is both the source of an extensive network of hydropower resources and the home of a unique assortment of fish and wildlife. In the past, the two have not coexisted without conflict. During the past 50 years, as the hydropower system has grown, the fish and wildlife in the basin have suffered. With its publication in 1982, the Columbia River Basin Fish and Wildlife Program represented the genesis of a concerted effort to rebuild the species that have been harmed by hydropower development and operation. Now, nearly five years later, the publication of the 1987 program provides an opportunity to assess the accomplishments of the past five years and to set a course for future actions.

The program's motto is: "A debt to the past ... an investment in the future." The 1987 Fish and Wildlife Program describes not only the effort to repay that debt but also the initial returns on the investment. Perhaps the greatest return has been the developing cooperation and consensus among previously dissident factions in the basin. The program is proof that a cooperative effort between hydropower and fish and wildlife interests can yield positive results—results that are beneficial to the economic and social well-being of the Pacific Northwest.

A consensus on a process for rebuilding fish and wildlife in the basin now exists, and it is time to put that process to work to produce tangible results. This program should mark the continuation, not the culmination, of those cooperative efforts. It signals the beginning of a new era of cooperation where all parties share a mutual goal: a healthy basin where the needs of hydropower production and fish and wildlife resources are treated in concert, not in conflict, with each other.

The Council would like to thank former Idaho Council member Larry Mills for his extensive contributions to the fish and wildlife program. Mr. Mills, who retired from the Council shortly before the new program was adopted, was instrumental in shaping the Council's fish and wildlife policies.

Sincerely,

ROBERT B. DUNCAN
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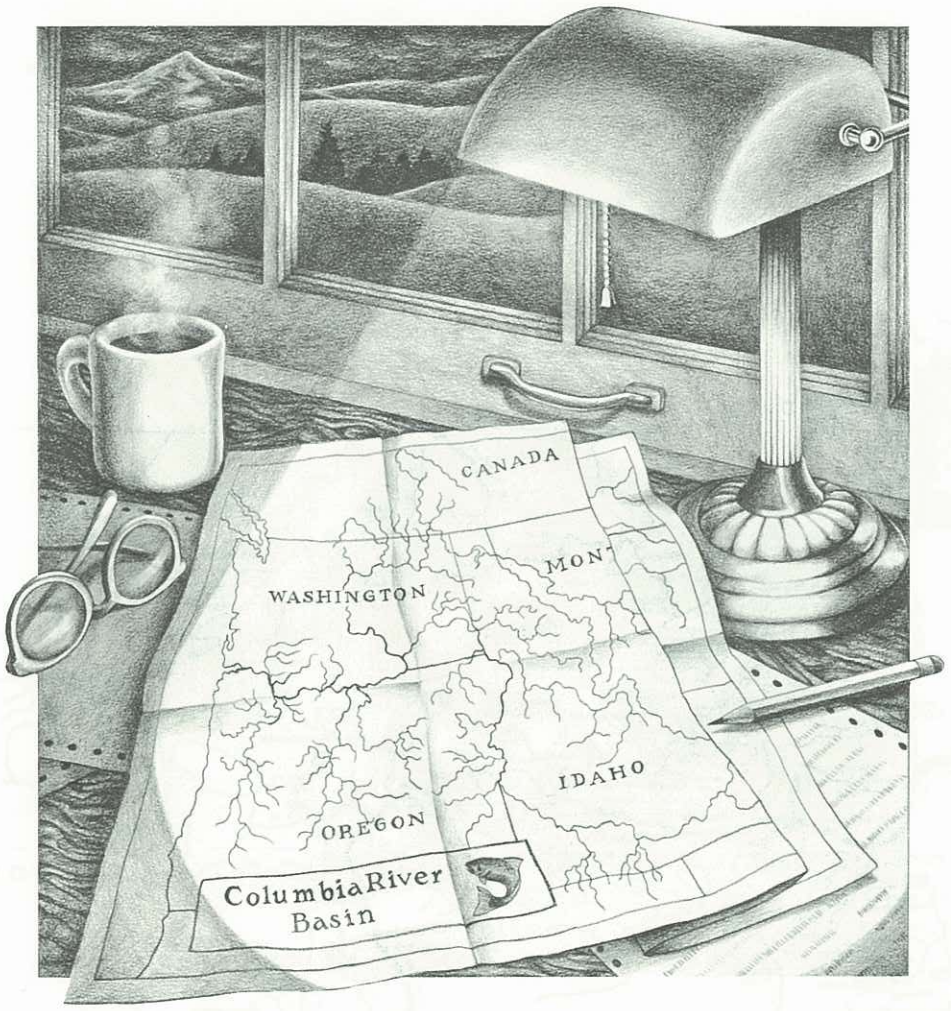

Figure 1.
Columbia River Basin Projects

Foreword

This is essentially a fish story. And like all good fish stories, it boasts of being the largest.

The story told in these pages focuses on one of the nation's most important river systems—the Columbia and its tributaries. This complex waterway, traversing much of the Pacific Northwest, is home to the unique and important species known as the kings among fish—the salmon and steelhead. This is a story of how these creatures came to the brink of extinction and of one of the largest efforts in the world to rebuild an animal population. It is also the story of other fish and wildlife facing the same problems in the Columbia River Basin of the Pacific Northwest. Finally, it is a story of that region and its citizens and of their extraordinary cooperative effort to reclaim a biological inheritance.

A catalogue of the great natural resources of the Pacific Northwest—and there are many—must first include the Columbia River and its tributaries. This large and complex river system has given the region the most abundant and lowest cost hydroelectric power in the nation. That power has lighted and warmed homes, powered businesses and industries, and turned arid wastelands into productive croplands through irrigation.

These benefits were made possible by harnessing the river and its tributaries with powerful dams that converted falling water into electricity. [See Figure 1.] This enabled power managers to regulate both the volume and timing of river flows in order to extend power production through both wet and dry seasons.

But this extraordinary benefit came with an extraordinary cost to the Columbia River Basin. Once a free-flowing river, the Columbia was turned into a series of lakes as dam after dam straddled the river's breadth. The impact on the basin's fish and wildlife was profound. Not only did the dams present physical barriers to migrating fish, but the regulation of the river altered water flows and temperatures. The reservoirs created by the dams inundated thousands of acres of spawning and rearing habitat. Development also stripped shoreline vegetation, increased erosion and sediment, and made wildlife more accessible to harassment. In some cases—for certain strains of salmon and steelhead, for example—development all but eradicated these creatures.

The decline of the fishing resource

By 1980, the Pacific Northwest was perilously close to losing its Columbia River salmon. Some runs had been considered for classification as endangered species. The annual salmon and steelhead runs had dwindled to 2.5 million, less than a quarter (and by some estimates only 15 percent) of the run sizes 100 years earlier. Most of the losses were upriver from Bonneville Dam, where the least mitigation for damage had occurred. The accessible habitat for spawning was cut by one-third. Not all of these losses were due to hydropower; other forces also were at work. Irrigation, flood control, overfishing, and poor logging, grazing and farming practices added to erosion and devegetation of shoreline habitat as well as siltation of spawning beds. But the major decline of the fish coincides with the construction and operation of the hydropower dams.

No group was more affected by the deterioration of the fish runs than the basin's Indian tribes who depended on salmon for cultural and religious purposes as well as for their livelihood and food. The Northwest was a territory secured for settlers in part by treaties with Indians. One of the most important trade-offs for the land had been guarantees to the tribes that they would have the right to fish in their "usual and accustomed" places. During the 1960s and 1970s, fishing disputes between the states and tribes in the Northwest were bitter and protracted. The resource was shrinking so rapidly it appeared that the runs could be gone, no matter who won the fishing rights.

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Commercial and recreational fishers, and indeed the entire Northwest economy, also felt the impact of the fish losses. Many groups and individuals were becoming increasingly concerned about the problem. Sincere efforts had been made to protect existing fish and wildlife and, in some cases, to make up for past losses. But, because the river and its tributaries ran through a number of jurisdictions, including states, federal and tribal lands, the work had been fragmented. A coordinated systemwide approach to reversing the decline of the basin's animal life was needed.

Legislative history

The Northwest desperately needed a solution, and time was running out. Then, an unusual opportunity arrived. In the late 1970s, the region's electrical power interests turned to Congress for another problem related to the Columbia River. Hydropower alone could no longer meet the region's electricity needs. A massive electricity deficit was predicted for the 1980s. Northwest utilities sought to expand the rights of the region's federal power marketing agency, the Bonneville Power Administration, to acquire new resources.

The time was ripe for the Northwest's fish and wildlife interests, and they found a sympathetic ear in Congress. A bill, which had begun as a Northwest power bill, soon picked up major fish and wildlife provisions. These provisions related directly to power because they called for the protection, mitigation and enhancement of fish and wildlife affected by hydroelectric development and operations in the Columbia River Basin.

An unprecedented consensus began to take shape. The issue was clear—the dams had exacted a costly toll. The debate was only one of degree—how much responsibility for fish and wildlife losses should the hydropower system bear? What ultimately emerged was as innovative as it was historic. The basin's fish and wildlife interests were to be accorded equitable treatment with Northwest electrical power interests.

Foreword

The Northwest Power Planning Council

In December 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act, known more commonly as the Northwest Power Act. The Act authorized the states of Idaho, Montana, Oregon and Washington to enter into an interstate compact to create a policy-making and planning body for two important Northwest resources—electrical power and the Columbia River Basin's fish and wildlife. The entity authorized by the Act and created by the four states is the Pacific Northwest Electric Power and Conservation Planning Council—more commonly known as the Northwest Power Planning Council.

The governors of the four states each appointed two members to serve on the Council. The Council, headquartered in Portland, Oregon, began operation in April 1981. To underscore the importance of protecting fish and wildlife, the Act directed the Council to develop its Columbia River Basin Fish and Wildlife Program before it developed a power plan.

The fish and wildlife program

This program is the result of that charge. It is the first systemwide approach to dealing with the impacts of the hydroelectric system on the Columbia River Basin's fish and wildlife. The enormity of the problem requires an unprecedented cooperative effort. The Council relied heavily on widespread public input in developing this program and continues to value such input as it monitors implementation and fine-tunes this program.

The Columbia River Basin Fish and Wildlife Program is, quite possibly, the most ambitious effort in the world to save a biological resource. The program is first of all enormous on a geographic scale, encompassing the entire Columbia River Basin and more than 30 subbasins—some 259,000 square miles. It is complex politically because the river and its creatures travel through a number of governmental and management jurisdictions. It is complex technologically and economically because of the requirements to balance fish and wildlife and power interests. And, not least of all, it is incredibly complex biologically because it involves species of animal life with unusual migratory and life-cycle characteristics, about which much is still unknown.

Northwest accomplishments

Because the fish and wildlife program is only five years old, and five years is about the life-span of many salmon and steelhead, it is still too early to determine if the program has resulted in a specific numerical increase in fish or wildlife populations. Many protection and rehabilitation projects are being implemented in the river for the first time, and some—for example the installation of certain mechanical fish bypass systems at dams—will not be completed for a few more years. The damage to fish and wildlife occurred over many decades; so no short-term fix is likely to meet the Northwest's needs.

That is not to say there hasn't been significant progress. Although it is too early to credit increased fish counts to this program, there have been measurable steps ahead in the basin. [See box: Five Years of Progress.] The fish and wildlife program has been a catalyst for a new spirit of cooperation. The program has created a forum for all the basin's fish and wildlife interests; it has provided a focused direction, an overall blueprint for the future; and, finally, it has set down specific actions to protect and rebuild fish and wildlife that were damaged by hydroelectric projects in the Columbia Basin. Some of these actions have already taken place; many are in progress; and still more are mapped out to be completed within specified times. Clearly, this program is far more than a philosophical discussion of a problem. The emphasis is on action.

Foreword

Five Years of Progress

In the last five years, the Pacific Northwest has taken major steps toward fish and wildlife protection and enhancement in the Columbia River Basin. Among the tangible results are the following. They represent the efforts of not only the Northwest Power Planning Council, but the region's state and federal fish and wildlife agencies, Indian tribes, Bonneville Power Administration, Corps of Engineers, Bureau of Reclamation, Federal Energy Regulatory Commission, public and private utilities, and other interested groups and citizens.

Together, these entities have:

- Developed a "water budget" (reserved block of water) for release during the spring to create higher flows to aid downstream migration of young salmon and steelhead.
- Pressed for the completion or improvement of bypass systems at 13 mainstem dams to help fish pass safely.
- Provided for use of spill (passing water through a spillway rather than a dam's turbines) to reduce juvenile fish mortality at dams as an interim measure until mechanical bypass systems can be put in operation at the remaining dams.
- Completed construction of release, collection and holding facilities in the Umatilla subbasin. Started development of other new salmon and steelhead production facilities in the Deschutes, Nez Perce, northeastern Oregon, Umatilla, and Yakima/Klickitat areas.
- Completed 29 sets of projects to improve tributary passage and habitat for salmon and steelhead in the Clearwater, Deschutes, Grand Ronde, John Day, Salmon, Umatilla, Wenatchee, Willamette and Yakima subbasins.
- Initiated more than 80 other new projects to improve natural and wild production of salmon and steelhead. These include efforts in the Deschutes, Grand Ronde, Hood, John Day, Salmon, Umatilla, Wenatchee, Willamette and Yakima subbasins.
- Developed a basinwide computerized planning model to aid in understanding the life cycles of salmon and steelhead and the relationships of production, mainstem passage mortality and harvest regulation.

Foreword

- Created the first basinwide data base to collect and organize existing information on the production of salmon and steelhead.
- Compiled the first comprehensive study on the extent and causes of the decline of salmon and steelhead in the basin. This study led to an estimate of how many salmon and steelhead were lost in the basin due to hydropower.
- Designed a planning process to set a course toward an interim goal of doubling salmon and steelhead runs in the basin.
- Begun a process to identify the high-value salmon and steelhead areas in the basin that may need special protection from hydropower development.
- Promoted use by the Federal Energy Regulatory Commission (FERC) of analyses that take into account the cumulative impact of a number of hydropower projects on fish and wildlife within a subbasin.
- Focused salmon and steelhead research on six areas: water budget effectiveness and reservoir mortality, disease, hatchery production, supplementation, bypass, and transportation effectiveness.
- Initiated a systemwide monitoring effort to evaluate the effectiveness of the salmon and steelhead program.
- Produced the first major report that identifies salmon and steelhead stocks now present in the basin.
- Supported the successful ratification of the United States/Canada Pacific Salmon Treaty designed to increase the number of fish returning to the basin.
- Completed construction of the Cabinet Gorge Hatchery to produce about 20 million kokanee in Idaho. Started construction of a hatchery to produce brook, rainbow and cutthroat trout on the Colville Indian Reservation in northeastern Washington.
- Undertook the basin's first major efforts to rehabilitate wildlife populations and habitat adversely affected by Hungry Horse and Libby dams in Montana.
- Initiated major projects to protect and rebuild resident fish populations in Montana.

Program Overview

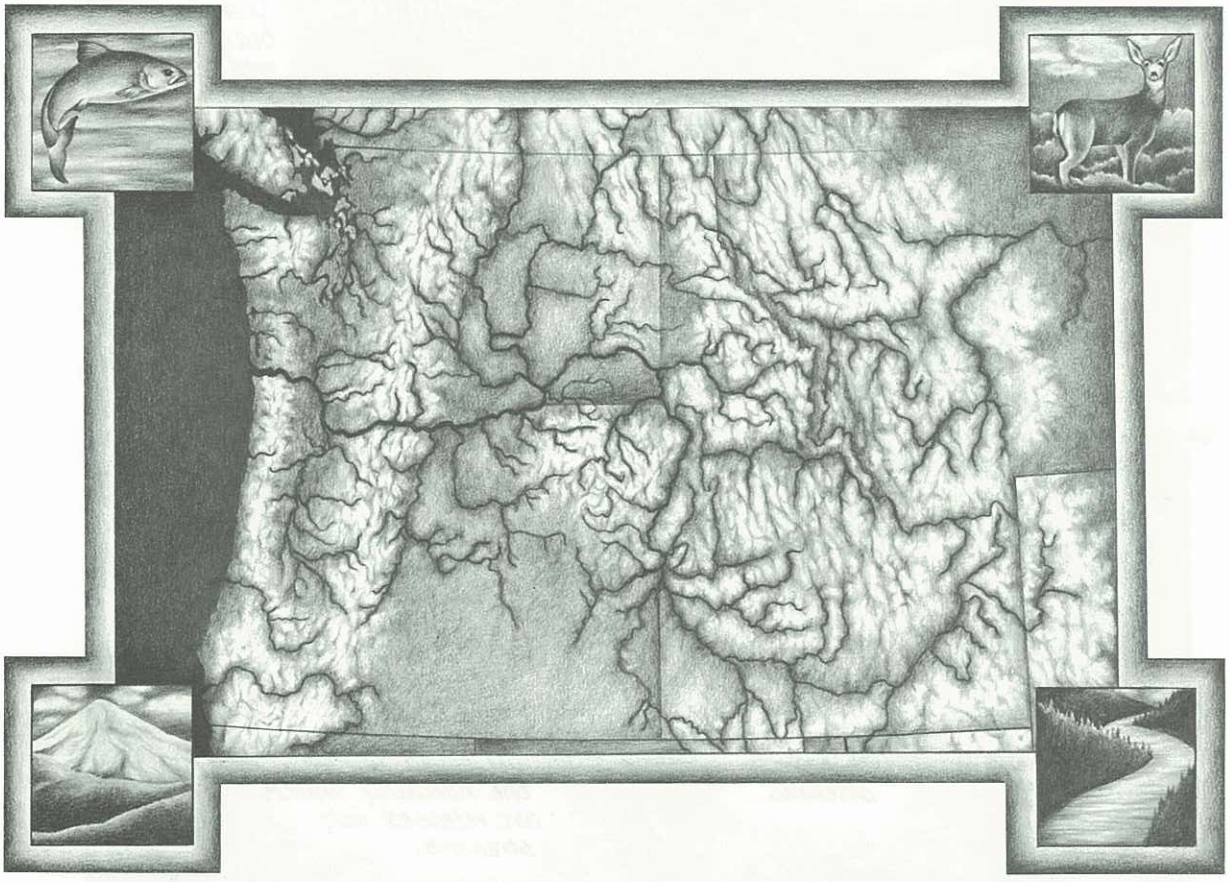
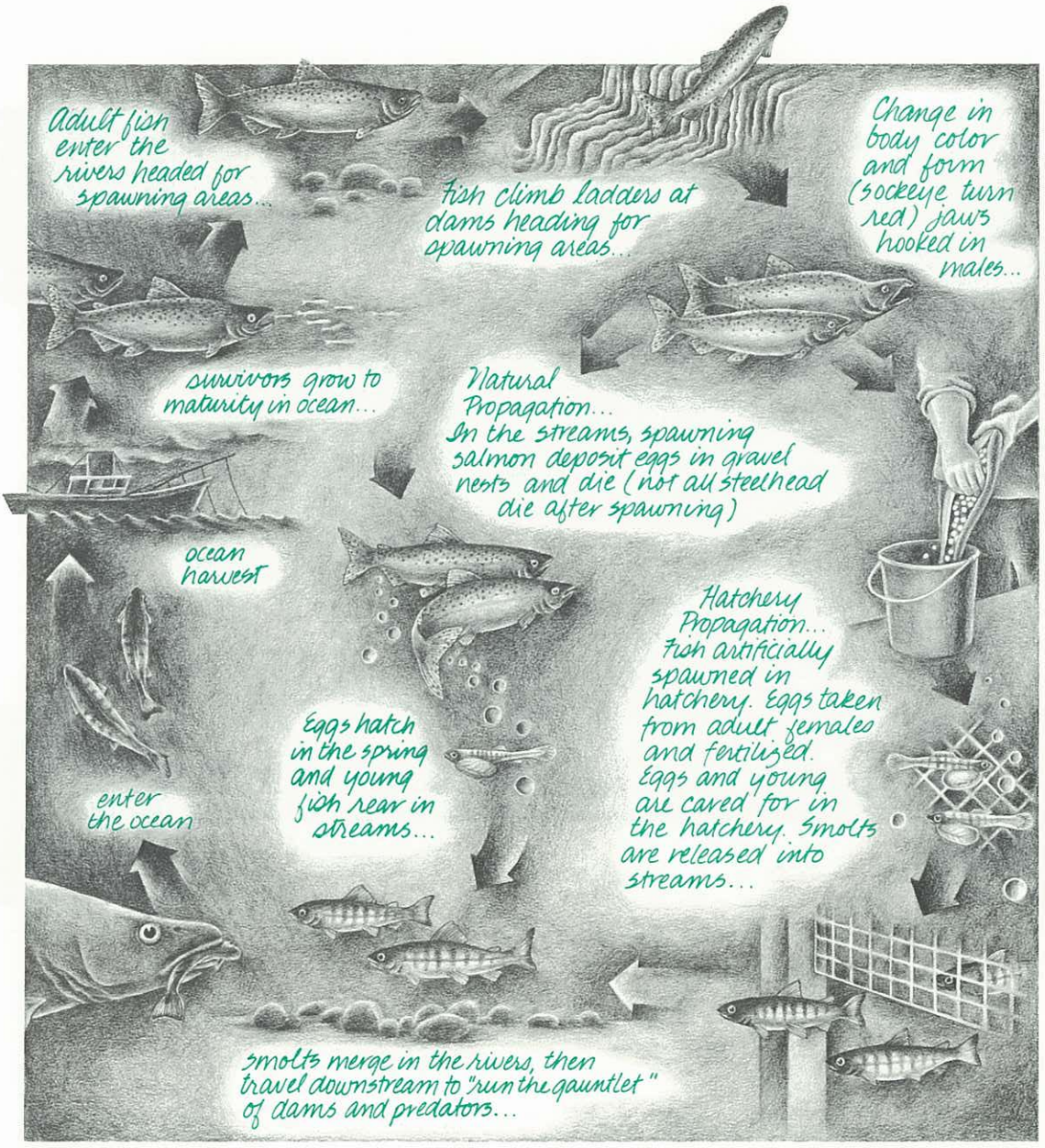


Figure 2.
Salmon Life Cycle



Program Overview

The major thrust of the Columbia River Basin Fish and Wildlife Program is to put more fish back into the Columbia River and its tributaries and to do so with maximum effectiveness at a reasonable cost to ratepayers.

While the program addresses the needs of all fish and wildlife affected by hydroelectric development in the basin, the focus is on salmon and steelhead. More than any other species, these anadromous fish (fish born in freshwater that spend their adult lives in the ocean) are symbols of Northwest waters. No other Columbia Basin species has such a vital impact on both the region's and the nation's economy.

Anadromous fish, such as salmon and steelhead, have a life cycle unlike any other creature. [See Figure 2.] The program is designed to address the needs of these fish at each important stage in their life cycle. These fish are born in freshwater streams throughout the Columbia Basin; then, as smolts, they begin an incredible journey that will take them to the ocean, where they spend their adult lives traveling thousands of miles over a period of roughly three to seven years. The fish that survive predators, including man, return to freshwater. Spurred on by a powerful homing instinct, they surge upstream to their birthplace to spawn. After spawning, the salmon die, but some steelhead species may live to repeat the cycle and reproduce again. The order of the salmon and steelhead sections in the program (Sections 200-800) corresponds to this cycle.

Each section of the program is summarized below.

Section 100: Introduction

The purposes and requirements of the Northwest Power Act as they relate to Columbia River Basin fish and wildlife are outlined, and the authorities and roles of the agencies that implement the fish and wildlife program are described. The Northwest Power Planning Council is charged with program development; the federal implementing agencies are the Bonneville Power Administration, the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation and the Federal Energy Regulatory Commission. This section also describes how the program was developed. A general description of program funding and safeguards for protecting ratepayer investments also is included.

Salmon and Steelhead

Section 200: Salmon and Steelhead Framework

The program stresses a basinwide, multifaceted approach to rebuilding salmon and steelhead runs. Such a systemwide perspective takes the entire Columbia River Basin, including its individual subbasins, into account. This perspective also integrates three approaches to protection and enhancement: 1) improvements in fish production, 2) safe fish passage in the mainstem rivers, and 3) harvest management designed to support the rebuilding of fish runs.

Section 200 establishes a numerical interim goal for rebuilding salmon and steelhead runs. The target is to double the runs, increasing existing runs from about 2.5 million to about 5 million fish. This goal was based on a comprehensive study of how many salmon and steelhead have been lost in the basin and, of them, what portion was lost due to hydropower. The interim goal is supported by a broad regional consensus.

However, if all the measures in the current program were implemented, they still would be unlikely to achieve the goal of doubling runs. Therefore, this section also sets forth seven policies and a planning process for selecting new measures to add to the program. Under these policies, the Council supports efforts to:

(1) Give priority to the area above Bonneville Dam.

(2) Assess genetic risks of actions.

(3) Accelerate actions to increase mainstem survival of fish.

(4) Increase production through a variety of methods.

(5) Manage harvest to support rebuilding of runs.

(6) Ensure that new plans and measures are consistent systemwide.

(7) Use adaptive management to increase knowledge and guide future actions.

The Council recognizes the importance of ensuring that ratepayers' expenditures are made wisely. Therefore, the program calls for systemwide monitoring and evaluation to assess progress toward the goal of doubling runs. The program also sets priorities for coordinated research on salmon and steelhead and establishes a policy for replacing salmon and steelhead with resident fish (those that do not travel to the ocean) in certain areas that are blocked to salmon and steelhead.

Section 300: Water Budget and Mainstem Flows

Nature has timed the downstream journey of most juvenile salmon and steelhead to coincide with the spring runoff. Historically, the flush of water helped young fish make it to the sea quickly. If they cannot reach the Pacific Ocean within about 30 days, the biological process that enables them to adapt from freshwater to saltwater may not be completed, and many of the fish will die.

The regulation of the river to produce power has affected fish travel times. Part of the spring runoff is stored in reservoirs to be used for power generation during drier parts of the year. The result is decreased flows that can slow salmon and steelhead migration.

The program establishes a water budget, a volume of water set aside for fish. It is released from upriver storage dams during the spring run to create an artificial freshet. Water budget flows are managed by two fish passage managers, one selected by the basin's fish and wildlife agencies and the other by the basin's tribes. Program measures also call for experimentation and evaluation to determine the water budget's effectiveness and its impact on the power system.

Section 400: Downstream Passage

The speed of the river is not the only thing that interferes with the passage of juvenile fish downstream. The dams themselves present physical barriers. The mortality rate for fish going through a dam's turbines can range from 10 to 30 percent at each dam. This loss is compounded when fish travel through a number of dams on their journey to the sea.

The program calls for permanent bypass facilities to be installed at most mainstem dams. Such facilities allow the bulk of the fish to travel past the dam without entering the turbines. Until these facilities are in place, the program also calls for an interim measure known as "spill." Spilling water over a dam or through a spillway is another method to pass fish more safely. It is not viewed as a permanent solution because spilled water does not generate power. Under the program, sufficient water is to be spilled to guarantee at least a 90 percent fish survival rate at each dam. However, in years,when water is above the critical flow level, a sliding scale approach is to be used to provide additional spill for improved fish survival.

Section 500: Harvest Management

When the young fish finally make it to the Pacific Ocean and mature , many are harvested in areas along the Washington and Oregon coasts and as far north as British Columbia and Alaska. These fish are part of a mixed-stock fishery that includes both hatchery and naturally produced fish. Commercial and recreational ocean fisheries indiscriminately harvest both types of fish. This has important implications for wild and natural fish. Because it is difficult to catch specific stocks selectively, natural fish may be overfished, while hatchery fish may be underfished.

To resolve this potential conflict, the program calls for careful coordination of hatchery production, natural fish propagation and harvest management.

The program calls for the ocean fishery managers to provide adequate levels of escapement (returning adults) to ensure reproduction of the stocks. Measures call for consultation and coordination among management entities as well as programs to improve knowledge about the stocks prevalent in particular fishery areas.

Section 600: Upstream Migration

Salmon and steelhead also face passage problems when they return upriver to spawn. While fishways (passage aids such as ladders) have been installed at many dams, problems remain. Water conditions at the base of a dam can mask the flows that should attract fish to the fishway entrance. Mechanical and maintenance inadequacies have also diminished the effectiveness of several fishways.

Studies to increase upstream survival rates and criteria to ensure efficient fishway operation and maintenance are described in this section. The program calls for improvements in adult fish passage at tributary projects as well as mainstem dams.

Section 700: Wild, Natural and Artificial Propagation

Approximately one-third of the natural spawning and rearing habitat for salmon and steelhead has been lost. This includes nearly all of the habitat on the mainstem Columbia. Some of the habitat was inundated by reservoirs, while other areas were rendered inaccessible because of the dams. Artificial propagation can help compensate for habitat losses, but it involves problems ranging from disease to the time and place for releasing smolts.

The program supports a three-part approach to producing more salmon and steelhead that combines and coordinates natural production, hatchery production and "supplementation" of natural runs. The latter term refers to releasing hatchery fish into natural habitats in an effort to build a natural run. Improvements in tributary spawning habitat and new fish production facilities also are included in the program. All production efforts are to be integrated with harvest management policies and fish passage projects.

Program Overview

Section 800: Yakima River Basin

The Yakima River is an important tributary to the Columbia. It is also the water supply for irrigated agriculture, a prominent and economically important feature of the Yakima Basin. Irrigation and fish must therefore share the limited water supply in the area. Because of inadequate streamflows in dry years, antiquated fish passage facilities and other factors, salmon and steelhead were nearly eliminated in the Yakima Basin during this century.

Fortunately, since the area was not inundated by reservoirs, most of the Yakima Basin's salmon and steelhead habitat remains intact. For this reason, the program focuses on the Yakima River Basin as a prime location for off-site enhancement. Off-site enhancement projects are used to compensate for hydropower-related fish and wildlife losses, but the projects are located away from the sites of the hydroelectric projects that caused those losses.

Measures to provide safe fish passage in the Yakima Basin have received priority, and a number of passage improvements are already completed. Plans for a hatchery to benefit the Yakima Basin are under way. In addition, data on future water storage and on flow requirements for fish are being collected to help determine the amount of storage necessary for fish flows.

There is evidence that the fish stocks in the Yakima Basin are beginning to rebound. In 1980, approximately 2,000 salmon and steelhead returned to the Yakima to spawn. By 1987, the number of returning fish had increased to 12,000. These results are encouraging, but much remains to be done if fish and agriculture are to coexist compatibly in the Yakima River Basin.

Resident Fish and Wildlife

Section 900: Resident Fish

Hydroelectric projects also have affected resident fish (e.g., cutthroat trout and other species that do not migrate to the ocean). These fish are particularly important to areas such as Montana that do not have anadromous fish. As the rivers were regulated, their decreased flows allowed sediment to build up and damage spawning beds. Fluctuations in reservoir levels also can deprive fish eggs of water, diminish food supply, crowd fish and alter water temperatures.

Several program measures address these problems, including limits on reservoir drawdown and requirements for water flows to protect fish and their habitat. The program also establishes measures for substituting resident fish in areas where the dams have cut off access for anadromous fish. Resident fish hatcheries are also part of the program.

Section 1000: Wildlife

Wildlife also lost habitat as reservoirs flooded grazing areas, and fluctuating water levels and hydroelectric development created barren vegetation zones. On the other hand, some wildlife benefited. For example, reservoirs created new habitat for waterfowl. This program addresses the net wildlife losses attributable to hydroelectric power.

A wildlife mitigation process has been developed. It includes status reports on mitigation efforts at each hydropower project, statements identifying losses, and mitigation plans. When they are approved, the mitigation plans will be adopted into the program. The first wildlife mitigation plans—for Hungry Horse and Libby dams in Montana—recently were added to the program.

General

Section 1100: Future Hydroelectric Development

While most program measures address damage already done to fish and wildlife, the program also provides protection for the future. A number of applications have been filed with the Federal Energy Regulatory Commission seeking authorization for new hydropower projects in the basin. Many are small projects, but together they could have significant cumulative effects on fish and wildlife in critical parts of the basin.

Future developers must mitigate harm to fish and wildlife. The program urges the Federal Energy Regulatory Commission and others to take into account the cumulative effects of hydropower development when they license projects. The program also initiates a study to identify areas which, because of their effects on fish, may need to be protected from future hydropower development.

Section 1200: Coordination

Coordination is particularly important in solving the basin's problems because of the number of competing uses for a limited resource—the river system. In the past, fish and wildlife needs often took a distant second place to power needs. This section outlines reasonable constraints on the power system designed to ensure that fish and wildlife are provided equitable treatment and that the dam operators and regulators take the program into account in their decision-making.

This section describes the general implementation and coordination responsibilities of the Bonneville Power Administration, Corps of Engineers, Bureau of Reclamation and Federal Energy Regulatory Commission.

Section 1300: Amendments

Congress requires that the fish and wildlife program be opened for public review at least once every five years. In order to be flexible and to respond to new information and improved technology, the program may be amended more frequently if needed. This section describes the Council's amendment process.

Section 1400: Five-Year Action Plan

The program's Action Plan establishes priorities and schedules for projects to be completed between 1987 and 1991. This five-year period is designed to accommodate the planning and budgeting requirements of implementing agencies.

Section 1500: Disclaimers

This section defines the limits of the program in relation to water, tribal, state and federal rights and prerogatives, as described in the Northwest Power Act.

Section 1600: Glossary

Technical terms used throughout this program are defined in the glossary.

Appendices

Appendix A: Tools, Assumptions and Tasks for System Planning

This section provides additional information and tools to be used in the systemwide planning efforts for salmon and steelhead described in Section 200: Salmon and Steelhead Framework.

Appendix B: Completed Actions

This section lists program actions that have been completed since the publication of the 1982 and 1984 fish and wildlife programs.

The following three documents are available in separate volumes upon request:

Appendix C: Response to Comments on the 1986 Draft Amendment Document and Rationale for Rejections

This volume summarizes the Council's responses to comments on the 1986 Draft Amendment Document and provides explanations for the Council's rejection of certain applications for amendment.

Appendix D: Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin

This volume contains the information that formed the basis for the Council's estimates of salmon and steelhead losses in the basin. An initial version of this information was first published in 1986.

Appendix E: Numerical Estimates of Hydropower-Related Losses for Salmon and Steelhead

This volume contains the information that formed the basis for the Council's estimate of the portion of salmon and steelhead losses due to the hydropower system.

Section 100

Introduction

101. Purpose

"The Council shall promptly develop and adopt ... a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries."

—Pacific Northwest Electric Power Planning and Conservation Act of 1980

These words set in motion a unique and comprehensive program to protect and rebuild some of the Northwest's great natural resources—the fish and wildlife of the Columbia River Basin. The Northwest Power Act also directed that "the program, to the greatest extent possible, shall be designed to deal with that river and its tributaries as a *system*." This means the region can formulate solutions that go beyond the problems created by each particular dam and that address the cumulative impact of the basin's entire hydropower system.

These solutions can become reality because the Act explicitly gives the Bonneville Power Administration, the region's federal electrical power marketing agency, the authority and responsibility to use its legal and financial resources "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with ... the program adopted by the Council ... and the purposes of this Act." The Act further requires Bonneville and the federal hydropower project operators and regulators to take the program into account to the fullest extent practicable at each relevant stage of their decision-making processes.

With the phrase "protect, mitigate, and enhance," Congress has signaled its intent that the Council's fish and wildlife program should do more than avoid future hydroelectric damage to the basin's fish and wildlife. It also must counter past damage and work toward rebuilding those fish and wildlife populations that have been harmed by the hydropower system. By law, this program is limited to measures that deal with the impacts created by the development, operation and management of hydroelectric facilities on the Columbia River and its tributaries.

The program does not address other rivers in the Northwest. Nor does it address harm to fish and wildlife from causes other than hydroelectricity. However, off-site enhancement projects are used to address the effects of the hydropower system on fish and wildlife away from the sites of the hydropower projects. The Council must develop this program "while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply." The overriding principle of the Act is clear—that fish and wildlife interests and power interests must cooperate as partners in the management of the Columbia River Basin for the benefit of all citizens of the Pacific Northwest.

To ensure this cooperation, the Council is required to consult with a variety of groups in the Northwest and to maintain comprehensive programs for public participation. This program reflects those requirements. Those participating in the development of this program included federal and state fish and wildlife agencies, Indian tribes, utilities, federal program implementors (Bonneville, Corps of Engineers, Bureau of Reclamation and the Federal Energy Regulatory Commission), state and local governments, federal and state land and water managers, environmental groups and other interested parties, including private citizens. Through this program, the citizens of Idaho, Montana, Oregon and Washington have an opportunity to share in the decision to protect the Columbia Basin's fish and wildlife resources and to counter the harm caused by decades of hydroelectric development and operations.

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102. How the Program is Developed and Amended

The Act directed the Council to develop this program and to make subsequent major revisions by first requesting recommendations from the region's federal and state fish and wildlife agencies, appropriate Indian tribes (those within the basin) and other interested parties. The recommendations are to include:

a. Measures that Bonneville and other federal agencies can implement to protect, mitigate and enhance fish and wildlife affected by hydroelectric dams;

b. Objectives for developing and operating hydroelectric dams in a way designed to protect, mitigate and enhance fish and wildlife; and

c. Coordination of fish and wildlife management, research and development (including funding).

Groups and individuals submitting recommendations are asked to supply information to support their positions. In program amendment processes, which follow the procedures for the original program's development, the Council incorporates qualifying recommendations or modifications of proposals received from outside parties, along with recommendations the Council initiates on its own, into a draft amendment document. The Council also lists recommendations it proposes not to adopt, along with rationale for each proposed rejection.

Publication of the draft document initiates an extensive public comment period, which includes public hearings in each of the four states and consultations with interested parties. During the development of the initial program and the subsequent amendment proceedings, this public comment period resulted in thousands of pages of testimony from dozens of groups and individuals.

After closing the comment period and following a review and deliberation period, the Council adopts final program measures. In developing the original program and in subsequent amendments, the Council used the recommendations it received as the basis for its draft document and made significant changes in the final document as a result of public comment on the draft.

Adoption of the amended program must occur within a year of the deadline for receiving proposals for amendments. When the Council declines to adopt any recommendation, it must explain, as part of the program, why the recommendation is less effective than the existing program measures or why it is inconsistent with the standards for program measures set up by the Act. Under the Act's standards, a measure must:

a. complement the existing and future activities of the federal and state fish and wildlife agencies and appropriate Indian tribes in the region;

b. be based on, and supported by, the best available scientific knowledge;

c. use the alternative with the minimum economic cost where equally effective alternative means of achieving the same sound biological objective exist;

d. be consistent with the legal rights of appropriate Indian tribes in the region; and

e. in the case of anadromous fish,

- provide for improved survival at hydroelectric facilities on the Columbia River system; and
- provide flows of sufficient quality and quantity between such facilities to improve production, migration and survival as necessary to meet sound biological objectives.

Overall, the Act requires that the program must consist of measures that address the impacts of hydropower in fish and wildlife while "assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply."

103. History of Program Development

Efforts to develop the fish and wildlife program began immediately after enactment of the Northwest Power Act on December 5, 1980. By April 1981, fish and wildlife agencies and Indian tribes had established an ad hoc executive committee to coordinate their recommendations. The Council was formed on April 28, 1981, and issued its request for fish and wildlife program recommendations on June 10, 1981. More than 400 recommendations were received for the original program.

From the beginning, the level of public participation has far exceeded the Council's expectations. Comments have been as impressive in content as they have been in volume. Those commenting have taken literally the Council's request for specific, detailed suggestions for improvements in the draft programs. The quantity and quality of the comments is evidence that the Council, the fish and wildlife agencies, Indian tribes, Bonneville, federal project operators and regulators, utilities and the public are committed to solving the basin's fish and wildlife problems permanently. The interest in this program and the amount of thought, time and effort put into this process have been exceptional.

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The Columbia River Basin Fish and Wildlife Program was adopted on November 15, 1982. The program included provisions for amendment so that it would be flexible and responsive to new information. The Act requires the Council to open the program for overall review at least every five years. (Amendments to individual sections can be—and have been made—on the Council's own motion at any time.) The Council chose not to wait five years for the first reviews. In 1983, the entire program was opened for revision and interested parties were invited to submit recommendations. The Council received more than 140 amendment applications by the November 15, 1983, deadline. Final amendments for that review process were adopted in October 1984. A major outcome of that amendment proceeding was the establishment of a Five-Year Action Plan that set priorities and schedules for the program's more than 200 measures.

Proceedings to amend specific sections of the program occurred in 1985 and 1986. In the first one, the Council took on the job of assessing salmon and steelhead losses due to hydropower as a preliminary step toward establishing goals for rebuilding those fish runs. In the second procedure, the Council refined provisions for spill (diverting juvenile fish through a dam's spillway so that they will avoid the dam's turbines). Spill is an interim measure used until permanent structural bypass systems are installed.

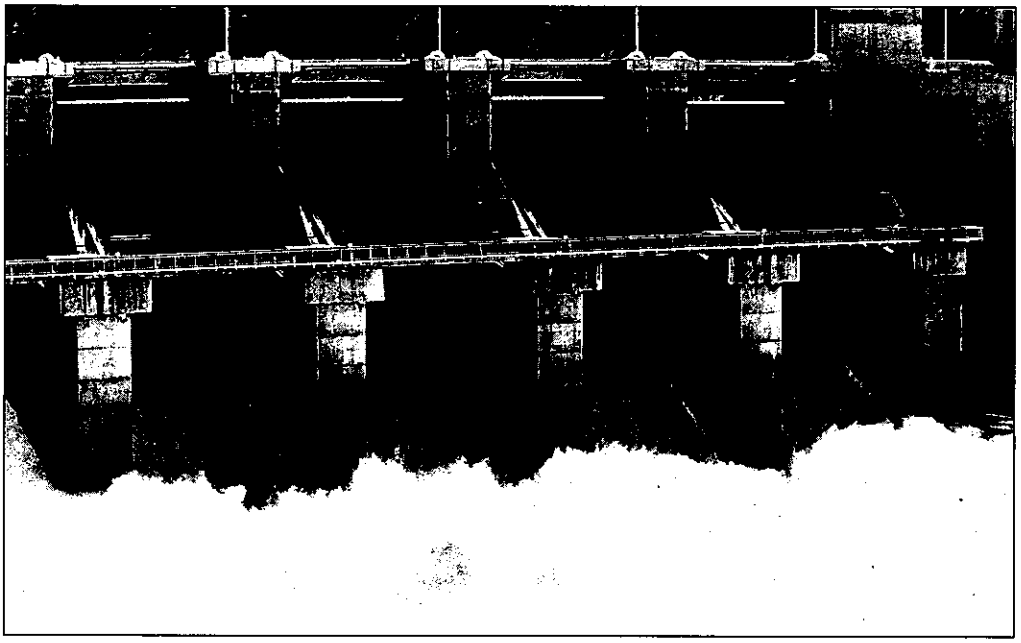
The program was opened again for major review in 1985, with public recommendations due in February 1986. An important reason for the new amendment process was the Council's desire to define the scope of the salmon and steelhead part of the program and to establish a framework that would give cohesiveness to the program's many and varied salmon and steelhead measures.

When the program was first developed—by the deadline set by Congress—the Council had only a year to address complex problems that had been decades in the making. Rather than setting comprehensive long-term policies at that point, the Council chose to adopt clearly needed actions so that important mitigation activities could begin immediately. That allowed the Council and others participating in the program to take the time to develop a program framework without delaying efforts to "protect, mitigate and enhance" the basin's fish and wildlife. This 1987 program completes the circle by incorporating measures from the original 1982 program and the amended 1984 program, while adding new measures and—at the same time—establishing overall policies and directions for salmon and steelhead. [See Section 200: Salmon and Steelhead Framework.]

104. Role of the Council and Other Agencies

The Council is a planning, policy-making and reviewing body. It develops and monitors implementation of this fish and wildlife program, which is implemented by the Bonneville Power Administration, the Corps of Engineers, the Bureau of Reclamation, and the Federal Energy Regulatory Commission and its licensees. Under Section 4(h)(11)(A) of the Northwest Power Act, these federal operating and regulating agencies are directed by Congress to exercise their responsibilities, in a manner consistent with the purposes of the Act and other applicable laws, to provide equitable treatment for fish and wildlife.

The federal agencies are also directed to take this program "into account at each relevant stage of decision-making processes to the fullest extent practicable." In addition, in Section 4(h)(10)(A), Congress has directed Bonneville to use the Bonneville fund and all of the agency's legal authorities "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with ... the program adopted by the Council under this subsection, and the purposes of this Act."



The Council recognizes that the program must be implemented in accordance with the substantive and procedural requirements of the Act and other statutes under which each federal agency operates. For example, an agency may have to comply with environmental, budget or procurement procedures. Substantive provisions of statutes governing the agencies may require that other factors, in addition to program measures, be taken into account in making a decision called for by this program.

In the case of program measures involving non-federal projects, the processes of the Federal Energy Regulatory Commission (FERC) must be respected. The Council has based its program measures on the best available scientific knowledge, as required by Section 4(h)(6)(B) of the Act. However, under the Federal Power Act, FERC must review a program measure and the license of the affected hydroelectric project to determine if the license can and should be amended. Formal adjudicatory proceedings will be necessary only if the parties cannot agree on the amendment. The Council strongly encourages the non-federal project operators to implement program measures voluntarily. Their cooperation can greatly speed fish and wildlife enhancement by eliminating the need for lengthy, and often unnecessary, administrative proceedings.

Congress expected action to overcome the harm to fish and wildlife caused by Columbia River hydroelectric dams. To that end, the Northwest Power Act anticipates that the Council and the federal implementing agencies will cooperate to achieve the goals set by Congress, as well as respect the role each has to play. Fish and wildlife protection, mitigation and enhancement will never occur if each agency tries to substitute its individual judgment for the scientific knowledge, expertise and judgment of those who went before.

The 1982 draft program used the word "shall" to explain actions that were expected to be taken in carrying out this program. That word was viewed by some parties as an attempt by the Council to usurp the authority of federal agencies, even though the term was defined in the draft program strictly in conformance with the statute. Other words have been suggested such as "will," "should," or the phrase "will be expected to." Each of these suggestions has advantages and limitations. None of these words is accurate, for the responsibilities of various parties can only be defined in terms of the law.

The Council chose to use the word "shall." The word "shall" is not used in this program as a legal imperative. Rather, it expresses the Council's expectation that this program can and should be implemented. It is also used as an exhortation to express the sense of urgency the Council observes throughout the basin for the protection, mitigation and enhancement of fish and wildlife, and in particular, for the rebuilding of the Columbia River's depleted salmon and steelhead runs.

Specifically, the word "shall" is used throughout this program 1) as a shorthand way of saying that the federal project operators and regulators must exercise their responsibilities "consistent with the purposes of (the) Act and other applicable laws;" provide "equitable treatment" for fish and wildlife; and take each program measure "into account at each relevant stage of decision-making processes to the fullest extent practicable," all as required by Section 4(h)(11)(A) of the Northwest Power Act, and 2) to reflect the requirement in Section 4(h)(10)(A) of the Act that Bonneville use its financial and legal authorities in a manner consistent with this program. The independent legal authority of the federal agencies is understood. The Council has no intention to exceed the authority given to it by law.

105. Protecting the Ratepayer Investment

Congress established three major principles in the Northwest Power Act to govern the economic costs for measures in this fish and wildlife program. First, hydropower ratepayers are to pay only for those measures designed to deal with the effects of hydropower development and operations. Second, measures must protect, mitigate and enhance fish and wildlife while assuring the region an adequate, efficient, economical and reliable power supply. Third, program measures must use the alternative with the lowest economic cost where equally effective ways of reaching the same sound biological objective exist. The Council has taken specific steps in the following program areas to further the economic principles set down by Congress.

Salmon and steelhead losses and goal. The Council has conducted an extensive analysis to estimate the scope of losses of salmon and steelhead related to hydropower development and operations. It concluded that from 5 million to 11 million fish have been lost due to the effects of hydropower. As a result, the program's goal of doubling the current run size of 2.5 million salmon and steelhead is well within the scope of hydropower-related losses. [See Section 203: Salmon and Steelhead Goal.]

Salmon and steelhead policies. The policies, which will guide efforts toward the doubling goal, are designed to help promote sound ratepayer investments. For example, the program calls for assessing the genetic risks of proposals related to producing more fish. Genetic diversity among fish is essential to the long-term productivity of salmon and steelhead stocks in the basin. The program also emphasizes the crucial need for passage at the dams and adequate river flows between the dams on the mainstem Columbia and Snake rivers, if fish produced with ratepayer funding in the tributaries and in hatcheries are to survive.

The program's salmon and steelhead production policy calls for developing "master plans" to resolve potential conflicts among increased production, mixed-stock harvest and other objectives, such as gene conservation, before the Council approves ratepayer funding of new artificial production facilities. In its harvest management policy, the program calls on harvest managers to regulate catch, including mixed-stock harvest, to support ratepayer-funded production and passage efforts. The program's adaptive management policy encourages projects to be designed to produce information that will reduce biological uncertainty and aid future decision-making. [See Section 204: System Policies for Doubling Runs.]

System planning alternatives. The program initiates a salmon and steelhead planning process designed to systematically identify and help choose among alternative methods to achieve sound biological objectives. [See Section 205: System Planning and Appendix A: Tools, Assumptions and Tasks for System Planning.] The program limits tributary passage and habitat projects until an overall basinwide plan for rebuilding salmon and steelhead runs has been completed. [See Sections 703(c)(1): Wild, Natural and Artificial Propagation and 1403: Action Plan, action item 4.2.]

Mid-course corrections. Any tributary passage or habitat project currently under way may be stopped or delayed if it is not needed in the immediate future or if results of feasibility studies or other new scientific information show that the project no longer meets the standards of the Northwest Power Act. [See Sections 1303: Amendments and 1403: Action Plan, action item 4.2.]

Research priorities. The program focuses ratepayer-funded salmon and steelhead research into six areas of emphasis, each aimed at improving the effectiveness of existing production and passage facilities and techniques. [See Sections 206(a)-(c): Salmon and Steelhead Research and Evaluation.]

Monitoring and evaluation. The Council is committed to a monitoring and evaluation program to promote sound ratepayer investments in salmon and steelhead projects. Changes in salmon and steelhead run sizes will be evaluated to determine whether those changes are due to ratepayer-funded efforts or to other causes. Monitoring and evaluation also will provide feedback so that ineffective actions can be identified and changed. [See Section 206(d): Salmon and Steelhead Research and Evaluation.]

Water budget evaluation. The program reflects the need to examine the effectiveness of the water budget and to explore alternative proposals to provide river flow benefits to fish while minimizing impacts on the power system. [See Sections 206: Salmon and Steelhead Research and Evaluation and 303: Water Budget and Mainstem Flows.]

Passage emphasis. The program emphasizes installation of bypass systems and use of transportation, rather than more costly spill, as long-term methods to improve fish passage around mainstem dams. [See Section 403: Downstream Passage.]

Resident fish and wildlife criteria. The program includes criteria that specifically tie resident fish and wildlife mitigation projects to hydropower-related losses of those species and their habitat. [See Sections 207: Resident Fish Substitutions Policy, 903: Resident Fish and 1003: Wildlife.]

New hydropower development. Measures calling for conditions on new hydropower development should help protect against new hydropower generation that would undermine ratepayer-funded enhancement of salmon and steelhead, resident fish and wildlife. [See Section 1103: Future Hydroelectric Development.]

Work plans. Public review of annual work plans proposed by Bonneville and other implementing agencies provides an additional opportunity for the Council and others to identify any new problems associated with the pace of funding the program. [See Section 1403: Five-Year Action Plan, action item 10.]

Contributions from others. Throughout the program, the Council recognizes that non-hydropower factors also have contributed significantly to declines in fish and wildlife in the basin. Flood control operations, irrigated farming, overfishing, logging and mining are among them. As a result, the program notes the need for complementary funding or other efforts from sources other than hydropower ratepayers. See, for example, Sections 205(b) (system planning), 303(a)(6) (examination of flood control requirements), 503(a) and (c) (harvest management), 803 (Yakima Basin water conservation, management and storage), and 1203(c) (coordination agreements).

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Amendment requirements. The Council's program amendment procedures and amendment application form require proponents of new measures to estimate the costs and impacts on the power system for their proposed projects. They also must explain in writing why their measures would be consistent with assuring an economical power supply; would use the alternative with the minimum economic cost to achieve the same sound biological objective; and otherwise would meet the requirements of the Northwest Power Act. The Council seeks public comment on whether those requirements would be met. It rejects or modifies any proposed projects that do not appear to meet those requirements. If new information later shows that an adopted measure would no longer meet the Act's requirements, the Council's amendment process also provides a mechanism for deleting the measure. [See Section 1303: Amendments.]

Program measures are implemented and funded by and through federal agencies. Generally, the Corps of Engineers and the Bureau of Reclamation are responsible for program measures related to their projects, and the Federal Energy Regulatory Commission is responsible for measures related to non-federal projects. Under the terms of the Northwest Power Act, Bonneville and the federal project operators fund program measures at federal dams. Non-federal hydroelectric project owners generally pay for program measures implemented at their dams. However, Bonneville is to bear any monetary costs and power losses that result from implementing a program measure at a non-federal dam if such a measure addresses fish and wildlife problems not attributable to that project.

A study by an outside consultant estimated that the costs of implementing all the recommendations for the 1982 Columbia River Basin Fish and Wildlife Program would be in the range of $650 million to $740 million over a period of 20 years. That estimate did not include revenue losses to the power system. It also did not reflect the costs of the measures actually adopted. The Council intends to review that estimate in light of subsequent program amendments, experience to date in program implementation, and other new information.

The program's greatest impacts on the power system are associated with the water budget to improve streamflows to aid downstream fish migration. [See Section 303: Water Budget and Mainstem Flows.] In 1982, the water budget was estimated to reduce the regional power system's firm energy load carrying capability (FELCC)[1] by approximately 550 megawatts. Although this estimate was based on the best data available at the time, actual execution of the water budget has resulted in smaller losses of FELCC. The Council will review estimates of the cost of the water budget based on this new information.

The Council also expects to have much better data to make appropriate water budget modifications through an aggressive program to determine more precisely the flows needed for downstream migration of juvenile fish. In addition, the Council will continue to consult with Bonneville and the federal operating agencies about possible actions to reduce the cost of providing adequate flows for fish. Such actions may include conservation, power exchange agreements with California, changes in thermal plant maintenance scheduling, use of Canadian storage to achieve water budget flows, changes in operations for flood control, and use or development of additional water storage.

1. Firm energy load carrying capability (FELCC) is the amount of firm energy that can be produced from a hydropower system based on the system's lowest recorded streamflows and the maximum amount of reservoir storage currently available to the system.

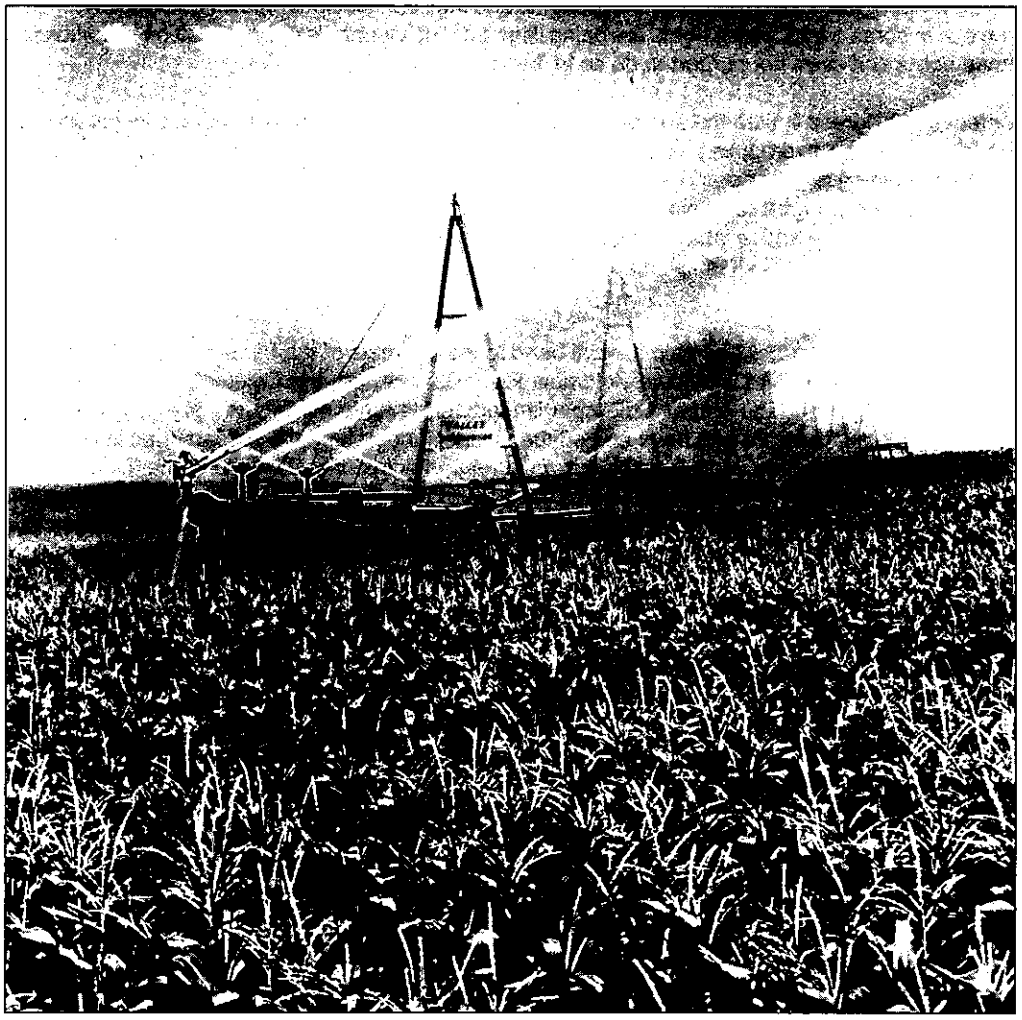
106. Indian Rights

In writing the Northwest Power Act, Congress stressed the importance of recognizing the legal rights of Indian tribes in this program. Section 4(h)(6)(D) of the Act requires program measures to be consistent with the legal rights of Indian tribes. Section 10(e) emphasizes that nothing in the Act affects or modifies Indian rights. Section 10(h) confirms that the Act does not limit Indian water rights. The full scope of Indian rights and their application in specific situations remains unclear. In some cases, those rights are being litigated. The Council is not in a position to adjudicate those rights and does not purport to do so in this program.

Moreover, Congress limited the authority of the Council. The Council must address its program to the impacts of the hydropower system on fish and wildlife. It may not address activities such as irrigation, logging or other practices that also have degraded fish habitat. In addition, the Council cannot create a program that would interfere with "assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply." Because of those limitations, this program may not satisfy the full scope of Indian fishing and hunting rights and related water rights in the Columbia River Basin.

Nevertheless, the Council has paid special heed to the interests of the tribes throughout development of this program. The individual Columbia River Basin tribes, the Columbia River Inter-Tribal Fish Commission and the Upper Columbia United Tribes have contributed significantly to the substance of this program and have helped the Council understand the fundamental importance of fish and wildlife resources to the religious, cultural and economic livelihood of the Indian tribes. The Council's program is designed to rebuild fish runs by improving habitat so that Indian tribes will be better able to realize their rights. Improvement of river flows and fish passage to increase fish survival play a major role in the program.

Many measures calling for restoring habitat to improve natural fish propagation and for hatchery management to complement natural propagation respond directly to tribal emphasis on re-establishing upriver runs. The off-site enhancement measures for the Yakima River Basin recognize another concern of the tribes. All program measures have been drafted carefully to promote full partnership by the tribes at each step of program implementation. To the limits of its authority, the Council has made an effort to ensure that its program is consistent with Indian rights.



107. Water Rights

Congress and the Council recognize that this program must be implemented within a complex scheme for allocating rights to use Columbia River Basin water. As noted in the Northwest Power Act and in Section 1500: Disclaimers, nothing in this program authorizes appropriation of water, affects rights to water or jurisdictions over water, or establishes the respective rights to water of the United States, states, Indian tribes or individuals. The Council assumes that the federal implementing agencies will work hard to develop cooperative and creative ways to implement the program's water flow measures with those requirements in mind.

The Council will continue to consult with Indian tribes, state water agencies, and the federal project operators and regulators to provide assistance in these matters. The Council is particularly hopeful that the states will consider the increasing effects on fish of water diversions in the Columbia and Snake river systems and will take into account both those effects and this program as they develop their individual water resource management programs.

108. Council Findings

The Council finds this program to be consistent with the purposes of the Northwest Power Act. The Council has evaluated the measures included in this program on the basis of the recommendations, supporting documents, consultations and public comment contained in its record. It has determined that the measures will protect, mitigate and enhance fish and wildlife affected by the development, operation and management of hydroelectric facilities located on the Columbia River and its tributaries, while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply. The Council also has determined that these measures meet the requirements of Section 4(h)(6) of the Act.

The Council has been particularly mindful of its responsibility to base this program on the best available scientific knowledge. Because areas of uncertainty persist, informed judgment has supplemented available knowledge, particularly in those areas requiring immediate action. The purpose of this program is to rebuild fish and wildlife resources, and program measures are only desirable if they achieve that goal. Where the Council has found that the scientific information is inadequate to support recommendations, it has rejected those measures. Improving the level and usefulness of the available scientific knowledge will continue to be one of the Council's primary objectives.

The program embodies a comprehensive, basinwide approach to the protection, mitigation and enhancement of fish and wildlife in the Columbia River Basin. The Council will facilitate action on this program by all the appropriate entities. It also will actively promote the cooperation of the federal and state fish and wildlife agencies and Indian tribes, which have maintained substantial fish and wildlife programs. This program is intended to complement those activities, not to replace them.

The Council has developed and maintained extensive programs to inform the people of the Northwest of the issues at stake and to seek the advice and consultation of Bonneville, fish and wildlife agencies, tribes, federal operating and regulating agencies, environmental and other citizen groups, state and federal land and water managers, customers of Bonneville, and electric utilities that own or operate hydroelectric dams on the Columbia River or its tributaries. The amount of technical effort and public participation that has gone into this program presents clear evidence that a regional approach to problem-solving is not only possible, but most effective. The final measure of the success of this program, and of its implementation by federal agencies, will be the rehabilitation of the once-abundant fish and wildlife resources throughout the Columbia River Basin.

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Terms Used in the Program

The following shorthand terms are used throughout this program for various government agencies, Indian tribes and other entities. See Section 1600: Glossary for definitions of other terms used in the program.

Abbreviations	Full Name
Bonneville	Bonneville Power Administration, U.S. Department of Energy
Bureau of Reclamation	Bureau of Reclamation, U.S. Department of the Interior
Corps	Corps of Engineers, U.S. Department of the Army
Federal land managers	Bureau of Indian Affairs, Bureau of Land Management, and National Park Service, all in the U.S. Department of the Interior
	Forest Service, U.S. Department of Agriculture
Federal project operators and regulators	Bonneville
	Bureau of Indian Affairs
	Bureau of Reclamation
	Corps
	Federal Energy Regulatory Commission
FERC	Federal Energy Regulatory Commission, U.S. Department of Energy
Fish and wildlife agencies	Fish and Wildlife Service, U.S. Department of the Interior
	Idaho Department of Fish and Game
	Montana Department of Fish, Wildlife and Parks
	National Marine Fisheries Service, U.S. Department of Commerce
	Oregon Department of Fish and Wildlife
	Washington Department of Fisheries
	Washington Department of Game
State land management agencies	Idaho Department of Lands
	Oregon Division of State Lands
	Montana Department of Natural Resources and Conservation
	Washington Department of Natural Resources
State water management agencies	Idaho Department of Water Resources
	Montana Department of Natural Resources and Conservation
	Oregon Department of Water Resources
	Washington Department of Ecology
Tribes	Burns-Paiute Indian Colony
	Coeur d'Alene Tribes
	Confederated Tribes of the Colville Reservation
	Confederated Salish-Kootenai Tribes of the Flathead Reservation
	Confederated Tribes of the Umatilla Reservation of Oregon
	Confederated Tribes of the Warm Springs Reservation of Oregon
	Confederated Tribes and Bands of the Yakima Indian Nation
	Kalispel Indian Community
	Kootenai Tribe of Idaho
	Nez Perce Tribe of Idaho
	Shoshone-Bannock Tribes of the Fort Hall Reservation
	Shoshone-Paiute Tribes of the Duck Valley Reservation
	Spokane Tribe of Indians

Section 200

SALMON AND STEELHEAD

Framework

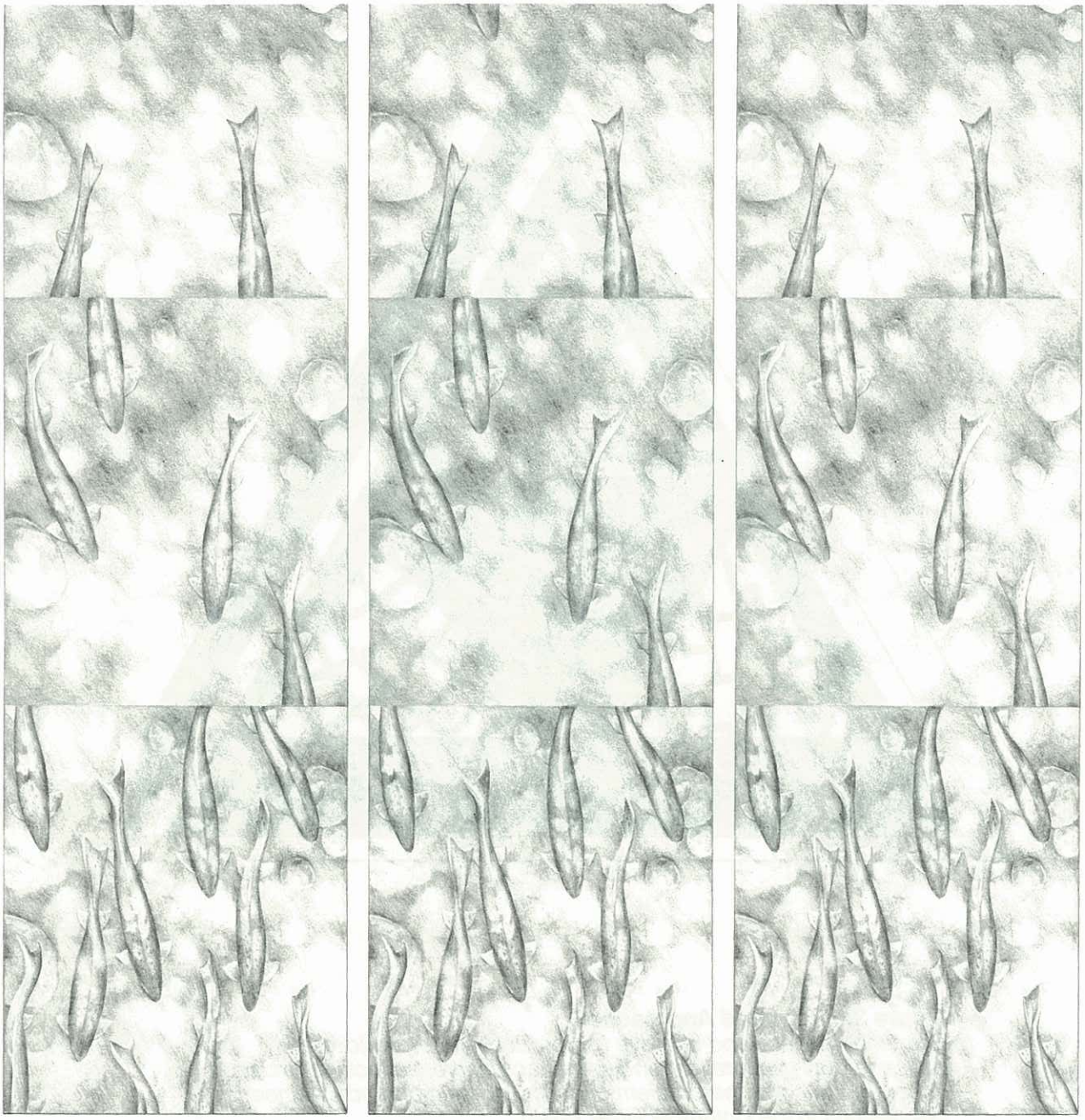

Figure 3. Integrated Approaches
Efforts to increase and improve fish production, to provide safe passage during migration, and to manage harvest effectively must be integrated to solve the problem of dwindling salmon and steelhead populations in the Columbia River Basin.

201. The Problem

While the program encompasses all of the fish and wildlife of the Columbia River and its tributaries affected by hydroelectric development and operations, the main focus is on salmon and steelhead because of their social and economic importance to both the Northwest and the nation as a whole. Salmon and steelhead are "anadromous" fish, a term used throughout this program to refer to fish that are born in freshwater but migrate to the ocean, where they spend their adult lives before returning to their freshwater spawning grounds.

Anadromous fish

No single approach can solve the problem of dwindling salmon and steelhead populations in the Columbia River Basin. Efforts to increase and improve fish production, to provide safe passage during migration, and to manage harvest effectively are all needed. Furthermore, integrating these three approaches is particularly important if each is to be most effective. [See Figure 3.] For example, the ratepayers' investment in increased hatchery production will be lost if a significant number of the fish produced die on their passage downstream. Producing hatchery fish without coordination with natural and wild production and harvest management can also put natural and wild fish at risk if they are overharvested as a result of increased catch predicated on increases in hatchery releases.

Integration of production, passage and harvest

While the original fish and wildlife program established a number of important measures to address the damage done by hydropower to salmon and steelhead runs in the Columbia Basin, it did not provide much guidance on how these measures related to each other. Nor did it provide a method for evaluating the effectiveness of these measures. What was missing was a systemwide perspective—one that takes into account the detrimental impacts of hydropower on salmon and steelhead at each of their life stages throughout the entire range of their migratory cycle and then integrates the various approaches to rebuilding salmon and steelhead runs. Finally, a systemwide goal was needed against which progress could be measured.

Systemwide perspective and goal

Research and evaluation are also vital to ensure that the program achieves its objectives. In the past, salmon and steelhead research has been conducted by a number of federal and state agencies, Indian tribes, utilities and others. For the most part, however, each entity has had its own interests and management objectives, and much of the research was not coordinated. As a result, this research lacked both a systemwide perspective and a strategy that set basinwide priorities. Systemwide monitoring and evaluation to assess the effect of management actions and policies also have been limited. Consequently, major gaps remain in understanding Columbia Basin stocks, their life patterns and their survival at different points in their life cycles. This is particularly true of wild and natural stocks.

Coordination of research

The Columbia River Basin also has lacked a central policy forum in which results of salmon and steelhead research could be evaluated to determine their implications for management decision-making. Because of this, new knowledge and information often went unshared. Fish and wildlife agencies and tribes also questioned the allocation of test fish for research. Shortages often occurred because the number of test fish needed for experiments were not identified until hatchery production schedules already had been set.

Finally, as part of the overall system approach, a policy was needed for substituting resident fish to make up for losses of anadromous fish in areas now permanently blocked to salmon and steelhead.

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202. The Remedy

In its 1987 amendments, the Council approved a framework for rebuilding salmon and steelhead in the Columbia River Basin. This framework includes a goal; policies to guide achievement of that goal; a process to plan future efforts; guidelines for research; and a monitoring and evaluation program. This framework is intended to give consistent and integrated direction to the individual measures in Sections 300 through 800 of this program, all of which deal with salmon and steelhead.

Because the Council anticipates that the majority of program measures will be funded by Northwest electric ratepayers, it has a duty to ensure that program expenditures are related to losses caused by the hydropower system; that the program produces results; and that Northwest electricity consumers are assured of an adequate, efficient, economical and reliable power supply. One way to help achieve these purposes is to set a realistic program goal and associated policies. A goal and policies can provide a means to regularly and consistently evaluate the progress of the program and to identify potential problems in the early stages. Clearly identifying the expected results of the program should substantially increase the likelihood of success.

Doubling goal

Realizing this, the Council has set an interim goal of doubling salmon and steelhead runs from 2.5 million to 5 million adult fish. In establishing the interim goal, the Council conducted comprehensive research to determine annual adult salmon and steelhead run sizes prior to major development in the Northwest. Subtracting current average run sizes from estimated pre-development runs (mid-19th century) provided an estimate of the salmon and steelhead losses due to all causes. [See Section 203.] The Council then estimated what portion of those salmon and steelhead losses were due to the hydropower system. Only the hydropower-related losses are addressed in this program. The goal of doubling the salmon and steelhead runs is well within the number of fish losses attributed to the hydropower system and has received widespread support throughout the region.

If all the measures in the current program were implemented, they would be unlikely to double salmon and steelhead runs. Therefore, new measures are needed if the goal of doubling runs is to be met. Section 204 lays out seven policies to guide the region in selecting new methods and projects to increase salmon and steelhead runs.

Section 205 describes a systemwide planning process to ensure integration and consistency both within the fish and wildlife program and with efforts outside the program. Planning at the subbasin level to identify local opportunities and constraints will be a major aspect of the systemwide planning effort. Section 205 also describes the general features of system planning and indicates sources for its funding.

Systemwide planning process

A systemwide perspective and strategy for salmon and steelhead research and evaluation is described in Section 206. Noting that the fragmentation of previous research efforts has led to gaps in knowledge about the fish and their life cycles, the Council calls for basinwide priorities and a central policy forum. The program addresses research needs in four ways. First, it sets guiding principles for salmon and steelhead research. Second, it identifies six areas of emphasis for research. Third, it urges that sufficient test fish be made available for research. Fourth, it establishes a monitoring and evaluation program to measure progress and identify long-term research needs.

Research

Finally, Section 207 describes the Council's policy for substituting resident fish to make up for losses of anadromous fish in areas now permanently blocked to salmon and steelhead. The priority areas for resident fish substitutions are in the blocked areas above Chief Joseph Dam in northeastern Washington and Hells Canyon Dam on the Snake River on the border of Idaho and Oregon.

Resident fish substitutions

203. Salmon and Steelhead Goal

(a) Doubling: An Interim Goal

In light of devastating salmon and steelhead losses in the Columbia River Basin and the contribution of the hydropower system to those losses, the Council has set doubling runs as a reasonable interim goal to guide program planning, implementation, measurement and evaluation. Doubling means increasing the current run size of about 2.5 million adult fish to a run size of about 5 million adult fish, as a result of implementation of this program.[1]

Doubling goal

The doubling goal applies to the basin as a whole. It may not be possible or desirable to double the populations of all species in all subbasins. Specific means and locations for increasing production will be identified in future planning.

The time needed to double the runs will depend on a number of factors, including the program policies for mainstem survival, harvest management and fish production, and on further assessment of production opportunities. For this reason, the target date for achieving the doubling goal will not be set until additional information is gathered during the system planning process described in Section 205.

1. For program purposes, the total annual Columbia Basin salmon and steelhead adult run size is estimated by adding the number of adults returning to the mouth of the Columbia River plus the number of adults caught in the ocean. This definition has been chosen for ease of accounting, not biological reasons. The current run size of about 2.5 million adult fish is defined for this program on the basis of the average run size for the years 1976 to 1981, the period just prior to adoption of the Council's initial Columbia River Basin Fish and Wildlife Program in 1982.

Although doubling is a numerical goal, numbers will not drive this program to the exclusion of other important values, such as conservation of genetic resources. This numerical goal will guide planning and provide a context for evaluating program progress. As an ambitious, yet realistic, goal, it should provide an incentive for innovation in program implementation, improvements in communication and institutional arrangements, and development of management agreements. The goal also provides a signal that the program is a long-term, serious effort to solve complex problems not amenable to quick-fix remedies.

(b) Basis for the Goal

The Northwest Power Act directs the Council to develop a Columbia River Basin fish and wildlife program to protect, mitigate and enhance fish and wildlife "affected by the development, operation and management" of the hydropower system in the basin. Essential to this definition is an understanding of the extent to which salmon and steelhead have been affected by the hydropower system. In 1985, the Council began gathering information on the extent and causes of the declining numbers of salmon and steelhead in the basin. In 1985 and 1986, the public reviewed and debated the nature and limitations of that information. [The results of the Council's efforts have been published in a separate volume entitled Appendix D: Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin.]

After compiling information on salmon and steelhead losses, the Council solicited extensive public comment on the contribution of the hydropower system to declines in run sizes. Based on the losses information and on public comment, the Council identified alternative ways to estimate the portion of total losses that could be attributed to hydropower. [These alternatives are described in Appendix E: Numerical Estimates of Hydropower-Related Losses, published in a separate volume.]

Following is a summary of the Council's analysis of: 1) losses from all causes, and 2) losses related to development and operation of the hydropower system. [For further analysis, refer to Appendices D and E.]

(1) Estimate of Losses from all Causes. After an intensive review of the available data to make an informed judgment, the Council reached the following broad conclusions regarding salmon and steelhead losses.

Losses from all causes

Estimates of the average annual adult salmon and steelhead runs before development in the basin (dating to the mid-19th century) range from about 10 million to 16 million fish. In contrast, the average annual run size now is about 2.5 million adult fish. These estimates indicate a net basinwide decline in annual run size of about 7 million to 14 million adult fish due to a range of causes including fishing, logging, mining, grazing, agriculture, irrigation, pollution and urban development, as well as hydropower development and operation.

Habitat losses

Salmon and steelhead habitat in the entire basin has decreased from about 14,700 river miles before 1850 to about 10,100 river miles in 1976, a loss of about 30 percent. Salmon and steelhead habitat in the Columbia River Basin above Bonneville Dam has decreased from about 11,700 river miles before 1850 to about 7,600 river miles in 1976, about a 35 percent loss. [See Map, Figure 4.]

Concentration of losses above Bonneville Dam

The greatest salmon and steelhead losses occurred in the Columbia and Snake river drainages above Bonneville Dam. The three main factors responsible for these losses are loss of habitat; mortality of adult and juvenile fish passing through mainstem dams and reservoirs; and mixed-stock fisheries. Habitat losses, as described above, have been extensive. Passage mortality has been estimated to average 15 to 30 percent of downstream migrants per dam and 5 to 10 percent of upstream migrants per dam. This has enormous effects on upriver runs.

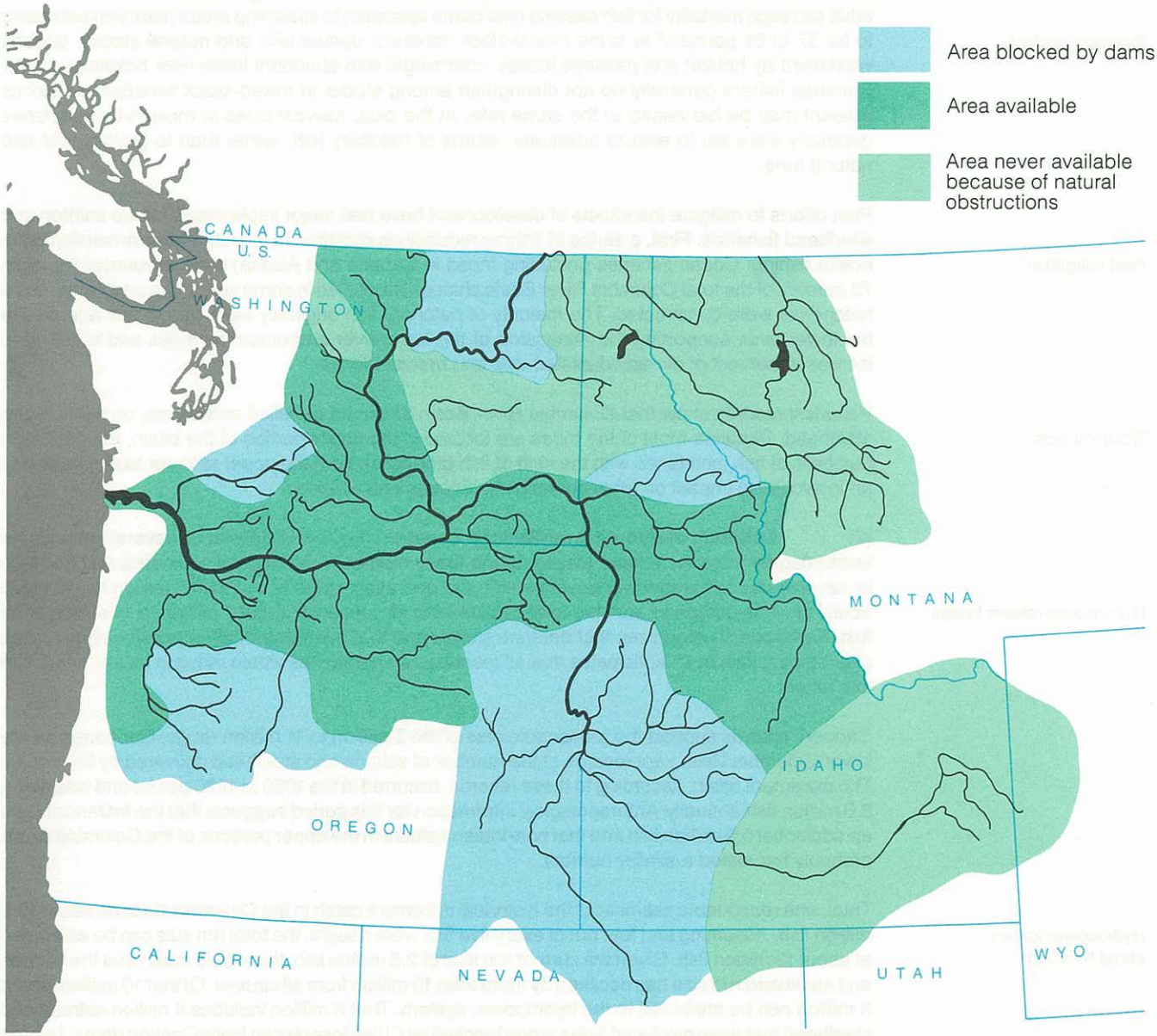


Figure 4.
Salmon and Steelhead Habitat in the Columbia River Basin.

Section 200

Passage mortality

Cumulative juvenile passage mortality for fish migrating downstream past nine dams has been estimated to be 77 to 96 percent, depending on the volume and timing of streamflows. Cumulative adult passage mortality for fish passing nine dams upstream to spawning areas has been estimated to be 37 to 61 percent.[2] In some mixed-stock fisheries, upriver wild and natural stocks, already weakened by habitat and passage losses, commingle with abundant lower-river hatchery stocks. Because fishers generally do not distinguish among stocks in mixed-stock fisheries, all stocks present may be harvested at the same rate. In the past, harvest rates in mixed-stock fisheries generally were set to ensure adequate returns of hatchery fish, rather than to protect wild and natural runs.

Past mitigation

Past efforts to mitigate the effects of development have had major implications for the salmon and steelhead fisheries. First, a series of fishing regulations contributed to a shift from inriver fishing to ocean fishing. Ocean fisheries (including those in Canada and Alaska) have accounted for up to 73 percent of the total Columbia River Basin chinook harvested in some years. Second, large-scale hatcheries were constructed. The majority of hatchery fish originally were raised and released in the lower river, supporting the expansion of the lower-river and ocean fisheries and resulting in increased harvest of already depleted wild and upriver stocks.

Tribal impacts

Historical records show that Columbia River Basin Indian tribes relied extensively on salmon and steelhead. Because most of the tribes are located in the upper portion of the basin, the decline in numbers of fish, combined with the shift of fish production from the upper to lower basin, have had an incalculable impact on tribal economies, cultures and religions.

Hydropower-related losses

(2) Estimate of Hydropower-Related Losses. The Council developed several methods for estimating hydropower-related losses. Using these methods, the Council estimated that declines in run size due to hydropower development and operation range from about 5 million to 11 million adult fish. This compares with the total decline from all causes of about 7 million to 14 million adult fish. The Council recognizes that data are limited and that other approaches to calculating losses may be possible, but it anticipates that all reasonable approaches would result in loss estimates in this range.

Cannery records support the reasonableness of the 5 million to 11 million range. Canneries on the lower Columbia River kept records of the number of salmon and steelhead delivered by fishermen. The maximum catch, according to these records, occurred in the 1880 to 1920 period and was about 8.8 million fish annually. Anthropological information for this period suggests that the Indians caught an additional 0.9 million fish and that non-Indian settlers in the upper portions of the Columbia Basin probably harvested a similar number.

Hydropower losses about 8 million

Thus, one reasonable estimate of the historical maximum catch in the Columbia Basin is about 10.5 million fish. Assuming that four out of every five fish were caught, the total run size can be estimated at about 13 million fish. Given the current run size of 2.5 million fish, this would mean that the salmon and steelhead run size has declined by more than 10 million from all causes. Of that 10 million, about 8 million can be attributed to the hydropower system. That 8 million includes 4 million salmon and steelhead that were produced in the areas blocked by Chief Joseph and Hells Canyon dams. Losses caused by mainstem hydropower operation (assuming that 15 percent of downstream migrants are killed at each mainstem dam) account for the decline of the other 4 million fish. [Appendices D and E in separate volumes provide additional background information.]

2. These juvenile and adult mortality rates assume downstream mortality rates of 15 to 30 percent per dam and upstream mortality rates of 5 to 10 percent per dam. These rates do not include higher survival levels that may be attainable by further improvements in bypass and transportation.

The present runs of about 2.5 million adult fish would have to be increased by 5 million to reach the low end of the range of estimated hydropower-related losses. Such an increase may not be feasible because biological, socio-economic and other limits on fish production may prevent such rebuilding. Increases in the salmon and steelhead runs will come through specific program measures consistent with system policies and planning. If 5 million more adult fish are produced as a result of this program, the Council may review its analysis of the hydropower ratepayers' share for protecting, mitigating and enhancing salmon and steelhead to judge whether the range can be narrowed.

The estimated range is stated in terms of a net loss or reduction in run size. It does not take into account the accumulation of hydropower-related losses of salmon and steelhead year by year since hydropower development started. Such cumulative losses would be far greater than 5 million to 11 million adult fish.

204. System Policies for Doubling Runs

While the measures included in this program are designed to increase salmon and steelhead runs, the Council recognizes that substantial challenges must be met to reach the interim goal of increasing those adult runs by 2.5 million. The current program is expected to add about 1 million salmon and steelhead to the current adult run size. System planning, discussed in Section 205, should help identify additional measures to meet the interim goal of 2.5 million more salmon and steelhead. This section describes policies to guide planning and implementation.

Cooperation

Doubling the salmon and steelhead runs of the Columbia Basin depends upon improvements in production, mainstem passage and harvest regulation. Policies and programs in these three areas have been controlled by different entities following different, often incompatible, mandates. An ambitious goal such as doubling the fish runs cannot be achieved without significant advances in cooperation and coordination.

The interim doubling goal provides a numerical target to guide program planning, implementation, measurement and evaluation. Equally important are the policies that will guide efforts to double runs. Taken together, the policies reflect the Council's conclusion that no single approach—increased production, mainstem passage improvements, or harvest regulation—is likely to achieve the doubling goal alone. A variety of tools and a commitment to cooperation among the diverse players are crucial to success.

The Council recognizes that conflicts may arise among the system policies and the doubling goal. For instance, doubling the runs is likely to require increased hatchery production which, if not managed properly, could harm wild and natural stocks. Addressing and resolving such conflicts will require a persistent, diligent systemwide effort.

(a) The Area Above Bonneville Dam Is Accorded Priority.

Emphasis above Bonneville Dam

Since it was initially adopted in 1982, the Council's program has emphasized the area of the Columbia River Basin upstream from Bonneville Dam. The greatest losses of fish runs have occurred in the upper Columbia and Snake river areas, while most of the mitigation for these losses has been in the form of hatchery production in the lower basin. [See Appendix D: Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin.]

Emphasis in the area above Bonneville Dam does not mean the program will not address lower-area losses attributable to hydropower. It does mean that system planning should begin in the subbasins—segments of the Columbia and Snake rivers and their major tributary drainages—above Bonneville Dam, and that implementation of measures in those subbasins will take precedence over those in the lower basin.

(b) Genetic Risks Must Be Assessed.

In a pristine environment, fish from each subbasin and perhaps even portions of subbasins, contain genetic traits for physical and behavioral characteristics that enhance their ability to survive. Within the fish population of a large and diverse basin such as the Columbia, a high degree of genetic diversity should be sustained so that the fish population contains genetic survival traits encompassing a wide range of environmental and physical conditions. These characteristics include resistance to disease; timing of spawning and migrating so that environmental conditions are most favorable; and optimum body size of adults and juveniles.

Genetic diversity

The Council encourages conservation of the genetic resources of Columbia River Basin salmon and steelhead. To this end, the Council will require that genetic risks of proposed actions be assessed in salmon and steelhead planning. Genetic diversity is of fundamental importance because the loss of genetic traits is probably irreversible. Yet the relationship between reductions in genetic diversity and human interventions, such as hatchery operations or harvest practices, is difficult to determine concretely for use in decision-making. Quantitative methods to incorporate gene conservation into production planning will be examined in the monitoring and evaluation program. This examination could include identifying research needed to quantitatively assess gene conservation. Practical experience in assessing genetic risks, together with research, if needed, should lead to a clearer, more effective approach to gene conservation.

The interest in doubling run sizes and preserving genetic diversity has led some people to characterize the choice in the Columbia River Basin as "meat versus museum." In other words, some say either increasing run sizes substantially or protecting wild and natural runs may be possible, but not both. This apparent conflict may be resolved through improvements in mainstem passage and through adjustments to the production and harvest balance, as discussed below.

(c) Mainstem Survival Must Be Improved Expeditiously.

As discussed in Section 203, juvenile fish mortality in reservoirs and at dams is a major cause of salmon and steelhead losses. Reducing this loss will increase population size, including wild and natural runs.

Increasing mainstem survival is a principal objective of the Northwest Power Act, which specifically calls for "improved survival of [anadromous] fish at hydroelectric facilities ... " and for "flows of sufficient quality and quantity between [hydroelectric] facilities to improve production, migration, and survival of [anadromous] fish as necessary to meet sound biological objectives." Improvements in mainstem passage and flows are crucial to the success of many of the other efforts in the program including hatchery production, outplanting programs and habitat restoration in tributaries. These actions represent major expenditures by the ratepayers to rebuild salmon and steelhead runs. The results of these efforts must be protected, especially at mainstem projects.

Mainstem survival

The program emphasizes the improvement of mainstem passage and flows to protect migratory fish through a combination of actions that include the water budget, interim spill, installation of mechanical bypass systems, transportation, and related research and evaluation. The Council will place a special focus on full implementation of the water budget (Section 300: Water Budget and Mainstem Flows) and expedited installation of bypass systems (Section 400: Downstream Passage). New measures to improve mainstem survival will be evaluated by the Council in light of the requirement of the Northwest Power Act that this program protect, mitigate and enhance fish and wildlife while assuring an adequate, efficient, economical and reliable power supply.

Even when all the mainstem improvements are fully implemented, the Council estimates that the doubling goal probably cannot be achieved through those improvements alone.

(d) Increased Production Will Result from a Mix of Methods.

Rebuilding runs will require a mix of wild, natural and hatchery production. Measures to increase production call for improvement of habitat and tributary passage; increased production at existing hatcheries; construction of new artificial production facilities; and substantial efforts directed at research. This program also includes a commitment to designate important salmon and steelhead areas that should be protected from new hydropower development. Needs for additional habitat improvement and hatchery capacity will be identified in future planning.

Mix of wild, natural and hatchery production

Increased hatchery production raises the question of whether wild and natural stocks can coexist with significant numbers of additional hatchery fish. The controlled environment of hatcheries is intended to result in greater survival of fish to the adult stage than occurs with wild or natural propagation. Yet wild and natural stocks often are caught together with artificially produced fish. If harvest in these mixed-stock fisheries is based upon the number of hatchery fish, then wild and natural fish can be overharvested. If harvest is based upon the number of wild and natural fish, then hatchery fish may be underharvested. There are at least two ways to address this dilemma.

Mixed-stock fishery

First, where harvest is based upon the number of wild and natural fish, harvest of surplus hatchery fish can be accomplished in a known-stock fishery, i.e., one in which only specific stocks are caught. This approach offers several advantages. It protects wild and natural fish and thereby promotes gene conservation. It could provide additional catch beyond levels available today. Also, harvest levels in existing mixed-stock fisheries could be increased as long as harvest rates are limited to protect weak stocks.

Known-stock fishery

Second, even if harvest is based upon the number of hatchery fish, it may be possible to increase natural runs by releasing hatchery-reared fish into natural production areas. This is called outplanting. In this way, weak naturally reproducing runs might be increased and therefore able to accommodate higher harvest rates. However, because outplanting may be undertaken in the Columbia River Basin on a larger scale than ever attempted anywhere else, careful testing and evaluation will be necessary. Outplanting may cause competition between hatchery and naturally produced juveniles as well as crossbreeding of adults, which could affect the gene pool adversely. Outplanting hatchery juveniles into natural areas that produce wild fish could provide the same results and eliminate the wild character of a stock. These potential side effects should be monitored closely.

Outplanting

How to balance increased artificial production with wild and natural stocks is a decision for the fish and wildlife agencies and tribes. Their choices are likely to differ from subbasin to subbasin and from stock to stock. The Council intends to complement the choices of the fish and wildlife agencies and tribes by increasing the number and range of production alternatives.

Because of the need to address potential conflicts among increased production, mixed-stock harvest and other objectives, such as gene conservation, the Council will require detailed master plans for new artificial production facilities before construction is initiated. Such plans should describe sources of brood stock, rearing schedules, release sites and schedules, production profiles, management policies (including policies to protect genetic diversity and to prevent disease), plans for biological monitoring and evaluation, coordination among the fish and wildlife agencies and tribes, relationships to system planning and related harvest plans.

Master plans

(e) Harvest Management Must Support Rebuilding.

Harvest management

The Council's program involves a substantial investment on behalf of ratepayers to rebuild salmon and steelhead resources in the Columbia River Basin. Effective management of harvest is critical to the effectiveness of program measures. The authority to manage harvest is held by a variety of fishery management entities from Alaska to California. In overseeing ratepayer investments in the program, the Council calls on the fishery managers to continue to regulate harvest as needed, especially in mixed-stock fisheries, in order to support the ratepayer-funded effort to double the basin's salmon and steelhead runs.

Harvest management can be instrumental in achieving the doubling goal. Rebuilding the runs could, for example, be accelerated by continued restraint of ocean and inriver harvest. Over the past decade, however, those restraints have caused major dislocations in commercial, sport and tribal fisheries. Another possibility lies in agreements to catch a portion of the increase in hatchery production in known-stock fisheries. However, such agreements are not likely to be reached before additional fish are available for harvest. The Council can help provide these additional fish by emphasizing action to increase runs that can be caught in known-stock fisheries. Such fisheries might be developed using artificial production from new facilities called for in this program, such as the Umatilla and northeast Oregon hatcheries.

(f) System Integration Will Be Necessary to Assure Consistency.

Systemwide coordination

As described above, doubling of existing runs will require three interdependent types of action: mainstem passage improvements, fish production and harvest management. [See Figure 3.] These efforts are likely to prove inadequate unless they are coordinated systemwide. Accordingly, the Council intends to evaluate efforts to protect and rebuild Columbia River Basin salmon and steelhead from a systemwide perspective. The Northwest Power Act emphasizes the need for such a perspective, and the biological, hydrological and institutional complexities of the basin demand it.

Management entities

Production, passage and harvest actions are undertaken by a number of entities with diverse purposes. Production is controlled by various entities that manage habitat and hatcheries. Such entities include state and federal fish and wildlife agencies and Indian tribes. These parties have responsibilities and plans that may differ from subbasin to subbasin. Actions affecting mainstem survival are taken by the Bonneville Power Administration, the Bureau of Reclamation, the Federal Energy Regulatory Commission and the U.S. Army Corps of Engineers. Harvest of Columbia Basin stocks is managed by the Pacific Salmon Commission, the Pacific Fishery Management Council, the North Pacific Fishery Management Council, the Columbia River Compact entities, states, Indian tribes and, in some cases, the courts.

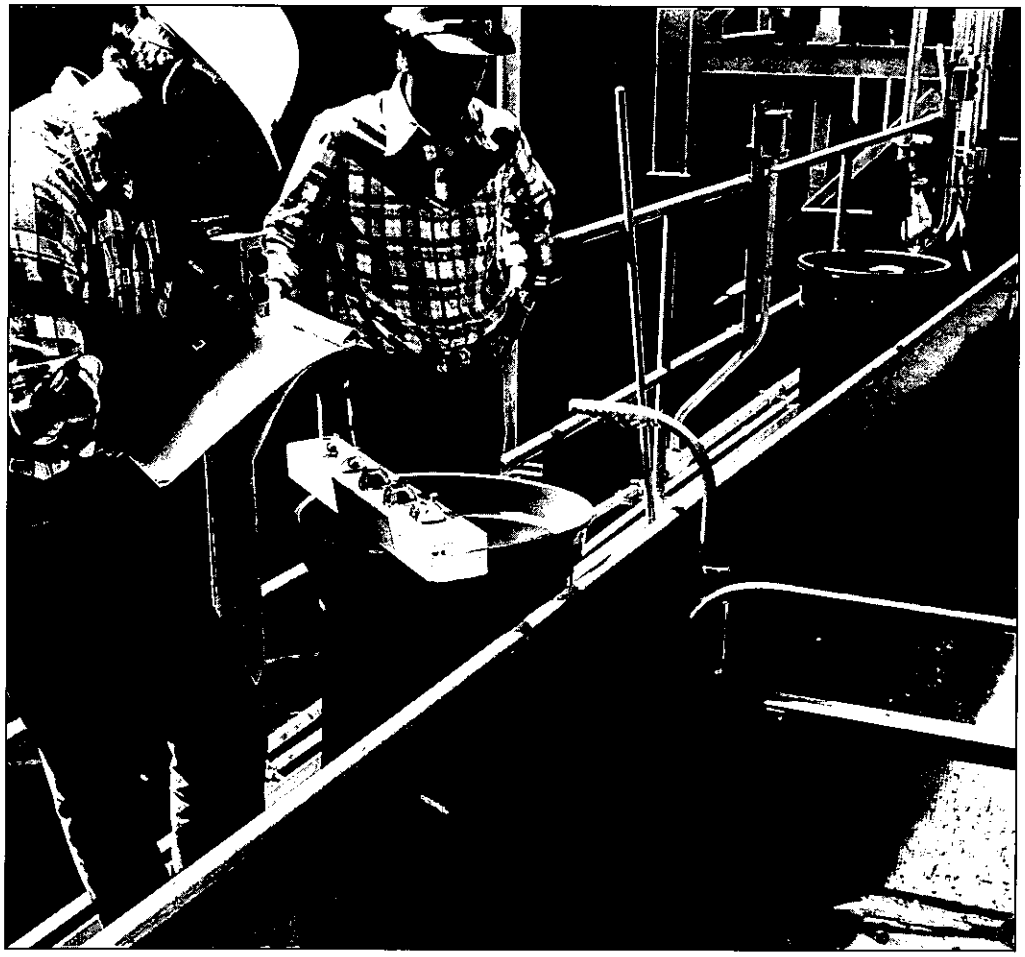
Meeting the Council's interim goal of doubling the runs will depend on the resolution of potential conflicts among production, passage and harvest. An accommodation between the desire to substantially increase runs and the need to protect wild and natural runs must be reached. In addition, increased production in upriver areas must be consistent with anticipated levels of mainstem passage survival and overall harvest to ensure successful investments. To address these and other challenges, the Council has called for a system planning effort to integrate passage, harvest, and natural and artificial production efforts. [This effort is detailed in Section 205 and in Appendix A: Tools, Assumptions and Tasks for System Planning.]

(g) Adaptive Management Should Guide Action and Improve Knowledge.

Adaptive management

The goal of doubling the runs can be achieved only if all parties in the Columbia River Basin learn from implementation of the program. This policy of learning by doing is called "adaptive management." Faced with substantial biological uncertainty, the parties involved should act affirmatively to protect and enhance fish and wildlife affected by hydropower development and operations. They must design projects carefully so that information can be collected to improve future management decisions. Projects should test quantitative hypotheses wherever possible, taking into account the need for control or comparison cases and for statistical validity.

Adaptive management is a scientific policy. It calls for a conscious effort to improve fish and wildlife management, using elements of this program as experiments that can provide useful information not otherwise available. Adaptive management also is a system policy, combining monitoring, evaluation and research throughout the Columbia River Basin so that the aggregated effects of this program can be detected, assessed and improved over time. The system monitoring and evaluation process described in Section 206(d) will aid adaptive management by providing feedback on program projects.



Round-table discussions

To facilitate adaptive management and program consultation, review and appraisal, the Council will convene annual round-table discussions. The annual discussions will address mainstem survival, harvest, escapement (the number of fish escaping harvest to return to spawn), hatchery production, natural and wild production, research and evaluation. These round-table discussions will allow the hydropower project operators, harvest managers, hatchery managers, fish habitat managers, land and water managers, Bonneville and the Council to exchange views and share information on each of these important subjects.

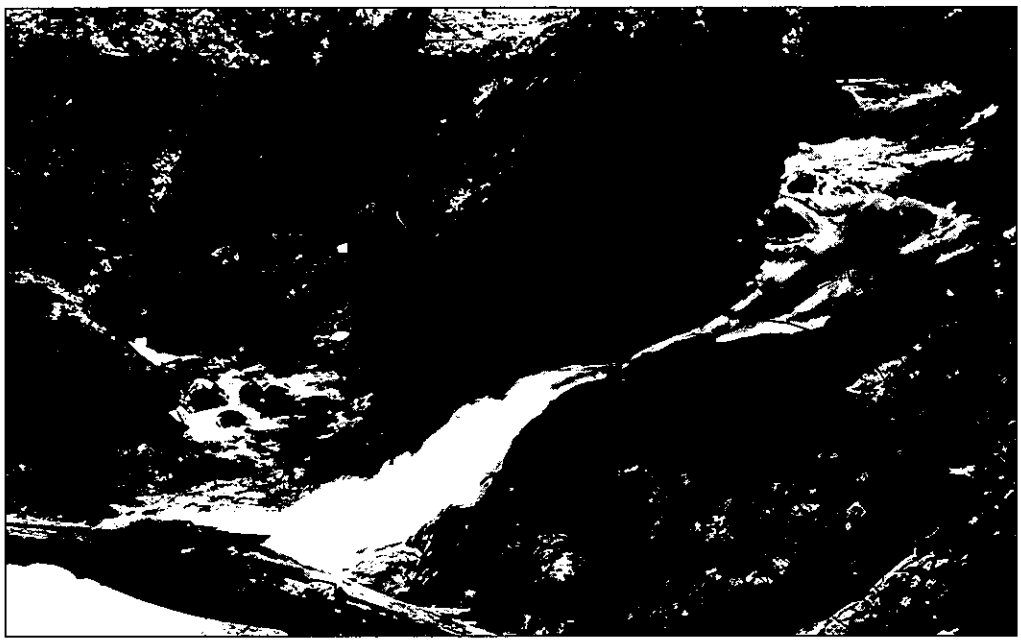
The Council also will convene round-table discussions every five years to review the program's goal, policies and results and to consider program amendments. A five-year interval permits more accurate estimation of trends. It also parallels the life cycles of salmon and steelhead. The five-year review should increase the likelihood that program changes will reflect the results of monitoring and evaluation. The trends identified during this review may indicate whether changes in the program's goal, policies and measures will be needed.

205. System Planning

(a) System and Subbasin Planning

System plan

Planning that will achieve the program's salmon and steelhead goal requires a system-wide effort to ensure integration and consistency with the program's goal and policies. That effort will include planning at the subbasin level to identify local opportunities and constraints. The major system planning tools, assumptions and tasks are described in Appendix A. The nature of the planning effort will be described more fully in a work plan to be proposed by the fish and wildlife agencies and tribes and reviewed by the public prior to Council approval.



(b) Process

(1) The Council will fund system and subbasin planning by the fish and wildlife agencies and tribes. The fish and wildlife agencies and tribes also will help fund the planning.

(2) The system and subbasin plans will be developed by the fish and wildlife agencies and Indian tribes in consultation with the Council, hydropower project operators and regulators, Bonneville, federal and state land and water managers, and interested members of the public.

206. Salmon and Steelhead Research and Evaluation

(a) Guiding Principles for the Columbia River Basin Salmon and Steelhead Research Program

Research principles

(1) Salmon and steelhead research under this program is expected to be designed to reduce scientific uncertainty and increase knowledge to achieve the salmon and steelhead goal and policies of this program.

(2) Research priorities are expected to reflect a systemwide analysis of the major uncertainties and problems associated with increasing runs in a biologically sound manner.

(3) Funding of research by Bonneville and the Corps is expected to be consistent with the areas of emphasis identified by the Council. Those areas may be modified by the Council, under the provisions of Section 1300 on program amendments, as problems are solved and new problems are identified through monitoring and evaluating program implementation.

(4) Knowledge gained as a result of the research program is to be reviewed and evaluated in a central policy forum and made available in a timely manner to policy-makers, resource managers, biologists, hydroelectric project operators and regulators, and other interested parties.

(5) The fish and wildlife agencies and tribes should participate in development and oversight of the research program.

(6) Bonneville and the project operators and regulators are expected to provide the funding and resources necessary to implement the research program.

(7) Research funded by Bonneville and the Corps under this program is expected to be coordinated with research funded by other entities to ensure efficient use of funds and maximum return on research investments.

(b) Research Funding by Bonneville

(1) **Areas of Emphasis.** Bonneville shall focus its funding of salmon and steelhead research in the next five years on the following areas of emphasis:

(A) Studying water budget effectiveness and reservoir mortality.

Research: water budget and reservoir mortality

Additional evidence is needed on the relationship between juvenile fish survival and travel time and flows as a basis for refining water budget use. This should include the relationship between flows and subsequent adult returns. Based on this information, the Council will determine whether the water budget is successful in increasing smolt survival and to what degree. In accordance with Section 1300: Amendments, the Council will consider proposed alternatives to the water budget for more effective ways of

improving downstream migration and reducing power system effects. However, if the work group on water budget effectiveness and reservoir mortality (described below) concludes that evaluating the effectiveness of the water budget is not possible or feasible, it should provide the Council with a scientific justification for its conclusion.

Studies also are needed to understand the impacts of reservoir mortality. Current estimates of reservoir mortality range from 10 percent to 40 percent. If these estimates are confirmed, reservoir mortality could be a major source of salmon and steelhead mortality in the system. A better understanding of reservoir mortality should lead to developing new methods to reduce reservoir mortality and also help in assessing the effectiveness of other measures such as the water budget. [See Sections 303: Water Budget and Mainstem Flows and 403: Downstream Passage.]

Research: disease

(B) Solving disease problems affecting spring and summer chinook.

Hatchery production, especially of spring and summer chinook, has been hampered seriously by the prevalence of disease. Unless disease is controlled, other enhancement efforts, such as improved passage, transportation and flow augmentation, will be undermined. [See Section 703(e)(4): Wild, Natural and Artificial Propagation.]

Research: hatcheries

(C) Exploring methods for substantially increasing and improving hatchery production at existing hatcheries within the next 10 years.

Production at existing hatcheries can be increased substantially by a variety of methods, such as improvements in husbandry practices and hatchery rearing operations. Before the Council can assess the need for substantial new hatchery production, it must have a better understanding of ways to solve problems at existing hatcheries and to realize the full potential of these facilities. [See Sections 703(e)(1)-(3) and (5): Wild, Natural and Artificial Propagation.]

Research: supplementation

(D) Improving supplementation techniques.

Supplementation is a technique proposed for quickly increasing natural runs. It involves outplanting hatchery fry and juvenile fish in the natural environment. However, documentation of successful supplementation efforts is minimal. Previous experiments have shown that supplementation can fail if proper attention is not paid to stock selection, timing of fish release and other factors. A better understanding of supplementation methods is needed to assess its potential to increase natural production. [See Sections 703(f)(1), (3) and (5), and 703(h)(1)-(2): Wild, Natural and Artificial Propagation.]

Work groups

(2) **Technical Work Groups.** Bonneville shall fund technical work groups to develop five-year work plans for each of the areas listed in Section 206(b). The work groups will be composed of representatives of the fish and wildlife agencies, tribes, hydropower project operators and Bonneville, with technical input from other experts. Members of a work group must have technical expertise in the research area. Each work group will be chaired by a designee of the fish and wildlife agencies and tribes. Council representatives will participate as observers. The reservoir mortality/water budget effectiveness work group shall include a representative of the Fish Passage Center.

Work plans

(3) **Five-Year Work Plans.** Each five-year work plan must include objectives, tasks and schedules, major milestones and estimated costs. In consultation with the Council, Bonneville will provide the technical work groups with estimates of program levels likely to be available for salmon and steelhead research over the five-year period. Work plans should incorporate planning previously conducted in each area and take into account research by other entities. The work plans also must identify test fish needs and explain how those needs will be met.

(4) **Council Approval of Work Plans.** The five-year work plans for each area of emphasis, along with estimated costs, will be presented to the Council as a package for approval prior to funding. The Corps and the technical work groups funded by Bonneville will submit their work plans to the Council concurrently to give the Council and the public the opportunity to evaluate the overall research program.

(5) **Other Responsibilities.** The technical work groups also will be responsible for: A) developing statistical and design standards for each area of emphasis, and B) assisting Bonneville in the development, evaluation and review of requests for proposals, project work statements and other related documents.

(c) Research Funding by the Corps of Engineers

(1) **Areas of Emphasis.** The two main areas of emphasis for Corps funding of salmon and steelhead research for the next five years shall be:

(A) Improving bypass at mainstem projects.

Research: bypass

Effective bypass at mainstem projects is critical to improving survival of juvenile salmon migrating downstream and for reducing reliance on spill that otherwise could be used to generate power. [See Section 403: Downstream Passage.]

(B) Evaluating and improving the effectiveness of transportation.

Research: transportation

Transportation has been shown to be an effective means of moving some stocks of juvenile steelhead and salmon downstream. Controversy exists, however, about its effectiveness for spring chinook. [See Section 403: Downstream Passage.]

(2) Fish Passage Development and Evaluation Program. The Corps will continue to develop five-year work plans as part of its Fish Passage Development and Evaluation Program. The Corps work groups will work closely with the technical work groups funded by Bonneville to ensure that: A) research work plans are complementary and coordinated, and B) test fish needs are met.

(3) Work Plans. Each five-year work plan must include objectives, tasks and schedules, major milestones and estimated costs. Work plans should incorporate planning previously conducted in each area and take into account research of other entities. The work plans also must identify test fish needs and explain how those needs will be met.

(4) Council Approval of Work Plans. The Corps and the technical work groups funded by Bonneville will submit their work plans to the Council concurrently to give the Council and the public the opportunity to evaluate the overall research program.

(d) System Monitoring and Evaluation

Monitoring and evaluation

(1) While the Council supports an aggressive rebuilding program, it continues to recognize the importance of ensuring that ratepayers' expenditures for fish and wildlife measures are well spent. To this end, the Council will develop a system monitoring and evaluation program to assess and account for changes in run sizes and thereby to measure progress toward the doubling goal as well as consistency with program policies. Such accounting should help identify changes in runs that grow out of program efforts, in contrast to changes due to natural variations and efforts outside this program. It also will supplement the Council's annual reports to Congress describing the effectiveness of the program, as required by the Northwest Power Act. In addition, a sound monitoring and evaluation program will further the Council's policy of adaptive management. To minimize the risks of management and enhancement decisions made against a background of biological uncertainty, actions must be accompanied by a monitoring and evaluation program to provide feedback to the Council, so that ineffective actions can be identified and management strategies modified accordingly.

(2) The Council's system monitoring and evaluation program will include:

(A) Development of alternative means to assess progress toward achieving the goal of doubling the runs of salmon and steelhead in the Columbia River Basin, consistent with the policies stated in Section 204. (This effort will focus on accounting for changes in run size attributable to ratepayer investments under the program in contrast to those changes resulting from other human activities or natural fluctuations.)

(B) Evaluation of research results and reporting on implications for program objectives.

(C) Development of a coordinated information system designed to facilitate effective exchange and dissemination of fisheries data. (This will entail the coordination of systemwide data collection programs; identification of data collection needs; and the development of standards for data reporting, storage and retrieval. It also will include coordination of the data collection activities of the program, especially those under Section 206(e), with other large-scale efforts, including those conducted by the Pacific Salmon Commission, the Pacific Fishery Management Council, the North Pacific Fishery Management Council, the Pacific Marine Fisheries Commission, and the federal, tribal and state harvest managers.)

(D) Maintenance of the system planning model, including documentation, recommended standards for use, and modifications.

(E) Integration with the system planning activities discussed in Section 205. (This will include coordination of monitoring programs and assistance in the integration of subbasin plans using the system planning model.)

(F) Examination of quantitative methods to incorporate genetic conservation into production planning.

(3) To aid development and implementation of a systemwide monitoring and evaluation program, the Council will assemble a group of experienced scientists or managers with quantitative technical expertise and with knowledge of the fish and wildlife program and the Columbia River Basin. The Council will fund participation in the group by the fish and wildlife agencies and tribes and will encourage participation by representatives of Bonneville and the hydropower project operators.

(e) Data Collection

(1) **Hatchery Data Base.** Bonneville shall fund collection of Columbia River Basin hatchery data for anadromous fish. The work group on improving hatchery production [described in Section 206(b)(2)], working in conjunction with the work group on system monitoring and evaluation [described in Section 206(d)], will determine the format, schedules and the data to be collected. These data will include at a minimum: numbers of returning adults; disposition of returning adults; source and description of brood stock; actions taken to maintain genetic diversity; and size, location and time of release of juvenile fish. Data collected shall be stored in the Council's anadromous fish data base.

(2) **Natural Production Data Base.** Bonneville shall fund collection of information on the natural production of anadromous fish in the Columbia River Basin. Data to be collected shall include at a minimum: adult escapement, redd counts and juvenile migration for key index streams in the Columbia River Basin. The key index streams shall be consistent with any key index streams identified through the United States-Canada Pacific Salmon Treaty and relevant planning processes. Data collected shall be stored in the Council's anadromous fish data base.

207. Resident Fish Substitutions Policy

Salmon and steelhead probably never will be able to return to some areas of the basin because of blockages by dams. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller blocked areas. In its analysis of the contribution of the hydropower system to salmon and steelhead losses, the Council has addressed the extent to which resident fish substitutions should be used to mitigate losses of salmon and steelhead production in these areas.

Section 200

Substitution principles

The Council has concluded that: 1) mitigation in blocked areas is appropriate where salmon and steelhead were affected by the development and operation of the hydroelectric projects; 2) to treat the Columbia River and its tributaries as a system, some level of substitution is reasonable for lost salmon and steelhead in areas where in-kind mitigation cannot occur; and 3) some flexibility in approach is needed to develop a program that complements the activities of the fish and wildlife agencies and tribes and that is based on the best available scientific knowledge. 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.

Priority blocked areas

Applying these principles, the Council has determined that it first will consider proposals for resident fish substitution projects in the blocked areas above Chief Joseph and Hells Canyon dams. The Council will consider projects in other blocked areas of the basin later, when the level of performance or accomplishment in anadromous fish rebuilding and in upper basin substitutions is known.

Resident fish substitution projects must:

(a) Incorporate adaptive management principles by defining the anticipated results in terms of hypotheses to be tested[3] and by including appropriate monitoring and evaluation to determine whether and why those results have been achieved;
(b) Complement activities of fish and wildlife agencies and tribes;
(c) Address unmitigated losses of salmon and steelhead attributable to development or operation of hydropower projects;
(d) Appear likely to achieve significant biological results;
(e) Avoid conflict with anadromous fish;
(f) Reflect a management plan with sound biological objectives;
(g) Demonstrate consultation and coordination with interested parties;
(h) Include estimated costs and a schedule for implementation and evaluation; and
(i) Otherwise meet the standards of the Northwest Power Act.

Resident fish substitution projects approved by the Council are included in Section 903(g): Resident Fish.

3. These hypotheses should be stated in quantitative terms if possible.

Section 300

SALMON AND STEELHEAD

Water Budget and Mainstem Flows

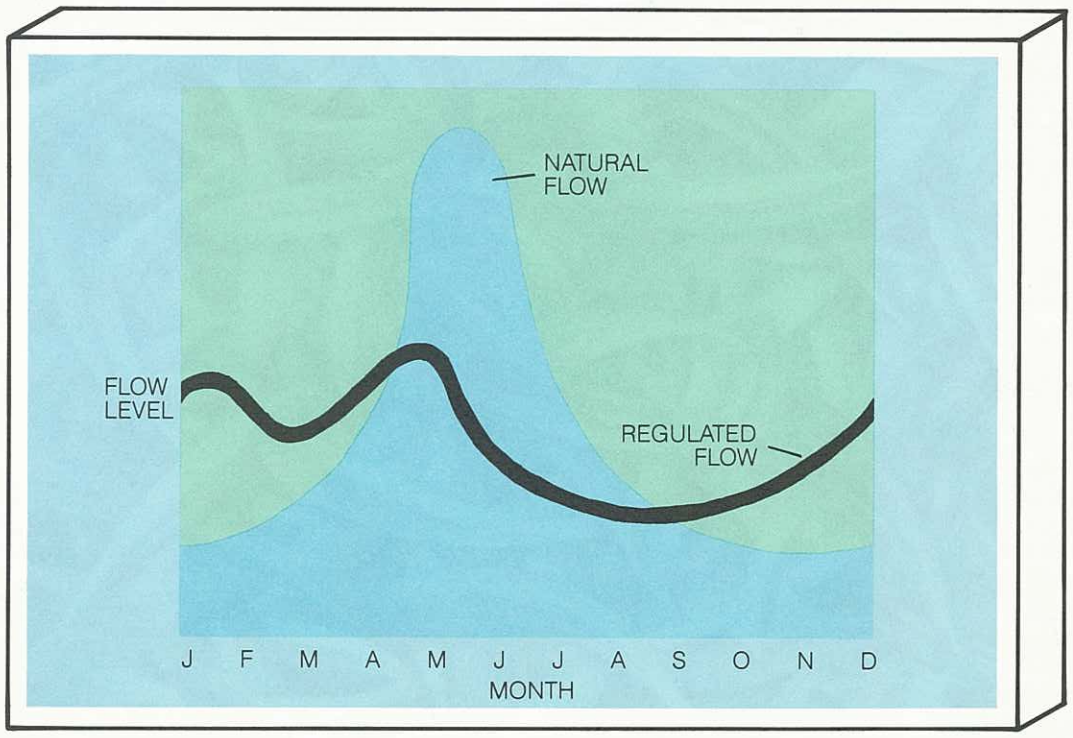


Figure 5.
Natural and Regulated Water Flows

301. The Problem

Development of the dams and hydroelectric projects on the Columbia and Snake rivers has greatly altered the natural flows in the Columbia River Basin. The spring runoff is stored in reservoirs to be used during periods of naturally low flows. Regulating the river in this fashion increases its ability to produce electricity throughout the year. However, it also reduces river flows, particularly during the spring when juvenile salmon and steelhead are migrating downstream to the ocean (Figure 5). The combination of reduced flows and the greater cross-sectional area of the river due to reservoir storage slows the juvenile fish as they migrate from their area of origin to the ocean. This increase in travel time affects the ability of the juvenile salmon (smolts) to make the transition from freshwater to saltwater and increases their exposure to predatory fish and birds. Reduced flows also endanger juvenile salmon by raising water temperatures, altering water chemistry and increasing susceptibility to disease.

Travel time

These physical problems have been compounded by the diversity of parties involved in the river basin's management. The fish and wildlife agencies and tribes recognize that in the past one source of their difficulties in influencing power system operations has been their lack of expertise and experience in power system planning and operations. They note that they have lacked funds to hire individuals with the interdisciplinary skills necessary to understand highly technical power system concepts as well as the biological needs of fish and wildlife. The power system operators point to the need for fish and wildlife agency and tribal representatives who can speak the language of the power system. The power system operators also stress the need for the fish and wildlife agencies and tribes to "speak with one voice" to ensure clear and timely integration of fish requirements when power system decisions are being made.

Coordination

302. The Remedy

The Council determined that increased spring flows are needed on the Columbia and Snake rivers to improve juvenile salmon migration. Power flows during the remainder of the year generally are sufficient to allow safe migration. To provide adequate flows during that portion of the spring when smolts are actually migrating downstream, the Council developed a "water budget" to be used between April 15 and June 15. The water budget is a block of water set aside for fish and released during the spring runs to create an artificial freshet that speeds juvenile fish to the ocean. Separate water budgets were established for measurement at Priest Rapids and Lower Granite dams, both in Washington.

Water budget

Through the use of the water budget, the fish and wildlife agencies and tribes can increase spring flows to aid the downstream migration of juveniles. The Council has established a schedule of firm power flows for the April 15 to June 15 period to provide a base from which to measure water budget use. (Firm power is the electricity that the hydropower system guarantees it can produce. That guarantee is based on the fact that this amount of hydropower is available even in historic low (critical) water conditions.) The water budget may be used to implement any flow schedule that would assure juvenile salmon survival, provided the flows allow existing firm non-power commitments, such as flood control, to be met.

Increase flows

The water budget would not be used to achieve flows that are greater than the optimum levels recommended by the tribes (140,000 cubic feet per second — 140 kcfs — for both Priest Rapids and Lower Granite dams). While the water budget will reduce the system's firm energy load carrying capability throughout the year, it will improve juvenile migrant survival. (Firm energy load carrying capability is the amount of firm energy that can be produced from a hydropower system based on the system's lowest recorded sequence of streamflows and the maximum amount of reservoir storage currently available to the system.)

The Columbia River Inter-Tribal Fish Commission contributed an important element to the development of the water budget by pointing out that optimum flows for downstream migration are only needed when the fish are present. Recognition of this factor led to the concept of "shaping" fish flows, which in turn led to the concept of a specified volume of water rather than specified flow levels. This volume of water, to be shaped by the fish and wildlife agencies and tribes, became the water budget.

Water budget calculations

To calculate the size of the water budget, the Council added the differences between the average monthly flows achieved under the original fish and wildlife agency recommendations and the average monthly flows achieved during the 42-1/2 month critical water period (historic low water) used for power requirements only. This calculation resulted in a total water budget of 67.8 kcfs-months (4.03 million acre-feet), composed of 40.2 kcfs-months (2.39 million acre-feet) at Priest Rapids Dam and 27.6 kcfs-months (1.64 million acre-feet) at Lower Granite Dam. (An acre-foot is the amount of water that would cover one acre up to a depth of one foot. One kcfs-month is a flow of 1,000 cubic feet per second for one month, or 0.0595 million acre-feet.)

Computer simulations indicate that the Snake River Basin has insufficient water during critical low water conditions to meet the flows recommended by the fish and wildlife agencies or to ensure that the system's reservoirs refill frequently enough to be used for future power and fish flow needs. To reflect these physical limitations, the Council has set the water budget for Lower Granite Dam in the Snake River Basin below what had been recommended. The Columbia River above the confluence with the Snake River does not have similar water availability problems. Therefore, the Council has set the water budget for Priest Rapids Dam in the mid-Columbia above the level recommended. This larger water budget for Priest Rapids Dam increases the total size of the water budget from 67.8 kcfs-months to 78 kcfs-months and, together with the ability to shape the flows, improves the region's ability to meet optimum flows below the confluence of the Snake and the Columbia rivers.

Fish passage managers

To improve coordination between fish and power interests, the Council called for two coordinators known as fish passage managers (originally called water budget managers). One manager is appointed by the basin's fish and wildlife agencies, and the other is selected by the majority of Columbia River Basin tribes. The Council provides a fish passage advisor on its staff to review the operation of the water budget, advise the Council on all matters related to the water budget, and assist the Council in resolving water budget disputes.

Water budget study

The Council developed the water budget approach at Priest Rapids and Lower Granite dams to increase the numbers of Columbia Basin salmon and steelhead without significantly affecting the provision of an adequate, economical, efficient and reliable power supply. Because this is the first effort to establish a water budget for fisheries enhancement, the Council has called for examination of its biological effects, including reductions of smolt travel time and improvements in smolt survival, and its impacts on the power system. In 1987, the fish and wildlife program was modified to encourage experimentation with and evaluation of alternatives for implementing the water budget.

303. Measures

(a) Establishment and Use of the Water Budget

Size, timing and use

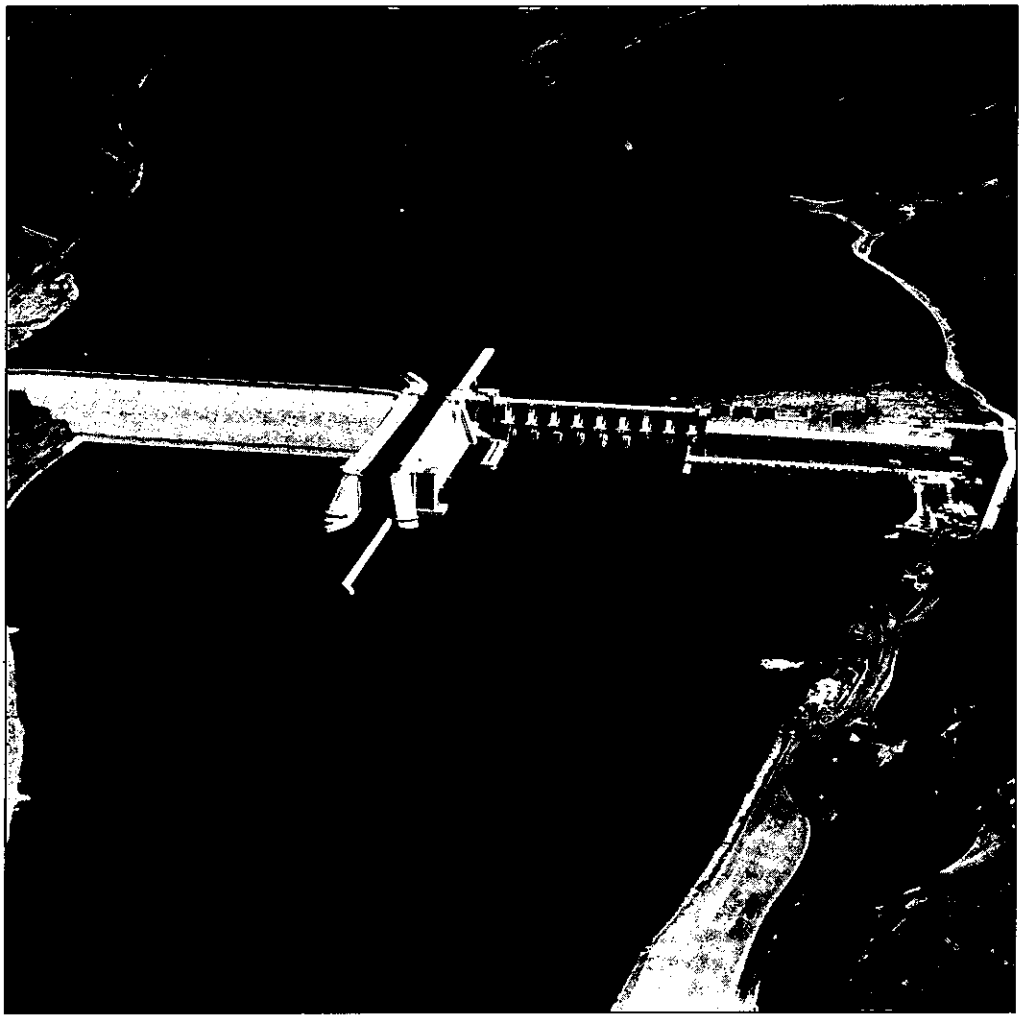
(1) The federal project operators and regulators shall provide the fish and wildlife agencies and tribes with a total water budget of 78 kcfs-months (4.64 Maf). It is to be divided into 58 kcfs-months (3.45 Maf) at Priest Rapids Dam and 20 kcfs-months (1.19 Maf) at Lower Granite Dam. The fish and wildlife agencies and tribes will specify the use of the water budget during the period April 15 through June 15. The water budget may be used by the fish and wildlife agencies and tribes to implement any flow schedule that provides maximum juvenile salmon survival, within the limits of firm non-power requirements, physical conditions, and flows required for firm loads.

(2) To provide a base from which to measure water budget use, the Council has established the "firm power flows" listed in Table 1. Fish passage managers will request flows for Priest Rapids and Lower Granite dams and specify dates on which these flows are desired. The flow requests must be greater than the firm power flows and less than 140 kcfs. The fish passage managers must give the Corps of Engineers three days' written notice of changes in the planned flow schedule from the water budget volumes, unless otherwise agreed to by the managers and the Corps. Water budget use will be measured as the difference between the actual average weekly flows or the fish passage managers' flow requests at Priest Rapids and Lower Granite dams, whichever is less, and the firm power flows, or as agreed to by the project operators and the fish passage managers.

Measurement and notice of change

Table 1
Firm Power Flows
(average weekly kcfs)

	Priest Rapids	Lower Granite
April 15 through April 30	76	50
May 1 through May 31	76	65
June 1 through June 15	76	60



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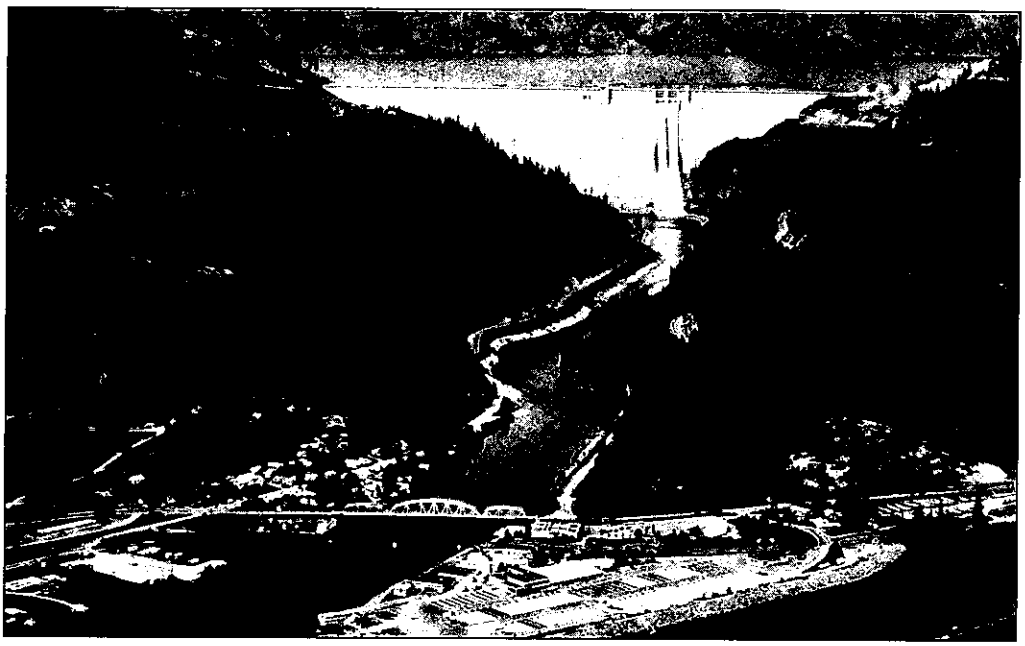


Firm requirement

(3) The federal project operators and regulators shall incorporate the water budget requirement in all system planning and operations performed under the Columbia River Treaty, the Pacific Northwest Coordination Agreement, all related rule curves, and in other applicable procedures affecting river operations and planning. All parties will act in good faith in implementing the water budget as a "firm" requirement. The Council expects that in order to reduce power system effects, maintenance of coal and nuclear power plants will be moved into the April 15 to June 15 period.

Estimated power loss

(4) The water budget originally was expected to result in an average annual loss of 550 megawatts (MW) of firm energy load carrying capability. The actual amount of power loss depends on actions taken by power managers to accommodate the water budget. Such actions may include extraregional firm power exchanges and shifting of thermal plant maintenance schedules. The Council will undertake new efforts to refine the estimates of the effects of the water budget on firm energy load carrying capability.

Dworshak and Brownlee reservoirs

(5) To allocate non-power impacts equitably between Dworshak and Brownlee reservoirs, some spill at Dworshak may be necessary. It is expected that Idaho Power Company will experience power losses as a result of operating Brownlee Reservoir for the purpose of supplying the water budget. Idaho Power Company maintains that, through its settlement agreement and FERC license, it has compensated for all adverse effects of its projects on fish. The Council does not express an opinion on this question. Nevertheless, the Council believes that Idaho Power Company's participation in the water budget on the Snake River will help significantly in providing systemwide flows for downstream migration. If Idaho Power Company experiences a power loss as a result of participating in the water budget, and it is determined that the need for water from Brownlee Reservoir is not attributable to the development and operation of the Idaho Power Company's Hells Canyon Complex, Bonneville shall replace the loss in-kind. [See Section 1203(a)(4): Coordination.]

Natural runoff and storage

(6) The water budget will not be used in conflict with firm non-power constraints. During all water conditions consistent with those within the 40-year record, including the critical period, the water budget requirements will remain unchanged. However, during better than critical water conditions, the water budget will be composed of a higher percentage of natural runoff and a lower

percentage of reservoir storage. In the event that the physical storage of the water budget is precluded due to evacuation of reservoirs for flood control, the Corps of Engineers immediately shall notify the Council and the fish passage managers. Even in this event, the federal project operators and regulators shall make every attempt, using the flexibilities of the system, to implement the water budgets at Priest Rapids and Lower Granite dams according to the flow schedules requested by the fish passage managers. The Corps shall re-examine its flood control requirements to ensure a proper balance among the many uses of the projects, including the water budget.

(7) In making flow requests from the water budget, the fish passage managers shall take into account flow and reservoir level fluctuation requirements for resident fish.

(8) The Council recognizes that the description of the water budget lacks many of the operating details that will be addressed as the water budget is implemented and operating problems occur. Recognizing that operating decisions could influence the effectiveness of the water budget, the Council recommends the following priority for competing uses of the hydropower system:

First:	Firm Power to Meet Firm Loads
Second:	Water Budget
Third:	Reservoir Refill
Fourth:	Secondary Energy Generation (beyond that provided in connection with use of the water budget)

(9) The Council recognizes that the water budget must be implemented within the context of laws related to federal, state and Indian water rights. [See Section 1500: Disclaimers.]

(b) Fish Passage Center

(1) Bonneville shall fund the establishment and operation of a Fish Passage Center, including funds for two fish passage manager positions, technical and clerical support and the services of consultants when necessary, as jointly agreed to by Bonneville and the fish and wildlife agencies and tribes. This support will assist the fish passage managers in: A) planning and implementing the annual smolt monitoring program called for in Section 303(d)(1); B) developing and implementing flow and spill requests; and C) monitoring and analyzing research results to assist in implementing the water budget and spill planning and in preparing reports.

(2) The Fish Passage Center will house the fish passage managers and their staff and will function as the primary program center for housing data and information regarding juvenile fish passage. All data collected and stored at the Fish Passage Center will be available upon request to all interested parties.

Duties of fish passage managers

(3) Bonneville shall provide funds to establish two "fish passage manager" positions. One fish passage manager will work for the entity (or entities) designated by a majority of the federal and state fish and wildlife agencies, and one will work for the entity (or entities) designated by a majority of the Columbia River Basin Indian tribes. The fish passage managers will provide expert assistance to the designated entities in working with the power project operators and regulators to ensure that requirements for fish are made a part of all river system planning and operations. They will be selected on the basis of their knowledge of the multiple purposes of the regional hydropower system as well as the water needs of fish and wildlife, and their ability to communicate and work with the fish and wildlife agencies, tribes, project operators and regulators and other interested parties, including members of the public. The Council will provide a fish passage advisor on its staff to review the operation of the water budget; advise the Council on all matters related to fish passage; and to assist in resolving fish passage disputes.

Communication

(4) The fish passage managers will be the primary points of contact between the power system and the fish and wildlife agencies and tribes on matters concerning all water budget and spill operations affecting juvenile fish migrating downstream at hydroelectric projects operated by the Corps of Engineers and the Bureau of Reclamation on the mainstem of the Columbia and Snake rivers. They will be responsible for informing the Corps of Engineers when and to what extent they wish to draw on the water budget. The Corps will inform the other project operators and regulators of water budget requests and spill communications to the extent necessary. The Corps shall manage and implement annual water budget and juvenile fish passage plans and make in-season spill decisions in consultation with the fish passage managers.

(5) The Council expects Bonneville and the fish and wildlife agencies and tribes to cooperate fully in developing the contractual agreements necessary to carry out tasks described in this section. Pursuant to this expectation, the Council or its staff will review all contracts related to the Fish Passage Center and the fish passage managers as provided in Sections 1203(d)(2)-(3): Coordination.

(c) Coordination of the Water Budget

Experimental procedures

(1) By January 15 of each year, the federal project operators and regulators shall meet with a committee composed of the fish passage managers, the Council's fish passage advisor and operators of the power system. The purpose of the meeting shall be to review the official January volume-of-runoff forecast; coordinate the system operation for the current year; and develop experimental use and accounting procedures for both the mid-Columbia River and the Snake River water budgets. A similar meeting shall be conducted in mid-February and mid-March of each year. Experimental water budget procedures shall be implemented for at least water years 1987 and 1988. This committee also shall evaluate alternative water budget implementation procedures and report to the Council.

(2) By March 20 of each year, the Corps of Engineers shall submit to the Council a coordinated plan of operation for the period April 15 through June 15. During that period, and the period June 15 through August 31, the Corps shall submit to the Council and the fish passage managers a daily flow report and shall make available a copy of the National Weather Service weekly flow forecast. During the remainder of the year, the Corps shall submit a monthly flow report to the Council.

Annual report

(3) By November 1 of each year, the fish passage managers will submit to the Council a single report that explains the scheduling of the water budget and supporting rationale for that calendar year. This report will include:

(A) The actual flows achieved for that calendar year;

(B) A record of the estimated number of smolts that passed Lower Granite and Priest Rapids dams and the period of time over which the migration occurred; and

(C) A description of the flow shaping used for that calendar year to achieve improved smolt survival.

(4) Bonneville shall pay the travel costs and related travel expenses for one or two representatives from each Columbia River Basin Indian tribe to attend up to three meetings per year for the purpose of coordinating tribal water budget activities.

(d) Monitoring

(1) Bonneville shall fund an annual smolt monitoring program to be conducted by the fish and wildlife agencies and tribes. The monitoring program will provide information on the migrating characteristics of the various stocks of salmon and steelhead within the Columbia Basin. The program shall include:

Smolt monitoring program

(A) Field monitoring of smolt movement to determine the best timing of storage releases;

(B) Coordination of runoff forecasts with water budget use and shaping;

(C) Continuous monitoring of runoff conditions and fish movement at Lower Granite and Priest Rapids dams to provide information to allow changes in water budget use if actual runoff conditions are inconsistent with runoff forecasts; and

(D) Coordination of hatchery releases with water budget use.

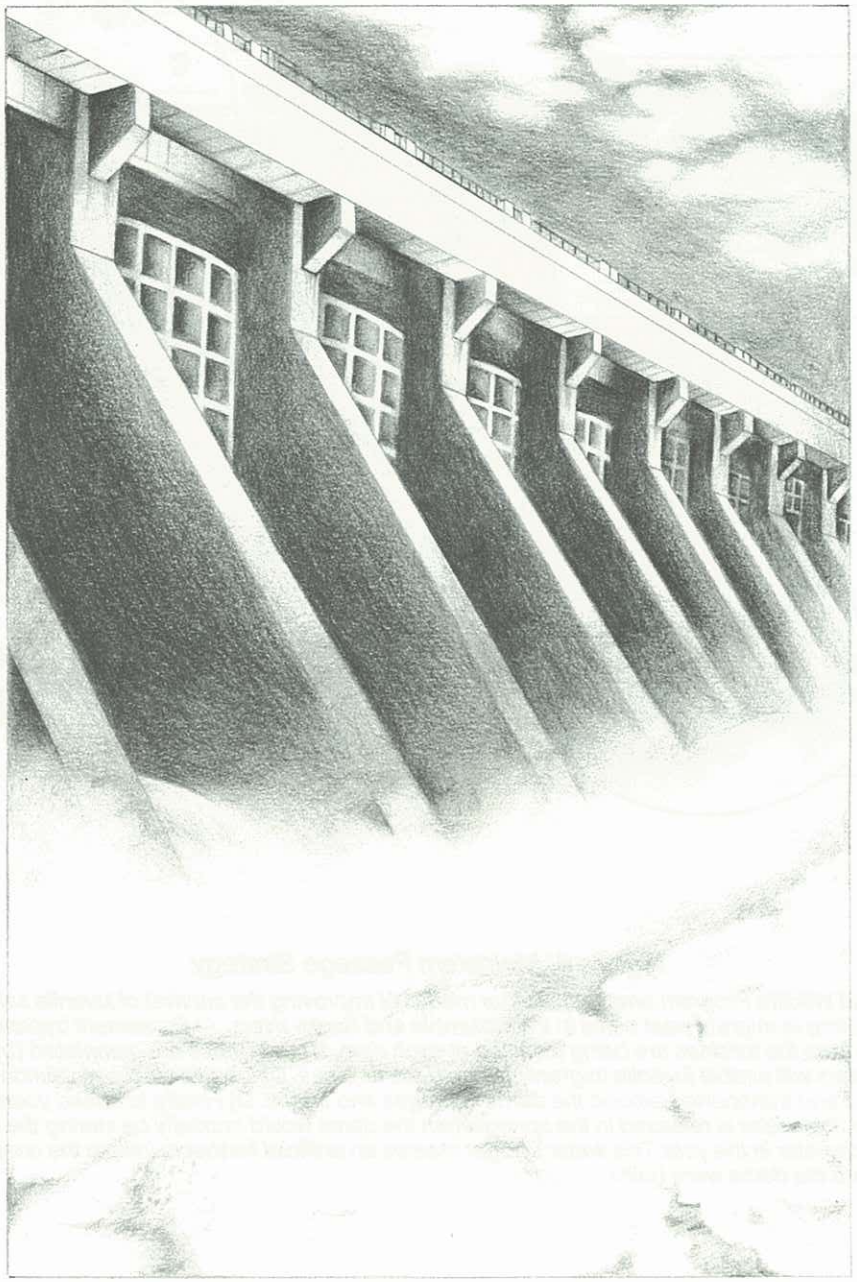
(e) Dispute Settlement

(1) In the event that the fish and wildlife agencies and tribes are unable to agree on a flow schedule for the water budget, their fish passage managers immediately will notify the Council, which will assist them in promptly resolving the dispute. In the event that the dispute cannot be resolved, the Council may establish and transmit to the Corps of Engineers its own flow schedule for the water budget.

(2) If federal project operators and regulators cannot resolve planning and operational disputes related to administering the water budget, the Council will meet with the representatives of those entities to help resolve the dispute. The Council will consult with the fish and wildlife agencies, tribes, public utility districts, the Federal Energy Regulatory Commission and other interested parties throughout implementation of the program. [See Section 1200: Coordination.]

SALMON AND STEELHEAD

Downstream Passage



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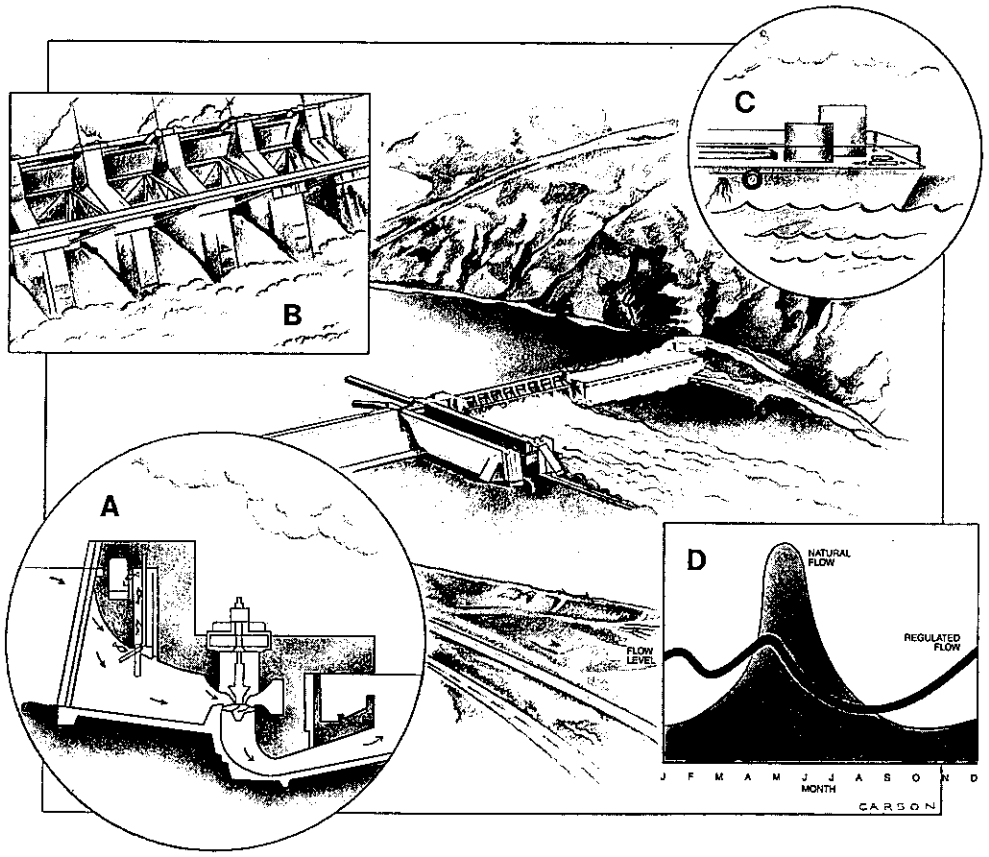


Figure 6. *Mainstem Passage Strategy*

The 1987 Fish and Wildlife Program emphasizes four means of improving the survival of juvenile salmon and steelhead attempting to migrate past dams in the Columbia and Snake rivers. A) Permanent bypass systems to divert young fish from the turbines are being installed at each dam. B) Until these are completed (by 1994), spills of water over the dams will enable juvenile migrants to avoid the turbines. C) Certain stocks of salmon and steelhead are also collected and transported around the dams in barges and trucks. D) Finally, to speed young fish through the system, a block of water is released in the spring when the dams would normally be storing the water to generate electricity later in the year. This water budget creates an artificial freshet to imitate the ones young fish used to ride before the dams were built.

401. The Problem

When hydroelectric dams originally were constructed in the Northwest, many people believed that providing adequate upstream passage over the dams for adult fish returning to spawn was sufficient to sustain salmon and steelhead runs. Since that time, research has shown that juvenile salmon and steelhead headed downstream also suffer a high mortality rate as they encounter the dams. As these migrants are drawn through a dam's power turbines, they are exposed to conditions that can cause injury and death in a variety of ways. Changes in pressure within each turbine are the primary contributor to juvenile mortality as the fish move from the top of the dam through the turbine intake and out a tunnel at the base of the dam. The impact of the moving turbine blades and the shearing action of water in the turbine can also cause injuries or death. In addition, juvenile salmon and steelhead become stunned and disoriented after passing through the turbines, thus increasing their vulnerability to predators, especially squawfish, which are abundant at the base of each dam.

Turbine mortality

Predation

402. The Remedy

The Council has taken a number of actions to reduce mortality rates of juvenile fish at the dams. It has called for permanent bypass facilities to be installed at mainstem dams. However, to protect juvenile fish while these installations were being built, the Council required the dam operators to spill sufficient water at the dams to guarantee a specified level of fish survival. With spill, fish-laden water is diverted through a spillway, passing the dam without going through its turbines. (Spill is to be distinguished from the water budget in that it helps juvenile fish around the dams. The water budget speeds the migrants' journey between dams.) The Council also adopted measures to transport juvenile salmon and steelhead around some dams, as determined by the fish and wildlife agencies and tribes. [See Figure 6.]

Mainstem bypass facilities

In 1982, the Council called for development of mechanical bypass systems at five public utility district dams regulated by FERC in the mid-Columbia area. In 1984, operators of four of the five dams agreed to develop bypass systems as part of a settlement with fish and wildlife agencies and tribes, which had petitioned FERC to make bypass a condition of license renewals for the dams. A settlement for the fifth dam was reached among the parties in the spring of 1987 and was pending approval by FERC and possible program amendment by the Council at the time this program went to press. Spill, which is to be used to protect fish until the bypass systems are operating, is to be shaped in coordination with the fish and wildlife agencies and tribes. At Priest Rapids Dam, the Council called for the study of a short-haul fish transportation program, while a prototype bypass system is being tested at the project.

Mid-Columbia bypass facilities

In 1984, the Council considered a number of proposals for improving fish passage efficiency and smolt survival at Columbia and Snake river dams, with the goal of improving smolt survival systemwide. Some recommendations proposed waiting for results of studies on fish passage problems before taking action to improve bypass efficiencies. The Council, however, found that the critical status of the runs on the Columbia and Snake rivers required prompt action instead of continued delay and study. As a result, amendments to the program called for the Corps of Engineers to develop coordinated interim juvenile fish passage plans, including spilling water over the dams, while developing permanent solutions to passage problems at John Day, The Dalles, Bonneville, Lower Monumental and Ice Harbor dams.

Interim spill

At the Council's request, the Corps completed a comprehensive report on smolt transportation in 1986. The Council also called on Bonneville to fund the testing and evaluation of alternative bypass conduit systems. In addition, the Council adopted a 90 percent fish guidance efficiency standard as a design criterion for devices that deflect fish away from turbine intakes. Until mechanical bypass systems are installed, the Council requires that the level of spill be sufficient to guarantee at least

90 percent fish survival at specified projects for the middle 80 percent of the spring and summer migrations. Spill operations are to begin when the first 10 percent of the spring migrants have passed a dam and are to protect 80 percent of the spring migration. Spill is to continue or begin again when the first 10 percent of the summer migrants have passed the dam and is to protect 80 percent of the summer migration.

In 1987, the Council adopted a "share the wealth" measure to provide increased levels of spill in years when water is above the critical level. The program continues to call for enough spill to meet the 90 percent fish survival requirement at mainstem dams in critical water years. An annual spill plan is to be worked out between the Corps and the fish and wildlife agencies and tribes, with the Council facilitating consensus.

403. Measures

(a) Mid-Columbia River Passage

Wells Dam

(1) FERC shall require Douglas County Public Utility District (PUD) to:

(A) Design a collection and bypass system tailored to the unique features of Wells Dam.

Collection and bypass system

(B) Complete testing and evaluation of a prototype collection and bypass system at Wells Dam and report the results of such tests and evaluation to the Council. The evaluation shall compare the effectiveness of the prototype collection and bypass system with the best available system. If the Council determines that the tested system is not the best available, the Council will request the evaluation of alternative collection and bypass systems.

(C) Complete installation at Wells Dam of a collection and bypass system that has been approved by the Council.

Rocky Reach and Rock Island dams

(2) FERC shall require Chelan County PUD to:

(A) Complete testing and evaluation of prototype collection and bypass systems at Rocky Reach and Rock Island dams and report the results of such tests and evaluation to the Council. The evaluation shall compare the effectiveness of the prototype collection and bypass systems with the best available system. If the Council determines that the tested systems are not the best available, FERC shall require the PUD to evaluate alternative collection and bypass systems.

Collection and bypass systems

(B) Complete installation at Rocky Reach and Rock Island dams of collection and bypass systems that have been approved by the Council.

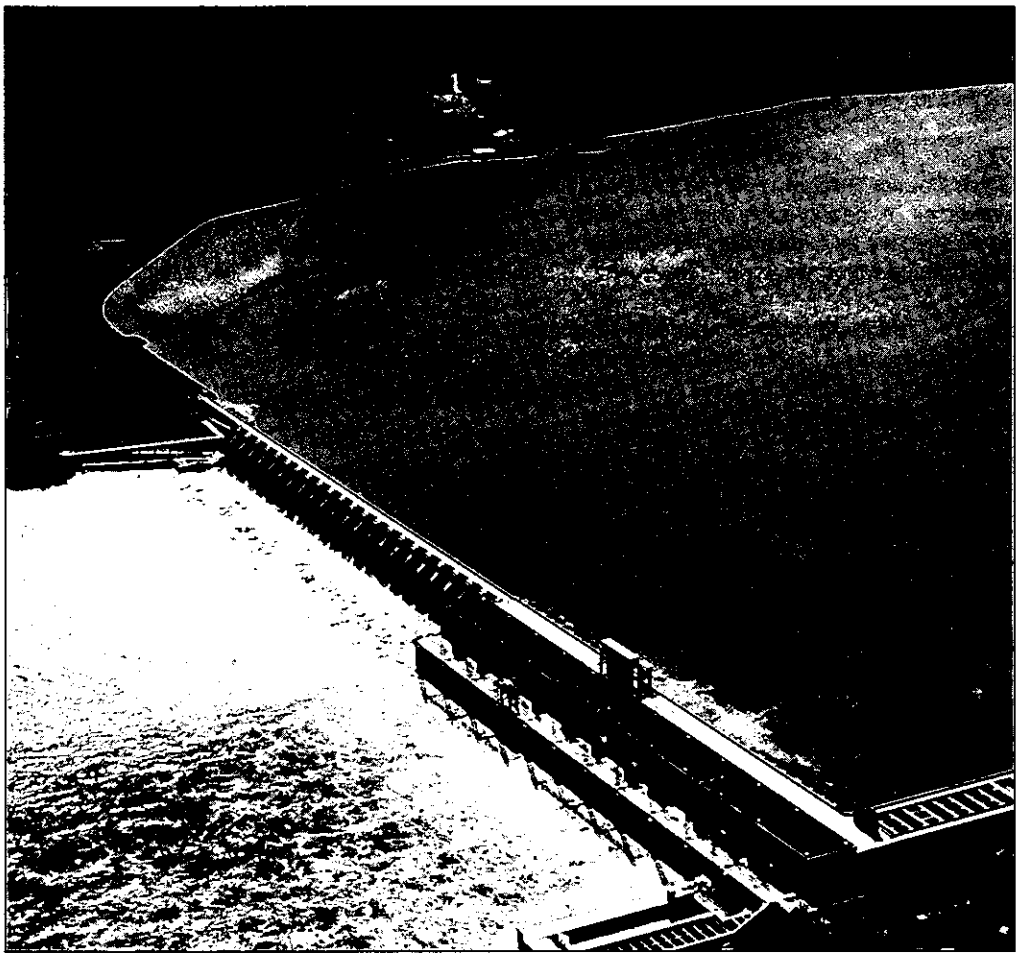
Wanapum and Priest Rapids dams

(3) FERC shall require Grant County PUD to:

(A) Complete testing and evaluation of prototype collection and bypass systems at Wanapum and Priest Rapids dams and report the results of such tests and evaluation to the Council. The evaluation shall compare the effectiveness of the prototype collection and bypass systems with the best available system. If the Council determines that the tested systems are not the best available, FERC shall require the PUD to evaluate alternative collection and bypass systems.

Collection and bypass systems

(B) Complete installation at Wanapum Dam of a collection and bypass system that has been approved by the Council.



Priest Rapids Dam

(4) Upon approval by the Council of a detailed study plan, FERC shall require Grant County PUD to begin to study the effectiveness of short-haul transportation of smolts from locations above Priest Rapids Dam to locations below the dam. The study plan shall be developed in cooperation with the fish and wildlife agencies and tribes and shall be submitted to the Council. The study plan shall include a description of where the fish will be collected and released; how many times they will be handled in their entire migration; specific measures for handling the juvenile fish to reduce stress; chemicals to be used to reduce stress; the number of fish required for the test; the proposed density of fish in each transportation vehicle; and an identification of each hypothesis to be tested. If the Council finds that the study plan is inadequate and if the study plan cannot be corrected to the satisfaction of the Council within 90 days, FERC shall require Grant County PUD to continue its prototype testing and complete installation of a collection and bypass system. If the study plan is approved by the Council, the fish and wildlife agencies, at the direction of FERC, will provide adequate numbers of fish for test purposes for the study.

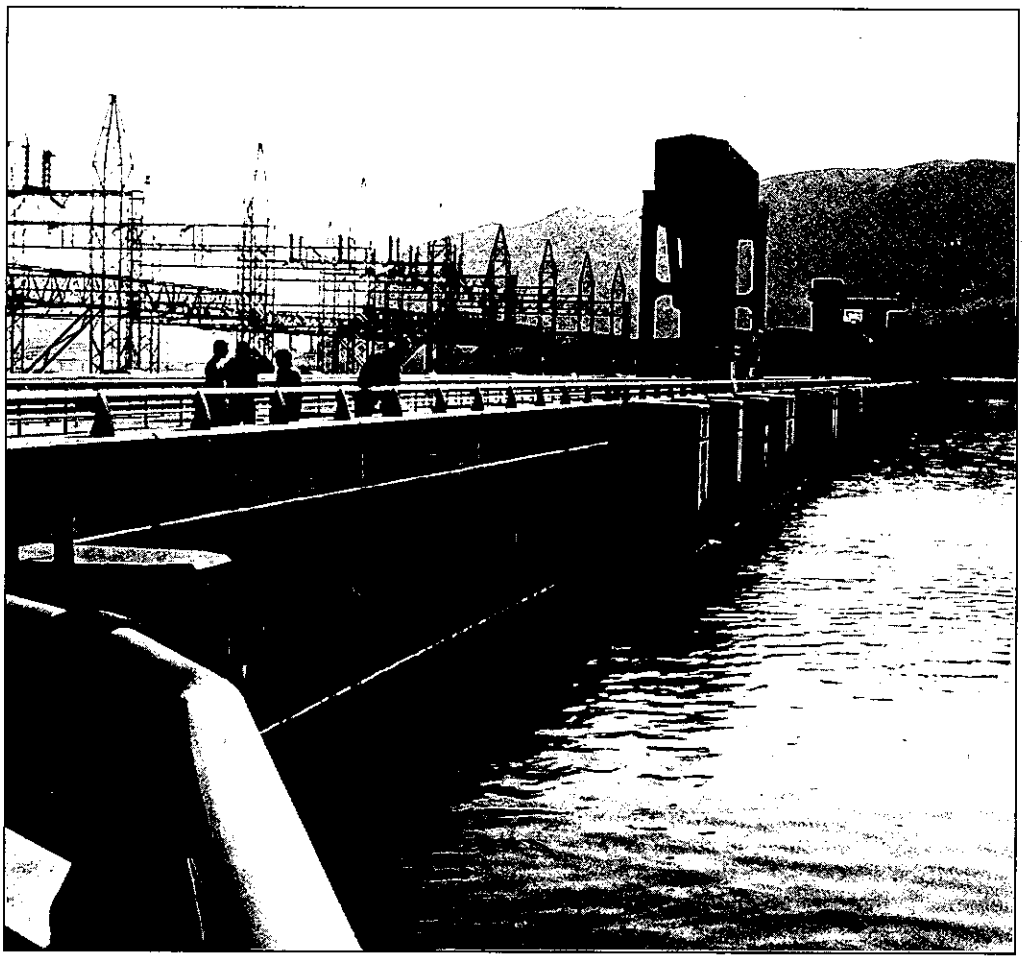
(5) If the Council approves a study plan, it will conduct a two-phased evaluation of the short-haul transportation study. To permit the Phase I evaluation, FERC shall require Grant County PUD to report the smolt survival data from the study to the Council. If, based upon this data, the Council determines that short-haul transportation is likely to be as effective as a collection and bypass system, the PUD may continue to test such transportation methods.

(6) If the Council determines in the Phase I smolt survival evaluation that short-haul transportation would not be as effective as a collection and bypass system, FERC shall require Grant County PUD to complete installation of a collection and bypass system at Priest Rapids Dam within two years from the date of such determination.

(7) If the transportation study continues in place of a bypass system, FERC shall require Grant County PUD to report to the Council the data on returning adults to permit the Phase II evaluation. If, based upon this data, the Council determines that short-haul transportation would be as effective as a collection and bypass system, FERC shall permit the PUD to conduct a short-haul transportation program in place of a collection and bypass system at Priest Rapids Dam.

(8) If the Council determines in its evaluation of the Phase II study that short-haul transportation would not be as effective as a collection and bypass system, FERC shall require Grant County PUD to complete installation of a collection and bypass system at Priest Rapids Dam within two years from the date of such determination.

(9) The fish and wildlife agencies, tribes and Grant County PUD will advise the Council regarding the effectiveness of any short-haul transportation program conducted by Grant County PUD. FERC shall require the PUD to fund this continuing assessment of the program's effectiveness and any necessary documentation.



(10) FERC shall require Douglas, Chelan and Grant County PUDs, in consultation with the fish and wildlife agencies and tribes, to develop plans for spills at their respective projects. These plans shall be developed by March 1 of each year. FERC shall require the PUDs to use their best efforts to provide spills that will achieve smolt survival comparable to that achievable by the best available collection and bypass systems. FERC shall require the PUDs to provide spills of at least 20 percent of the average daily flow at each project for any 30 out of the 60 days when the smolts are present. Such spills may be used during the early nighttime hours for maximum effectiveness and shall be provided for the period from April 15 through June 15 of each year. During the 30 days when smolts are present, a PUD may be allowed to spill less than 20 percent of the average daily flow only if the PUD can demonstrate to the satisfaction of the Council that at least 90 percent smolt survival at a particular project can be achieved with such reduced spills. In the case of Wells, Rocky Reach, Rock Island and Wanapum dams, FERC shall require the operating PUD to implement such plans for spills at each project until a collection and bypass system is in operation. At Priest Rapids Dam, FERC shall require Grant County PUD to implement such plans until a collection and bypass system is in operation, or until the Council has determined that the short-haul transportation program is likely to be as effective as a collection and bypass system.

All mid-Columbia dams

Interim spills

(11) FERC shall require the mid-Columbia PUDs to coordinate and consult with the fish and wildlife agencies and tribes in design of the study, as well as the research, evaluation and all other activities required in Sections 403(a)(1)-(10) to achieve the most effective permanent solutions to juvenile passage problems in the mid-Columbia. At the request of the tribes, fish and wildlife agencies or PUDs, the Council will help resolve any disputes related to achieving the objectives of this plan.

Coordination

(b) Lower Columbia and Snake River Passage

(1) For mainstem projects operated by the Corps of Engineers on the Columbia and Snake rivers (Figure 7), the following provisions shall apply until mechanical bypass systems are installed and operational:

All Corps-operated mainstem projects

(A) By April 1 of each year, the Corps shall develop and implement a systemwide juvenile fish passage plan that: i) reflects agreement with the fish and wildlife agencies and tribes to the fullest extent practicable; ii) results in spill to achieve at least 90 percent smolt survival, exclusive of transportation benefits, for 80 percent of the spring and summer migrants at each project in critical water years; iii) incorporates a sliding scale formula for providing variable levels of additional spill to achieve better than 90 percent smolt survival, exclusive of transportation benefits, for 80 percent of the spring and summer migrants at each project in better than critical water years; and iv) includes estimates of fish passage efficiencies and smolt survival for each project and for the system. The fish and wildlife agencies and tribes will prescribe the method for determining smolt survival at the projects. The Corps shall make in-season spill decisions in consultation with the fish passage managers.

Systemwide juvenile fish passage plan

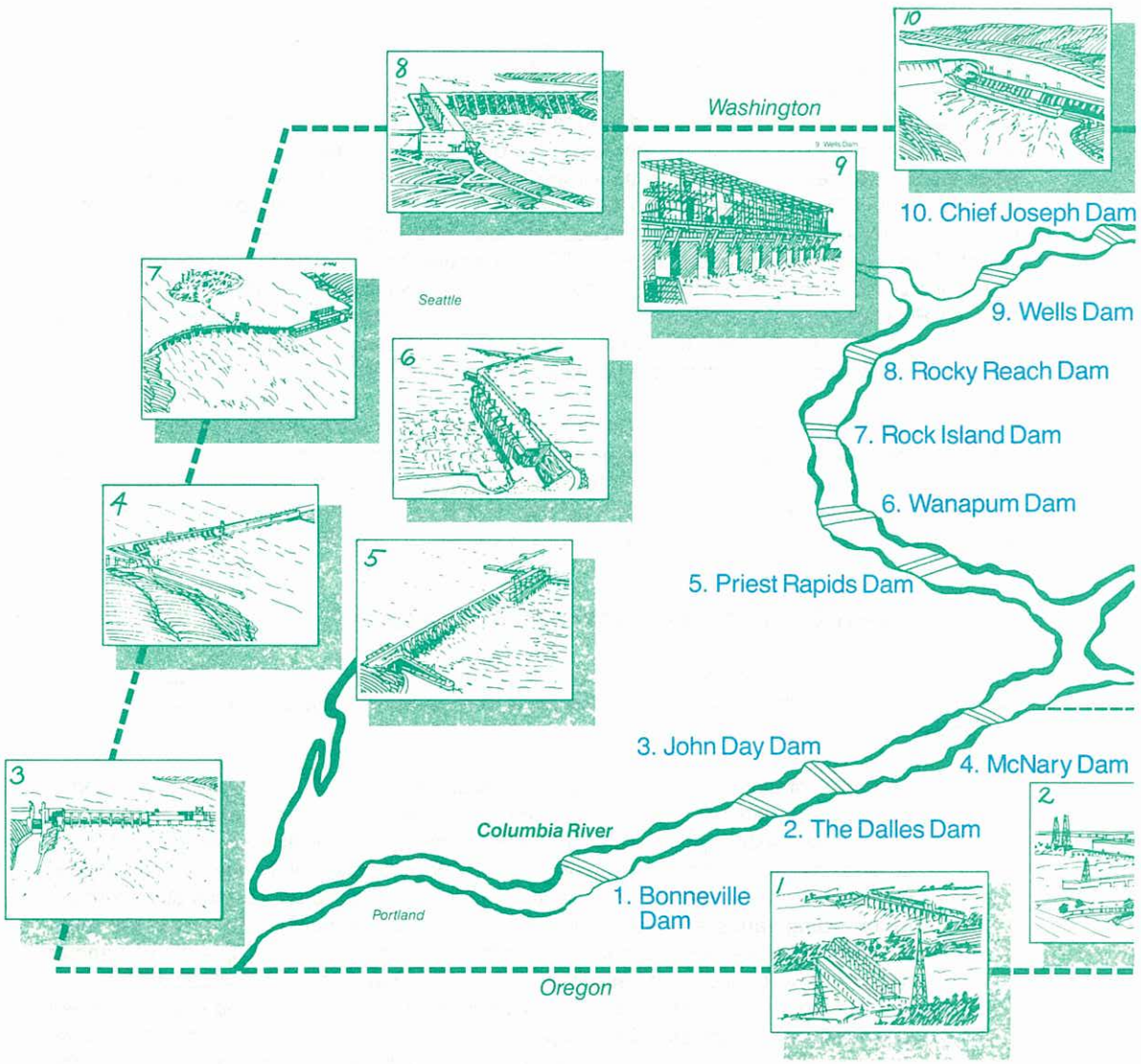
(B) Spill operations shall begin when the first 10 percent of the spring migrants have passed the dam and shall protect 80 percent of the spring migration. Spill shall continue or begin again when the first 10 percent of the summer migrants have passed the dam and shall protect 80 percent of the summer migration. Spill to achieve at least 90 percent smolt survival shall occur regardless of any impact on firm energy. No spill, however, shall be required after August 15 of each year.

Use of spills

(C) Before the juvenile passage season, the fish and wildlife agencies and tribes will develop spill criteria specifying: i) the spring and summer periods that include 80 percent of the typical spring and summer migrations; ii) the typical daily hours of peak fish passage;

Spill criteria

Section 400



1. Bonneville Dam
Location: Bonneville, Oregon, River Mile 146.1. *Operator:* U.S. Army Corps of Engineers.

2. The Dalles Dam
Location: The Dalles, Oregon, River Mile 191.5. *Operator:* U.S. Army Corps of Engineers.

3. John Day Dam
Location: Rufus, Oregon, River Mile 215.6. *Operator:* U.S. Army Corps of Engineers.

4. McNary Dam
Location: Umatilla, Oregon, River Mile 292. *Operator:* U.S. Army Corps of Engineers.

5. Priest Rapids Dam
Location: Near Ephrata, Washington, River Mile 397.1. *Operator:* Grant County Public Utility District (PUD).

6. Wanapum Dam
Location: Near Ephrata, Washington, River Mile 415.8. *Operator:* Grant County Public Utility District (PUD).

7. Rock Island Dam
Location: Wenatchee, Washington, River Mile 453.4. *Operator:* Chelan County Public Utility District (PUD).

8. Rocky Reach Dam
Location: Wenatchee, Washington, River Mile 473.7. *Operator:* Chelan County Public Utility District (PUD).

9. Wells Dam
Location: Azwell, Washington, River Mile 515.1. *Operator:* Douglas County Public Utility District (PUD).

10. Chief Joseph Dam
Location: Bridgeport, Washington, River Mile 545.1. *Operator:* U.S. Army Corps of Engineers.

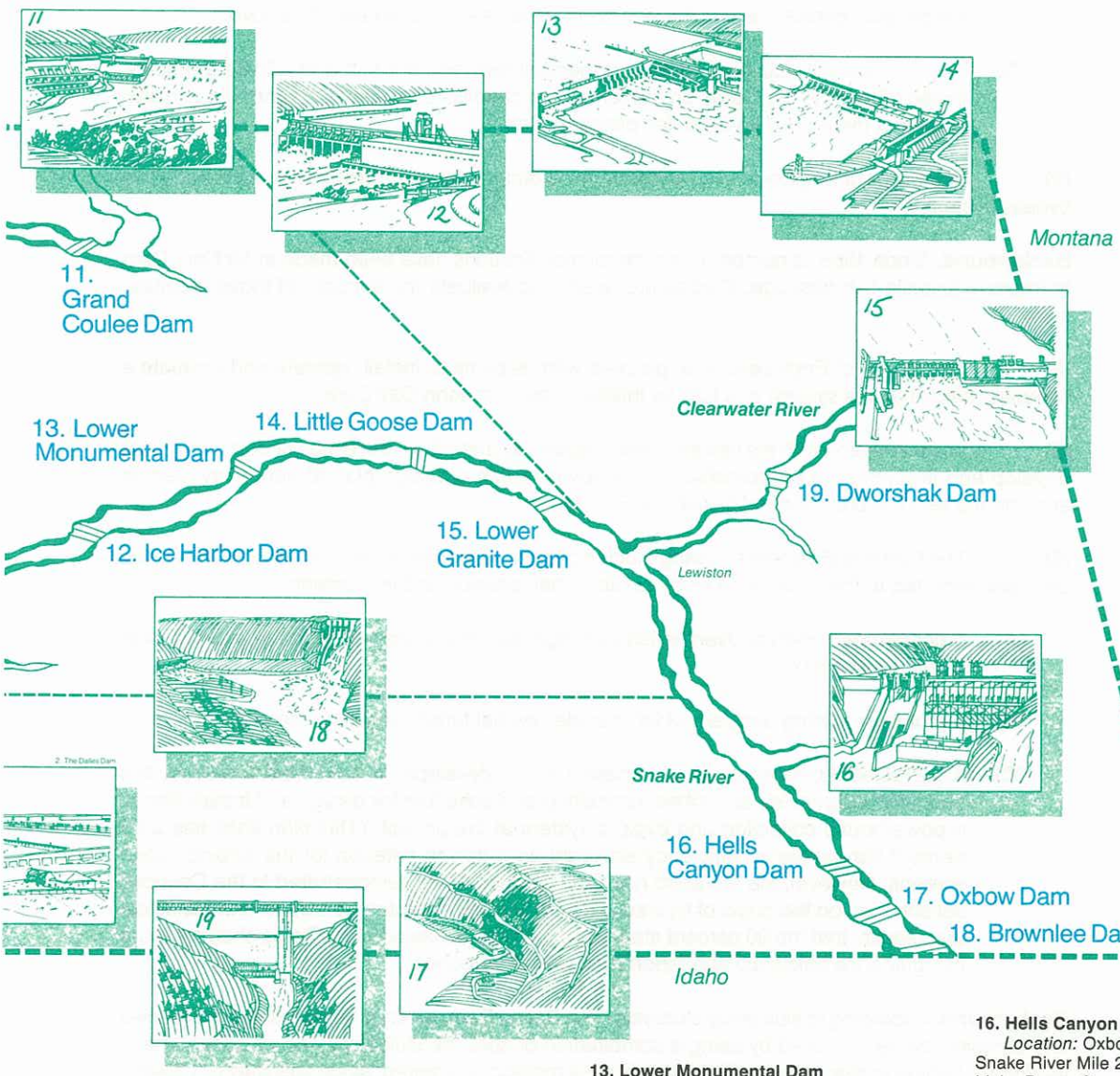


Figure 7.
Major Dams of the Columbia and Snake Rivers

11. Grand Coulee Dam
Location: Grand Coulee, Washington, River Mile 596.6. *Operator:* U.S. Bureau of Reclamation.

12. Ice Harbor Dam
Location: Pasco, Washington, Snake River Mile 9.7 (from confluence with Columbia River). *Operator:* U.S. Army Corps of Engineers.

13. Lower Monumental Dam
Location: Matthaw, Washington, Snake River Mile 41.6. *Operator:* U.S. Army Corps of Engineers.

14. Little Goose Dam
Location: Starbuck, Washington, Snake River Mile 70.3. *Operator:* U.S. Army Corps of Engineers.

15. Lower Granite Dam
Location: Almota, Washington, Snake River Mile 107.5. *Operator:* U.S. Army Corps of Engineers.

16. Hells Canyon Dam
Location: Oxbow, Oregon, Snake River Mile 247. *Operator:* Idaho Power Company (IPC).

17. Oxbow Dam
Location: Oxbow, Oregon, Snake River Mile 273. *Operator:* Idaho Power Company.

18. Brownlee Dam
Location: Cambridge, Idaho, Snake River Mile 285. *Operator:* Idaho Power Company.

19. Dworshak Dam
Location: Ahsahka, Idaho, North Fork–Clearwater River Mile 1.9 (from confluence with the Clearwater River).

and iii) the numbers of fish that will trigger spill operations. These spill criteria will be supported by the best available scientific information and will guide spill operations at the projects consistent with the provisions of subsections (A) and (B) above.

(D) The Council will actively facilitate agreement between the fish and wildlife agencies, Indian tribes and the Corps on the terms and conditions, sliding scale formula and spill criteria of the annual juvenile fish passage plan.

McNary Dam

(2) The Corps of Engineers shall continue its studies at McNary Dam to evaluate the juvenile bypass system.

Background. Since 1968, a number of structural modifications have been made at McNary Dam to improve juvenile fish passage. Studies are needed to evaluate the success of those modifications.

John Day Dam

(3) The Corps of Engineers shall proceed with its plans to install, operate and evaluate a complete smolt bypass system and turbine intake screens at John Day Dam.

(4) In consultation with the fish and wildlife agencies and tribes, the Corps of Engineers shall develop and implement a coordinated interim juvenile fish passage plan at John Day Dam in accordance with the provisions of Section 403(b)(1).

The Dalles Dam

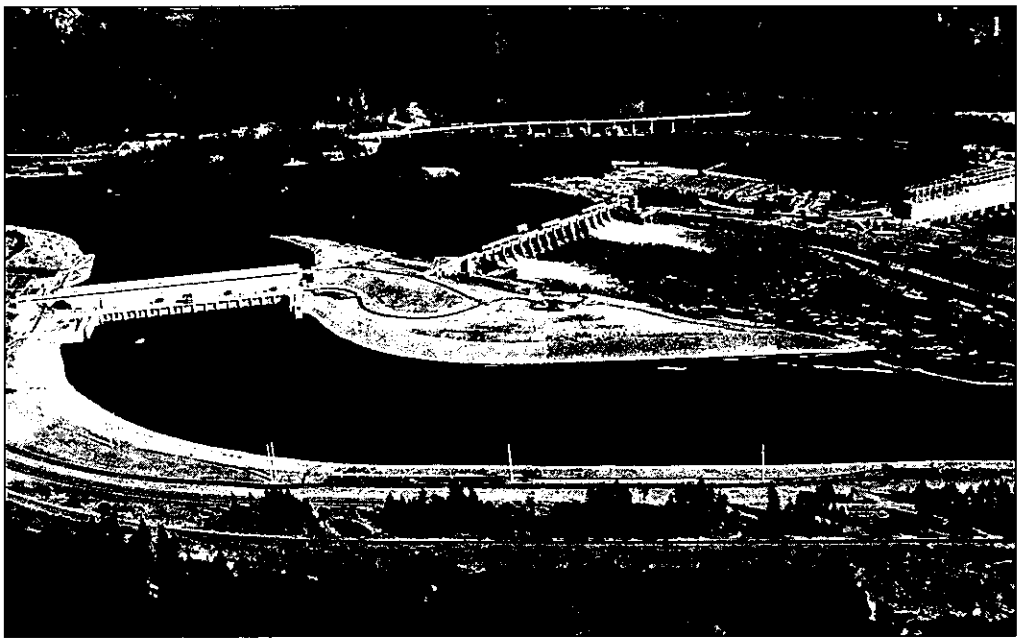
(5) The Corps of Engineers, having studied bypass efficiency of the sluiceway at The Dalles Dam and reported to the Council on study results, shall develop and implement:

(A) A coordinated interim juvenile fish passage plan in accordance with the provisions of Section 403(b)(1).

(B) A prototype testing program which includes partial turbine intake screening.

(C) A coordinated permanent juvenile passage plan developed in consultation with the fish and wildlife agencies and tribes, consisting of a schedule for design and installation of a powerhouse collection and bypass system at the project. (This plan shall use a 90 percent fish guidance efficiency standard as a design criterion for the turbine intake screens. However, the standard need not be used if it is demonstrated to the Council's satisfaction, on the basis of hydraulic model studies or prototype screen and biological test results, that the 90 percent standard cannot be achieved.) The Corps shall measure fish guidance efficiency and report results to the Council.

Background. According to sluiceway studies at The Dalles Dam, juvenile fish passage efficiencies and survival can be improved by using a combination of spill, the sluiceway and, at some time in the future, turbine intake screens. The latter bypass method is required, since spill may not always be available to pass juvenile fish. The reference to a 90 percent fish guidance efficiency criterion in this measure and in Sections 403(b)(9)-(10) is used as a standard for engineering the design of turbine intake screens at each of these projects. The Council will consider developing a performance standard for juvenile fish passage facilities during the next five years. The Corps shall provide equitable treatment for fish and wildlife affected by the development and operation of mainstem hydroelectric projects by cooperatively developing both adult and juvenile fish passage operating criteria. An example of this type of criteria can be found in the Detailed Fishery Operating Plan, an operations manual prepared annually by the fish and wildlife agencies and tribes for mainstem fish passage facilities. These criteria, mentioned here and in other measures, are intended to help coordinate power system and fish passage operations at mainstem hydroelectric projects.



Bonneville Dam

(6) (A) The Corps of Engineers shall complete the installation of turbine intake screens and appropriate bypass systems in the two Bonneville Dam powerhouses and shall carry out studies to evaluate their effectiveness. The Corps shall solve the juvenile fish passage problems at Bonneville's second powerhouse by making appropriate structural and operational modifications to achieve fish passage efficiencies comparable to those achieved at McNary Dam. The Corps shall report to the Council on the feasibility and cost of all alternatives, including forebay excavation. This report shall contain a schedule for timely completion of all needed improvements, developed in consultation with the fish and wildlife agencies and tribes, to minimize impacts on adult and juvenile fish in the vicinity of the second powerhouse.

(B) In consultation with the fish and wildlife agencies and tribes, the Corps shall develop and implement an interim juvenile fish passage plan. That plan shall include sufficient levels of spill and provisions for closure of the second powerhouse when downstream migrants are passing the project, to achieve 85 percent fish passage efficiency, except as needed to: i) provide adequate fish passage conditions as determined by the fish and wildlife agencies and tribes; ii) conduct research designed to correct fish passage problems; or iii) meet firm power demands that cannot be met elsewhere in the regional power system.

Background. The Corps has completed installation of turbine intake screens at the first and second powerhouses at Bonneville Dam. Modifications made in 1983-1984 of the downstream migrant system at the first powerhouse require evaluation. Guidance efficiency for juvenile fish has ranged from 14 to 35 percent (depending on species) at the second powerhouse. This may be due partially to the shallow forebay. The cause of poor juvenile guidance efficiency at the second powerhouse must be determined, and the necessary structural and operational modifications must be made to solve the problem and achieve turbine bypass levels comparable to those at McNary Dam, which is considered the best available mechanical bypass system. Fish guidance efficiencies of more than 85 percent were measured at McNary Dam during the 1982 spring outmigration. Special remedial efforts in the interim are crucial, due to the location of Bonneville Dam. Because Bonneville is the lowest project on the Columbia River, a major portion of hatchery-produced and wild salmon and

steelhead in the Columbia River Basin must pass the dam on their way to the ocean. In short, passage improvements at Bonneville Dam are the keystone for realizing the benefits of all restoration efforts upstream, both at other hydroelectric projects and in areas chosen for off-site enhancement measures.

Lower Granite Dam

(7) The Corps of Engineers shall continue to conduct studies to determine if it is necessary to modify the existing juvenile bypass system at Lower Granite Dam to reduce injuries and mortalities.

Background. Lower Granite Dam is equipped with turbine intake screens and a bypass system for juvenile migrants. Since 1976, a number of studies have been carried out to determine the efficiency of this system and to evaluate structural modifications. Some of these studies are incomplete or require updating to identify deficiencies in passage facilities that may require further modification.

Little Goose Dam

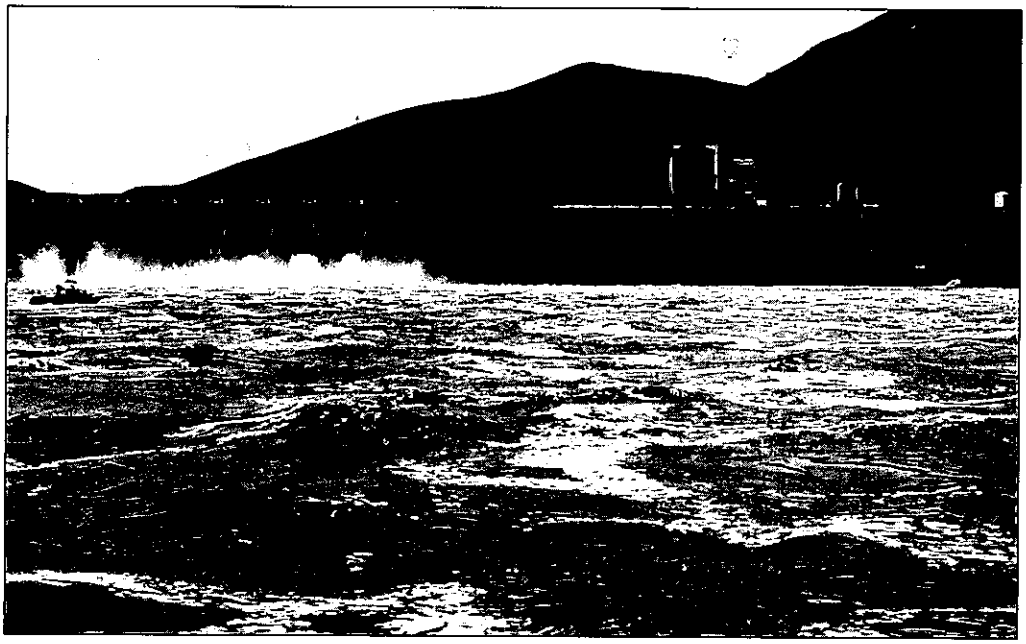
(8) The Corps of Engineers shall continue to conduct studies to determine if it is necessary to modify the existing bypass system at Little Goose Dam to reduce juvenile mortalities.

Background. When Little Goose Dam began operation in 1970, it was equipped with turbine intake screens and a bypass system that proved effective in reducing juvenile injuries and mortalities. Since 1979-1980, however, when the bypass conduit was reconstructed to enlarge the system, juvenile mortality has increased. Studies are needed to determine how to solve this problem.

Lower Monumental Dam

(9) The Corps of Engineers shall develop and implement at Lower Monumental Dam:

(A) A coordinated interim juvenile fish passage plan in accordance with the provisions of Section 403(b)(1).



(B) A coordinated permanent juvenile fish passage plan developed in consultation with the fish and wildlife agencies and tribes, consisting of a schedule for design and installation of a powerhouse collection and bypass system at the project. (This plan shall use a 90 percent fish guidance efficiency standard as a design criterion for the turbine intake screens. However, the standard need not be used if it is demonstrated to the Council's satisfaction, on the basis of hydraulic model studies and prototype screen and biological test results, that the 90 percent standard cannot be achieved.) The Corps shall measure fish guidance efficiency and report results to the Council.

Background. The problems at Lower Monumental Dam are similar to those at Ice Harbor Dam with regard to juvenile migration. [See Section 403(b)(10).] However, at Lower Monumental Dam there is no sluiceway system that can be modified to provide an effective non-turbine passage route. In consultation with the fish and wildlife agencies, the Corps has operated a program to collect and transport juveniles, with the intent of eliminating the need for a full bypass facility. Based on the results of the transportation program to date, the fish and wildlife agencies do not believe it is effective for all species and would prefer to see turbine intake screens installed. The Corps, on the other hand, asserts that more time is needed to evaluate the program. The Council intends to review, evaluate and determine the future of the Corps' transportation program. [See Section 403(b)(12).] Installation of a powerhouse collection and bypass system is necessary to provide adequate protection for the millions of natural and hatchery outmigrants that pass this project each year.

(10) The Corps of Engineers, having evaluated effectiveness of the sluiceway as a fish bypass system at Ice Harbor Dam, shall develop and implement:

Ice Harbor Dam

(A) A coordinated interim juvenile fish passage plan in accordance with the provisions of Section 403(b)(1).

(B) A sluiceway injury and mortality study.

(C) An evaluation of alternative bypass strategies, including prototype testing of turbine intake screens, to supplement sluiceway operation.

(D) A coordinated permanent juvenile passage plan developed in consultation with the fish and wildlife agencies and tribes, consisting of a schedule for design and installation of a powerhouse collection and bypass system at the project. (This plan shall use a 90 percent fish guidance efficiency standard as a design criterion for the turbine intake screens. However, the standard need not be used if it is demonstrated to the Council's satisfaction, on the basis of hydraulic model studies and prototype screen and biological test results, that the 90 percent design criterion cannot be achieved.) The Corps shall measure fish guidance efficiency and report results to the Council.

Background. According to sluiceway studies at Ice Harbor Dam, juvenile fish passage efficiencies and survival can be improved by using a combination of spill, the sluiceway and, at some time in the future, turbine intake screens. The latter bypass method is required because spill may not always be available to protect the millions of wild and hatchery outmigrants that pass this project each year.

(11) The Corps of Engineers shall expand the fish holding facilities at Lower Granite, Little Goose and McNary dams to allow efficient transportation of smolts and holding densities of no more than 5 pounds/gpm. In addition, to reduce further fish injury and stress at Little Goose Dam, the Corps shall provide a gravity feed system for loading fish into trucks.

Lower Granite, Little Goose, McNary dams

Transportation

Background. These three dams are major collection and transportation terminals for juvenile salmon and steelhead. However, less crowded and less stressful holding conditions need to be maintained to improve the survival of fish to be transported.

(12) Transportation

Transportation criteria

(A) The Corps shall transport juvenile salmon and steelhead in accordance with provisions developed by the fish and wildlife agencies and tribes. These provisions will include the criteria and periods for transporting the various species and stocks as well as operating criteria for the related collection and transport facilities. This program is not to begin earlier than April 1 of each year unless agreed to by all parties.

Funding

(B) The Council supports the funding of the barges, equipment, facilities and other expenses necessary to conduct the annual smolt transportation program in accordance with the provisions developed by the fish and wildlife agencies and tribes.

Evaluation

(C) The Corps of Engineers shall conduct studies to evaluate and improve the success of juvenile fish transportation from Lower Granite, Little Goose and McNary dams. The evaluation studies should place particular emphasis on identifying transportation effects on spring (yearling) chinook salmon. These studies shall be designed to yield statistically reliable results and to evaluate the effects of collection point and inriver passage conditions and post-release survival on the benefit ratio of transported and non-transported fish. The study design shall be developed as part of the five-year work plan as specified in Section 206(c).

(c) Tributary Passage

Marmot Dam

(1) FERC shall require Portland General Electric Company (PGE) to continue its studies to determine the effectiveness of the existing juvenile bypass system and screens at Marmot Dam.

Background. Marmot Dam is owned by PGE and is located on the upper Sandy River in Oregon. The project diverts 600 cfs from the Sandy River through Marmot Canal into turbines on the Bull Run hydroelectric project. A study currently is being conducted to determine whether juvenile fish migrating from the upper Sandy River are subject to delay, mortality or diversion into the forebay of the power turbines at Bull Run. The upper Sandy River has a high potential for fish production. A comprehensive evaluation of the existing bypass and screening system is necessary to determine if safe and undelayed passage can be provided.

Sullivan Plant

(2) FERC shall require Portland General Electric (PGE) to conduct studies to evaluate the juvenile bypass system and screening at the Sullivan Plant.

Background. PGE owns and operates a powerhouse, the Sullivan Plant, at Willamette Falls on the Willamette River. The plant diverts 5,000 cfs from the river into the hydroelectric turbines, and, during low flows, most of the water from the river passes through the turbines. PGE has taken several measures to correct existing problems, including shutting down the powerhouse during low flows and installing bypass screening. Further studies are needed to evaluate the effectiveness of these measures.

Foster Dam

(3) The Corps of Engineers shall evaluate existing studies and investigate alternative methods of providing adequate downstream fish passage at Foster Dam.

Background. Foster Dam is a low-head dam on the South Santiam River. When it was constructed, downstream migrants were expected to pass successfully through the turbines or under the spillway gates. Juvenile spring chinook and sockeye have been successful in passing the dam, but native winter steelhead have not. From 1973 to 1981, annual runs of steelhead declined from an estimated 1,900 adults to fewer than 500.

Leaburg Canal

(4) FERC shall require the Eugene Water and Electric Board (EWEB) to construct the best available juvenile bypass facility at its Leaburg Canal power project.

Background. Substantial populations of juvenile salmon and steelhead migrate through the portions of the McKenzie River affected by the Leaburg project. Studies have shown significant mortalities associated with turbine passage. EWEB has agreed to provide a bypass system.

(5) FERC shall require the Eugene Water and Electric Board (EWEB) to conduct studies to determine the best available method of providing a permanent bypass system for juvenile migrants at the Walterville Canal power project. **Walterville Canal**

Background. Walterville Canal is operated by EWEB in conjunction with Leaburg Canal. The problems encountered by juvenile migrants at this project are essentially the same as those at Leaburg. However, studies to determine the best method to alleviate the situation at Walterville have not been completed.

(d) Additional Research

(1) Bonneville shall continue its existing study and shall fund any further studies necessary to investigate juvenile salmon and steelhead losses to predators while the fish are migrating through the Columbia and Snake river reservoirs. The use of Squoxin for control of squawfish shall be evaluated as part of this study. [See Section 206(b)(1)(A): Salmon and Steelhead Research and Evaluation.] Predation

Background. Changes in the natural flows of the Columbia River due to the construction of dams and the impoundment of water have resulted in an increase in resident fish that prey on salmon. Although some research has been done on this problem, further studies are necessary to document the importance of predation as a cause of juvenile mortality.

(2) Bonneville shall fund a study to test and evaluate an alternative conduit system for safely and efficiently conveying juvenile fish from powerhouse intakes to tail water. This study shall test a design with potential for broad application at dams where turbine intake screens are in use or under consideration, taking into account related research at other projects. Alternative conduit system

Background. Injuries to juvenile fish occur in pressurized conduit systems currently used to convey juvenile fish from powerhouse intakes to tail water. New designs, such as open channel flumes, need to be tested and evaluated in order to resolve this problem.

Homing behavior

(3) Bonneville shall fund a study of the homing behavior of fish transported directly from selected fish hatcheries.

Background. Before transportation directly from hatcheries can be adopted as an annual operation to reduce juvenile mortality, the success of homing must be determined. The effects of potentially large numbers of upriver strays on lower-river populations must be assessed adequately. Also, due to the relative success of transporting steelhead as compared to salmon, the evaluation of transportation efforts for steelhead stocks should continue. During lower runoff conditions, particularly in the Snake River Basin, the transportation of steelhead may prove to be the most effective approach for improving smolt survival.

(e) Maintenance Plans

Passage facility maintenance

The federal project operators and regulators shall develop a plan for repair and maintenance of any part of each dam relating to the passage of salmon and steelhead. The plan shall include: 1) measures to be followed in the event that any such facility breaks, is washed out or ceases to operate, and 2) designation of an individual responsible for carrying out the plan. If any dam operator fails to comply with the plan, the Council will ask the person responsible for carrying out the plan to explain at a Council meeting the reasons for the non-compliance. The Council will decide upon appropriate action at that time.

Section 500

SALMON AND STEELHEAD

Harvest Management

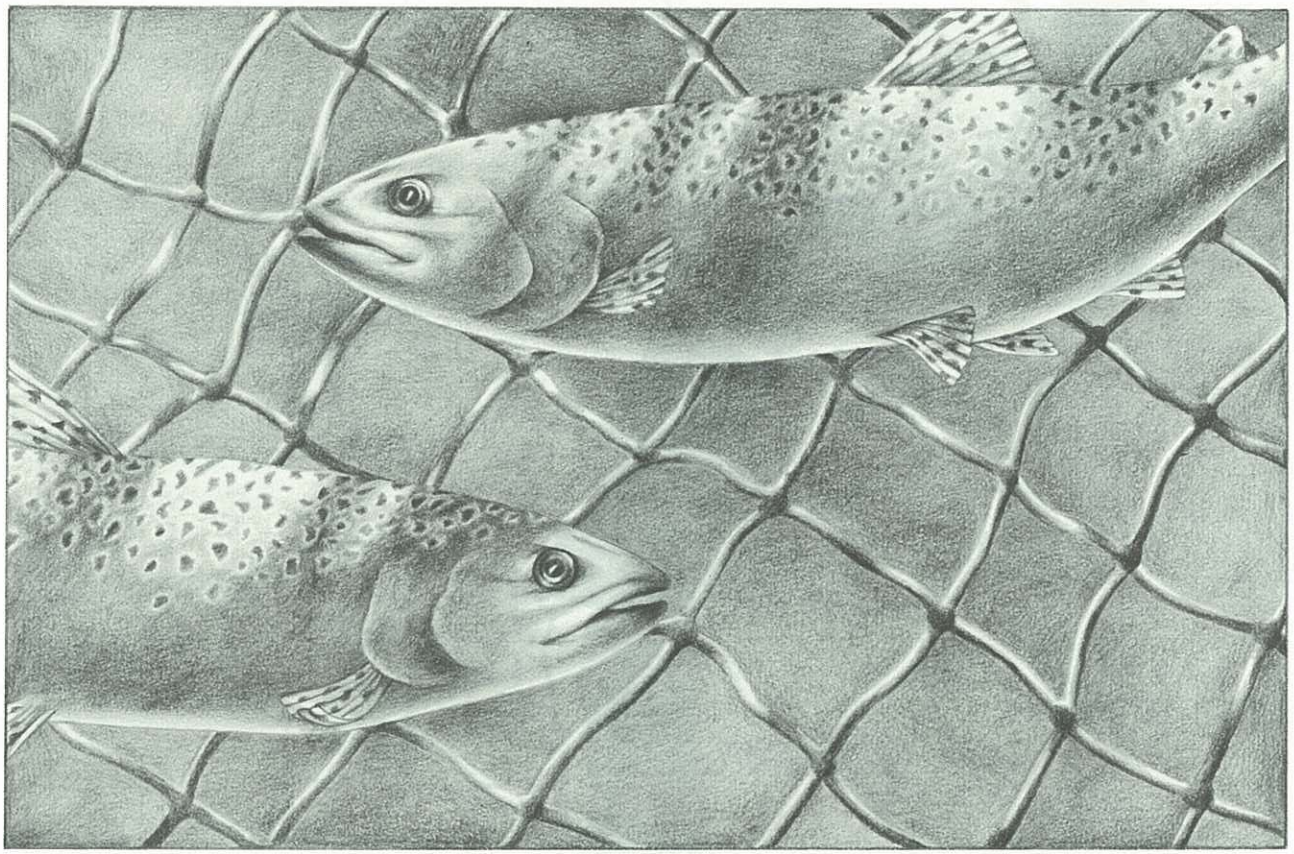


Figure 8. *Harvest Management Jurisdictions*

501. The Problem

Overharvest of natural stocks

The commercial, recreational and tribal fisheries in the ocean and mainstem Columbia River are mixed-stock fisheries. This means they harvest a mixture of hatchery-produced and naturally produced stocks from numerous areas of origin. Because of their high juvenile survival rates, hatchery-produced fish generally can withstand a higher harvest rate than naturally produced fish. Those who fish mixed-stock fisheries are generally unable to harvest specific stocks selectively. Thus, naturally produced stocks are often harvested at rates appropriate for hatchery-produced fish, resulting in overfishing of the naturally produced stocks. In the Columbia River Basin, the problem associated with mixed-stock fisheries results at least in part from operation of hatcheries constructed to mitigate the effects of hydroelectric development. This problem cannot be resolved without implementing a hatchery and natural propagation program that is coordinated and consistent with harvest management.

Harvest of the Columbia River Basin's fish in mixed-stock ocean fisheries occurs primarily off the coasts of Alaska, British Columbia, Washington, Oregon and California. Since World War II, there has been a significant increase in the number and effectiveness of commercial, ocean-going trolling vessels and, more recently, in the number of ocean-going recreational vessels (both private and charter).

Harvest regulation

Ocean harvest in U.S. waters is regulated by the coastal states out to three miles from shore. The Pacific Fishery Management Council (along the Washington, Oregon and California coasts) and the North Pacific Fishery Management Council (along the Alaskan coast) regulate the federal fishery conservation zone located from 3 to 200 miles off the coast. [See Figure 8.] These entities were established under the Fishery Conservation and Management Act of 1976. A primary objective of that law was to establish a regional basis for managing all fisheries within 200 miles of the U.S. coastline. Although this management structure improved the control over harvest, the fish still migrate through numerous political jurisdictions, all of which find reducing the mixed-stock fishing effort difficult.

This makes enhancement of naturally spawning stocks essential in order to prevent their decline. At the same time, the effectiveness of enhancement efforts can be diminished if increases in hatchery-produced and naturally produced fish are not considered in harvest management. If the Council's program results in improved fish runs, fishing may increase. That increase could result in additional harvest of naturally produced stocks due to the mixed-stock fishery.

502. The Remedy

The Council recognizes that an excessive mixed-stock ocean and mainstem Columbia River fishery could reduce the effectiveness of program measures designed to restore naturally produced stocks. While the Council looks to fisheries managers to ensure adequate levels of escapement (returning adults) to increase those stocks, the Council also recognizes that it must work together with harvest managers to resolve problems.

Restricting harvests

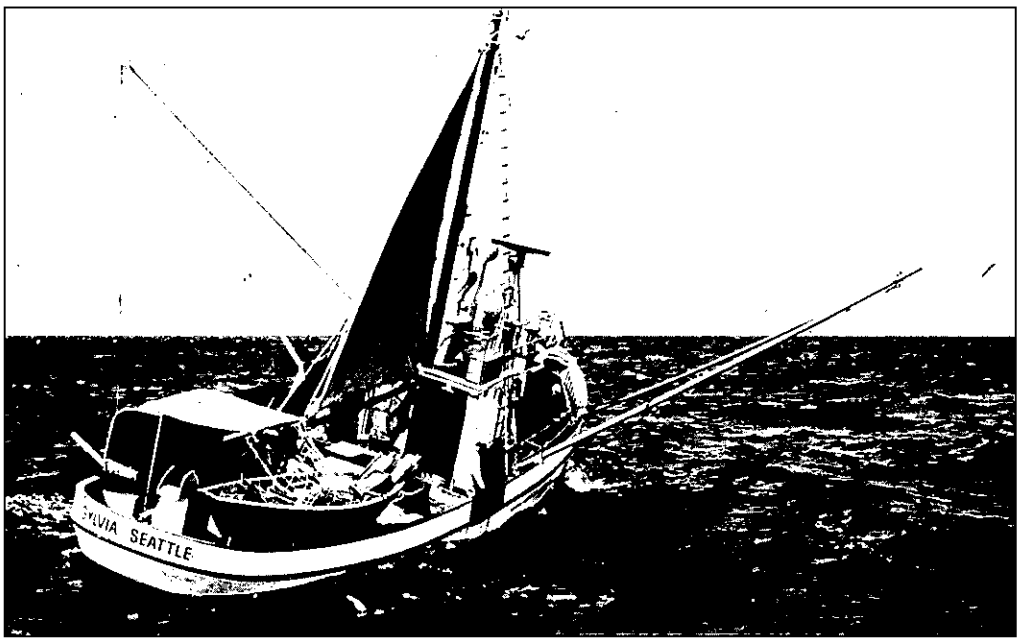
In part, to address concerns about the mixed-stock fishery, Alaska, British Columbia and Washington have programs to reduce the number of fishing vessel licenses available. Although Oregon and California currently have a moratorium on new licenses, they have not initiated a license reduction program. Ocean harvest regulations off Washington and Oregon have been more restrictive in recent years in an effort to reduce harvest rates of naturally produced stocks in the mixed-stock fisheries.

Section 500

U.S.-Canada Pacific Salmon Treaty

An important development since the program was first adopted was the signing in 1985 of the United States-Canada Pacific Salmon Treaty, a long-sought agreement on salmon allocation and conservation for the two countries' intercepting fisheries. The treaty has two major goals: to encourage fish production while discouraging overfishing and to balance each country's harvestable returns against its investment in restoring the fishery. In addition, since ratification of that treaty, the state fish and wildlife agencies and Indian tribes in the Columbia River Basin have made substantial progress in addressing inriver harvest and production issues.

The Council has developed program measures that call for consultation and coordination with ocean harvest management entities; an electrophoresis testing demonstration program to help determine which stocks contribute to which ocean fishery areas; research to improve stock identification; known-stock fishery demonstration programs; and research on how oceanographic factors in the Columbia River plume affect salmon. The fish and wildlife program also includes funding for specific projects, on the condition that they do not contribute to inadequately controlled fisheries.



503. Measures

(a) Consultation and Coordination

Coordination

(1) To ensure that harvest management is consistent with the objectives of the fish and wildlife program, the Council will consult on a regular basis with the Pacific Fishery Management Council; the North Pacific Fishery Management Council; state harvest management agencies responsible for management of Columbia River stocks, including the Alaska Department of Fish and Game and the California Department of Fish and Game; tribes; and the Pacific Salmon Commission, created by the United States-Canada Pacific Salmon Treaty. The consultations will determine whether:

(A) Annual management plans, including those developed pursuant to the Magnuson Fishery Conservation and Management Act of 1976, specify harvest regulations for ocean and inriver fisheries that will achieve the escapement objectives for upriver stocks;

(B) Regulation of tributary fisheries for trout adequately protects rearing and migrating juvenile wild salmon and steelhead; and

(C) Management and enhancement plans adopted pursuant to the Salmon and Steelhead Conservation and Enhancement Act of 1980 are consistent with the production goals of this program.

(2) To assist the Council in evaluating and commenting on whether ocean and inriver harvest management controls are adequate, the management entities listed above will report annually to the Council on the following:

(A) The extent to which escapement objectives were achieved during the previous year's harvest season; and

(B) The extent to which proposed regulations for the coming season are expected to achieve escapement objectives identified by the Council.

(b) Known-Stock Fisheries

(1) Electrophoresis Demonstration Program

Stock profiles

The Council supports in-season management of mixed-stock fisheries using electrophoresis to profile the contribution of the different upriver stocks. Bonneville shall share funding with the fishery management agencies of a five-year program that demonstrates the effectiveness of this technique in profiling the ocean fisheries more accurately and in refining harvest regulations to protect Columbia River stocks. At the conclusion of the five-year program, the fishery management agencies will propose a plan for further action.

Background. The electrophoretic technique is a product of recent scientific research and allows biologists to identify within 48 hours the specific stocks being caught. Using this technique, fishery managers can better understand the time and area distribution of different stocks within the ocean fishery and adjust regulations to protect upriver stocks.

(2) Stock Identification

Bonneville shall fund research to improve stock identification methods where these are in accord with the research and monitoring needs identified by the Council's system monitoring and evaluation program. [See Section 206(e): Salmon and Steelhead Research and Evaluation.]

Background. The need for known-stock fisheries is based on the principle that maximum harvest of abundant stocks results in overharvest of weaker stocks in mixed-stock fisheries. This dilemma can be reduced through accurate and timely knowledge of the composition of the catch in ocean and river mixed-stock fisheries. This knowledge would allow adjustment of fishing regulations as appropriate to protect weaker stocks. Although electrophoresis is the state-of-the-art technique for this purpose, continued research could develop new procedures to provide fishery managers with improved stock identification techniques.

(3) Known-Stock Fishery Demonstration Programs

Bonneville shall fund known-stock fishery demonstration programs where these programs are consistent with the system plan and policies adopted by the Council.

Background. The development of known-stock fisheries may allow the fish and wildlife program's goals to be achieved in a more timely and cost-effective manner. Programs using new and existing techniques to demonstrate the effectiveness of known-stock fisheries are in the ratepayers' interest.

(c) Funding

Salmon and Steelhead Conservation and Enhancement Act

(1) If the Council determines that adequate controls have been imposed on ocean and river harvest of salmon and steelhead stocks, it will support development of an agreement with Bonneville and other appropriate entities for funding and administering measures to help accomplish objectives common to the Northwest Power Act and the Salmon and Steelhead Conservation and Enhancement Act of 1980.

Background. The Northwest Power Act and the Salmon and Steelhead Conservation Act were adopted 17 days apart and have many similar objectives. Section 4(h)(8)(C) of the Northwest Power Act provides a basis for coordinated funding and administration of measures addressing the common objectives of both acts. That section states that, to the extent the Council's program provides for coordination of its measures with additional measures designed to deal with fish losses (including losses caused by non-hydroelectric activities), those additional measures are to be implemented through agreements on administration and funding among the appropriate parties.

Hatchery production

(2) In Section 700, the Council has authorized design and construction of a hatchery for enhancement in the Yakima Basin and elsewhere. The Council will decide which stocks may be produced at the hatchery, depending on the status of harvest controls. The facility will be designed pursuant to Section 703(f)(3): Wild, Natural and Artificial Propagation.

Background. Certain upriver salmon and steelhead stocks do not contribute significantly to ocean fisheries. Others contribute substantially to fisheries off the coasts of Alaska, British Columbia, Washington, Oregon and California. The hatchery will be designed so that fish produced do not contribute to inadequately controlled fisheries.

(3) To the extent practical, the Council supports enhancement activities geared towards stocks that contribute to adequately controlled fisheries. This policy is intended to protect ratepayers from investing in major capital construction facilities that contribute to uncontrolled fisheries.

(4) The Council does not take a position on funding for the construction of any other hatcheries or the operation and maintenance of existing hatcheries currently funded by the state or federal government. This program will not include such funding unless adequate controls are imposed on the ocean and river harvest of salmon and steelhead.

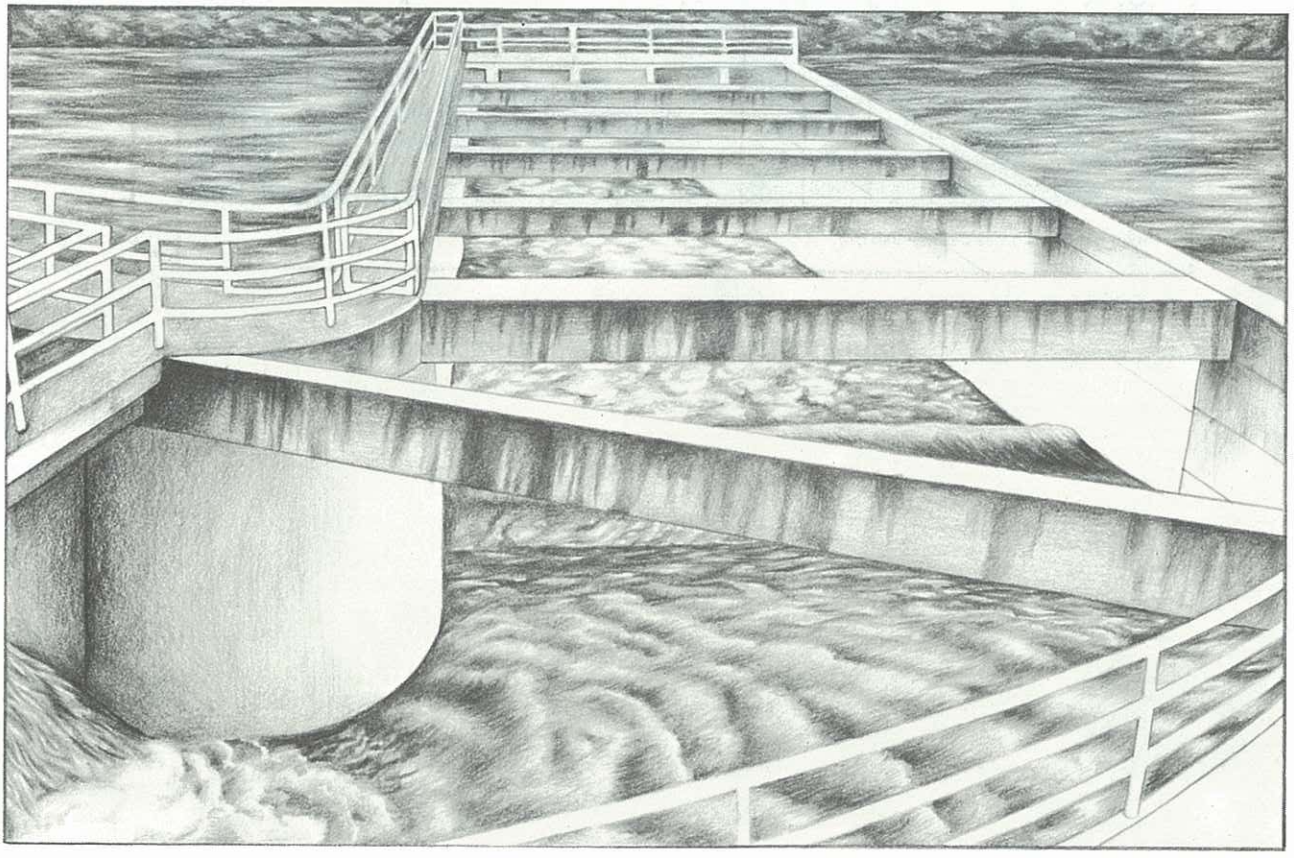
(d) Ocean Plume Research

Bonneville shall fund research on the influence of oceanographic factors (temperature, salinity, currents, upwelling) in the nearshore Columbia River plume area on the distribution, survival and growth of Columbia River juvenile salmon. Proposals will be in response to research and monitoring needs identified by the Council's system monitoring and evaluation program. [See Section 206(e): Salmon and Steelhead Research and Evaluation.]

Background. Early ocean growth and survival play a vital role in the ultimate abundance of adult Columbia River salmon and steelhead. Small changes in survival during the first two to three months in the nearshore ocean environment can result in large differences in adult abundance. The Columbia River plume, the freshwater extrusion from the mouth of the Columbia, is a major element of the nearshore ocean environment. Changes in river flows to meet hydroelectric needs can influence the character of the plume and thereby the distribution and growth of juvenile salmon. This could affect the design and results of the monitoring and evaluation program.

SALMON AND STEELHEAD

Upstream Migration



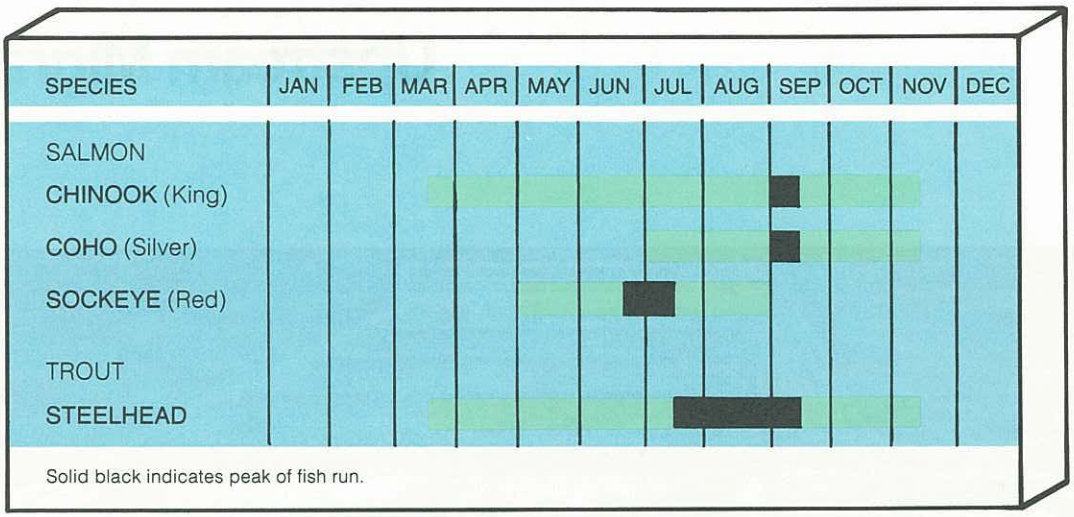


Figure 9. *Timing of Upstream Migration at Bonneville Dam*

601. The Problem

Hydroelectric projects present a physical barrier to adult salmon and steelhead migrating from the ocean to spawning areas upstream. [See Figure 9 for timing of upstream migration of various species.] To solve this problem, "fishways" (fish passage facilities) have been constructed at many of the dams in the Columbia River Basin. Water flows and spills also have been adopted to provide unimpeded passage and maximum attraction of the fish to the fishways.

Fishway attraction

However, not all of these measures have been successful. For example, flow and spill conditions at the base of some of the mainstem Columbia and Snake river dams tend to discourage fish movement in the river or to mask the flows that attract fish to the fishway. In addition, inadequacies in certain fishway facilities and in the operation and maintenance of these facilities reduce the success of adult fish passage at both mainstem and tributary dams. These inadequacies include failure to provide the necessary flows at fishway entrances; ineffective fish ladders; mechanical failures of pumps that supply fishway auxiliary water; and lack of fish counting facilities to permit effective management of adult runs.

Losses of returning adult salmon and steelhead at each dam due to upstream migration problems can be heavy. Reducing these mortalities could increase significantly the number of adults available for spawning and harvest.

Returning adult losses

602. The Remedy

The Council has adopted a number of measures to improve adult migrant survival. For cases in which studies on flow and spill are called for, program measures specify dates by which the studies must be completed. The Council also calls on the Corps of Engineers to implement operating criteria for fishways at its projects and to correct problems created by unreliable pumps. Tributary projects to improve adult fish passage also have been approved. In addition, the fish and wildlife agencies and tribes pointed out that some disease problems among migrating salmon and steelhead may be caused or intensified because of their concentration at fish ladders. The Council agrees that these problems warrant further research and calls for research on fish disease at passage facilities.

Adult survival

The Council also expects that the fish and wildlife agencies and tribes will carry out their fish and wildlife enforcement responsibilities to ensure that returning adult salmon and steelhead are not taken illegally. The Council will consult with fish and wildlife agencies and tribes to explore other techniques to improve upstream migration.

603. Measures

(a) Flow and Spill Criteria

(1) The mid-Columbia public utility districts (PUDs), as required by the Federal Energy Regulatory Commission (FERC), and the Corps of Engineers shall continue to conduct existing studies and, if necessary, shall initiate new studies to determine the effects of reduced and instantaneous flows on adult fish migrants and fisheries.

All Columbia River and Snake River dams

Background. Further research is needed to determine optimum flows for upstream migration and for the related fisheries. Knowledge gained from these studies will be important in assessing the effects of peaking operations at hydroelectric projects.

Flows

Section 600

Spill guidelines

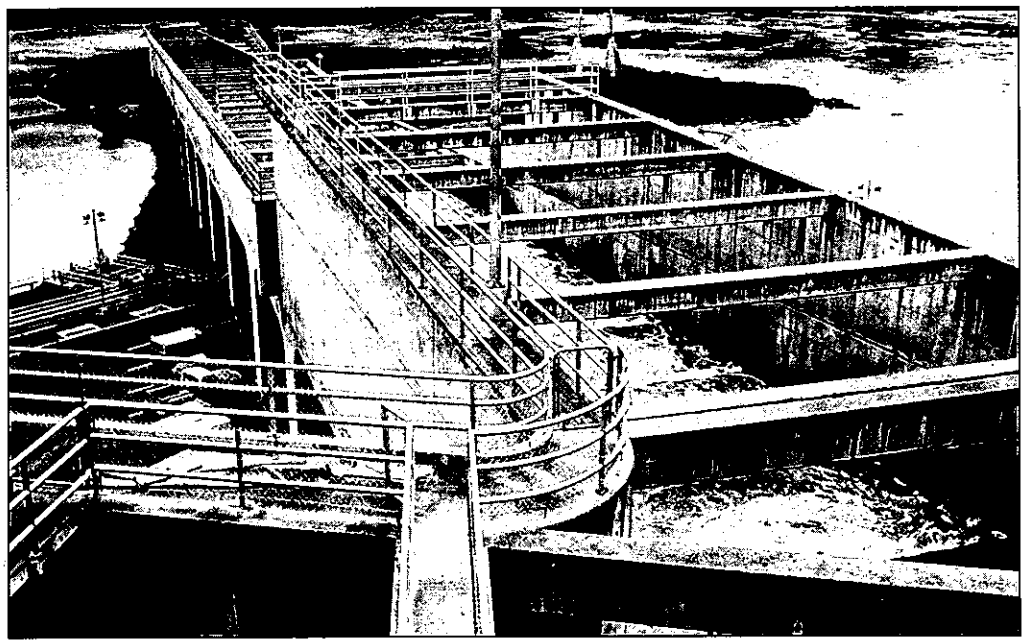
(2) The mid-Columbia PUDs, as required by FERC, and the Corps of Engineers shall continue existing studies and, if necessary, shall initiate new studies to develop new spill configuration guidelines for improving adult fish passage at all Columbia and Snake river hydroelectric projects. They also shall report on the progress between the fish and wildlife agencies and tribes toward agreement on guidelines. Until the Council approves new spill configuration guidelines, existing guidelines shall remain in effect.

Background. Based on detailed studies, spill configuration guidelines have been adopted at all Corps of Engineers projects in the Columbia River system. For the most part these guidelines have proven effective in protecting adult migrants. However, since the guidelines were established, major changes have been made in some of the Corps projects, including expansion of powerhouses and conversion of base load generation to peaking generation. Spill configuration guidelines need to be re-evaluated at these facilities. No detailed studies have been made on the effects of spill configuration on adult passage at the five mid-Columbia PUD dams. Such studies are needed to collect information from which the best spill plans can be determined.

Fishways evaluation

(3) Bonneville shall fund evaluation studies at all projects with expanded powerhouses to determine the effectiveness of entrance flows at new fishways.

Background. Flows at fishway entrances need to be studied to determine if the designed operations are effective under actual operating conditions. Past studies at other dams on the Columbia and Snake rivers, such as The Dalles and Ice Harbor dams, have indicated that flows not incorporated into the original design were more effective in attracting migrants to fishway entrances.



Green Peter Dam

(4) The Corps of Engineers shall conduct studies to determine the effect of fluctuating flows at Green Peter Dam on the maintenance of steelhead runs in the South and Middle Santiam rivers. The studies shall include:

(A) An evaluation of the effect of maximum and minimum flows or combinations of flows on adult steelhead movement;

(B) Monitoring of steelhead movement in Green Peter and Foster reservoirs to determine whether delays in migration are occurring in the reservoirs; and

(C) An assessment of spawning and rearing areas above Green Peter Reservoir to determine if alterations that affect spawning and rearing have occurred.

Background. Since the completion of the Green Peter Dam/Foster Dam complex on the South and Middle Santiam rivers in 1969, the number of native winter steelhead has decreased in the upper South Fork and Middle Fork of the Santiam River. In 1979 and 1980, no adults returned to the Green Peter Dam adult trap, and in 1981, only 13 adults returned. Research is necessary to determine solutions for the decreasing runs in the Middle Santiam River.

(b) Operation and Maintenance of Adult Fishways

Corps of Engineers and mid-Columbia projects

(1) The Corps of Engineers shall implement existing fishway operating criteria for all Corps projects on the Columbia River. FERC shall require Grant, Chelan and Douglas County PUDs to continue to implement fishway operating criteria for optimum fish passage for the mid-Columbia projects under their control. If necessary, the PUDs shall revise the criteria in consultation with the fish and wildlife agencies and tribes.

Fishway operating criteria

Background. Criteria for optimum fish passage largely have been completed for Corps of Engineers dams on the Columbia and Snake rivers and for the five mid-Columbia PUD dams to improve upstream migration.

Fishway pump problems

(2) The Corps shall provide a permanent solution to the problem of unreliable pump gearboxes that supply auxiliary water for fishways. Efforts of the Corps to solve those problems shall be continued, but if those efforts are unsatisfactory, the pumps shall be replaced promptly.

Background. Turbine pump gearboxes at a number of Corps dams have been unreliable in the past due to mechanical failures associated with bearings and shafts. This equipment is required for providing sufficient water at fishways.

(c) Adult Passage Improvements at Tributary Projects

Willamette Falls

(1) Bonneville and the Portland General Electric Company (PGE) as required by FERC shall jointly install, operate and maintain an adult trapping facility in the Willamette Falls fishway. Funding for the facility shall be in the same proportion as the original ratio of federal-to-PGE funding of the adult fishway.

Background. The fishway at Willamette Falls provides entrance to the upper Willamette Basin for fish destined for upriver areas. Currently up to 50 percent of the annual spring chinook counted at Willamette Falls cannot be accounted for at upstream locations. The ability to trap adult fish will permit the collection of biological data for improved management. It is estimated that an effective adult trap will provide increases of almost 10 percent in adults returning to the upper Willamette River.

Clackamas River dams

(2) The fish and wildlife agencies and Portland General Electric Company (PGE) shall work cooperatively to investigate and resolve adult fish passage problems associated with PGE's Clackamas River hydroelectric dams.

Background. The fish and wildlife agencies maintain that the fishways located at the three PGE dams on the Clackamas River have not been effective, and adult fish are delayed in moving upstream. PGE maintains that the delay of adult fish is not due to the ineffectiveness of its fish ladders, but is caused by the Oregon Department of Fish and Wildlife's smolt release program. Summer steelhead smolts that normally would be released above PGE's North Fork project are released into the North Fork ladder to keep the fish from being caught by trout fishermen. Spring chinook smolts are released at the Clackamas hatchery immediately below River Mill Dam.

(d) Additional Areas of Investigation

Mid-Columbia fish counting

(1) FERC shall require each mid-Columbia PUD to evaluate adult fish counts at mid-Columbia PUD dams so that it can be determined if losses are occurring between the dams.

Background. Counting and tagging studies have shown that losses occur between certain Corps of Engineers dams. Similar studies are needed for mid-Columbia dams to provide information on possible losses.

Disease studies

(2) Bonneville shall fund studies to investigate diseases that occur at fish passage facilities.

Background. A number of diseases that affect adult fish have been associated with fish ladders and attraction facilities at existing dams. Studies are needed to document the extent to which these disease problems cause losses of fish.

Fish accounting procedures

(3) Bonneville shall fund a study of accounting procedures for anadromous fish as they migrate upstream past Columbia and Snake river dams. The purpose of this study will be to determine which stocks of salmon and steelhead are experiencing significant undocumented losses.

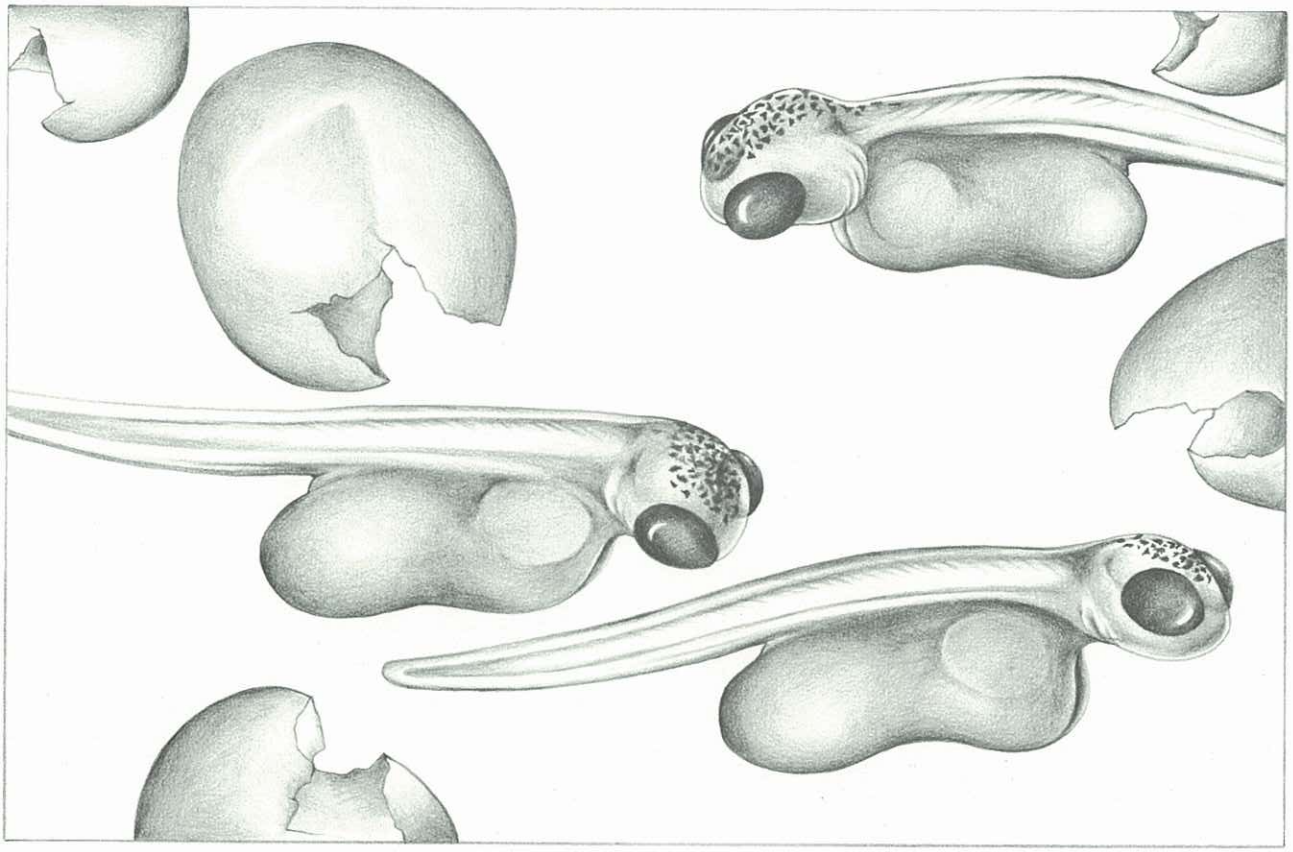
(e) Maintenance Plans

The federal project operators and regulators shall develop a plan for repair and maintenance of any part of each dam relating to the passage of salmon and steelhead. The plan shall include: 1) measures to be followed in the event that any such facility breaks, is washed out or ceases to operate, and 2) designation of an individual responsible for carrying out the plan. If any dam operator fails to comply with the plan, the Council will ask the person responsible for carrying out the plan to explain at a Council meeting the reasons for the non-compliance. The Council will decide upon appropriate action at that time.

Section 700

SALMON AND STEELHEAD

Wild, Natural and Artificial Propagation



701. The Problem

Hydroelectric development has eliminated much of the natural spawning and rearing habitat in the Columbia River system. Reservoirs created by dams have inundated nearly all of the mainstem Columbia spawning habitat. Although the Hanford Reach of the Columbia River and the Hells Canyon area of the Snake River remain free-flowing, fluctuations in water levels caused by power peaking operations hinder the use of those areas for spawning. Fortunately, the Columbia River Basin has a number of tributary streams with good spawning and rearing habitat. Many of those streams can be brought to their full propagation potential through habitat improvement. Other streams offer good habitat but currently are underused by fish, primarily because passage problems block or inhibit fish from reaching those areas.

Lost spawning habitat

Hatcheries produce large numbers of fish. However, important questions remain concerning selection of stocks, control of disease, quality of smolts, genetics, integration of hatchery propagation with natural propagation, and the timing and locations for releasing hatchery-produced smolts.

Hatchery production

Because hatcheries play a crucial role in restoring the Columbia River Basin fisheries, additional research is needed to improve hatchery propagation. Even if measures to increase levels of natural propagation are extraordinarily successful, releases of selected hatchery-reared stocks will still be needed to improve salmon and steelhead runs. Hatchery propagation objectives must be integrated fully with natural propagation objectives.

Integration

Finally, if the Council's fish propagation objectives are to be implemented successfully, they must be coordinated with harvest management. Until salmon and steelhead harvest management moves further in the direction of known-stock harvest practices, rather than a mixed-stock harvest, the Council's efforts to rebuild the basin's naturally spawning stocks and to maintain existing wild stocks will be less effective than they could be.

Coordination with harvest management

702. The Remedy

The Council supports a three-part approach to producing more salmon and steelhead through a combination of: 1) natural production, 2) hatchery production, and 3) supplementation of wild and natural fish production by releasing hatchery fish into natural habitats for rearing. To advance this threefold effort, the Council has adopted measures to provide water flows and temperatures suitable for natural and wild propagation; improve habitat and tributary passage; increase knowledge of appropriate timing and sites for release of hatchery fish; improve existing artificial propagation facilities; and build some new hatcheries, mostly as outplanting facilities.

Three-part production approach

Maintaining the delicate balance between naturally produced and hatchery-produced fish will require a systematic approach to propagation, as described in Section 200: Salmon and Steelhead Framework. The measures in Section 700 reflect the Council's commitment to a systemwide approach that coordinates production, harvest regulation and passage improvements. [See Figure 3.]

Some measures call for new hatchery and outplanting facilities in the Umatilla and Yakima areas and in northeast Oregon, as well as acclimation ponds at John Day Dam. To ensure that new hatcheries are integrated with wild and natural production, and that other potential problems with hatchery production are addressed, the Council calls for the development and approval of master plans before those facilities are built. The fish and wildlife program also promotes testing low-cost, small-scale production facilities for salmon and steelhead in the Columbia River Basin and specifically identifies the Nez Perce Reservation as the site for such facilities.

Hatchery master plans

The Council also has endorsed habitat and tributary passage improvements as a means to improve spawning habitat. Those projects will be developed in conjunction with the systemwide planning effort described in Section 205: System Planning.

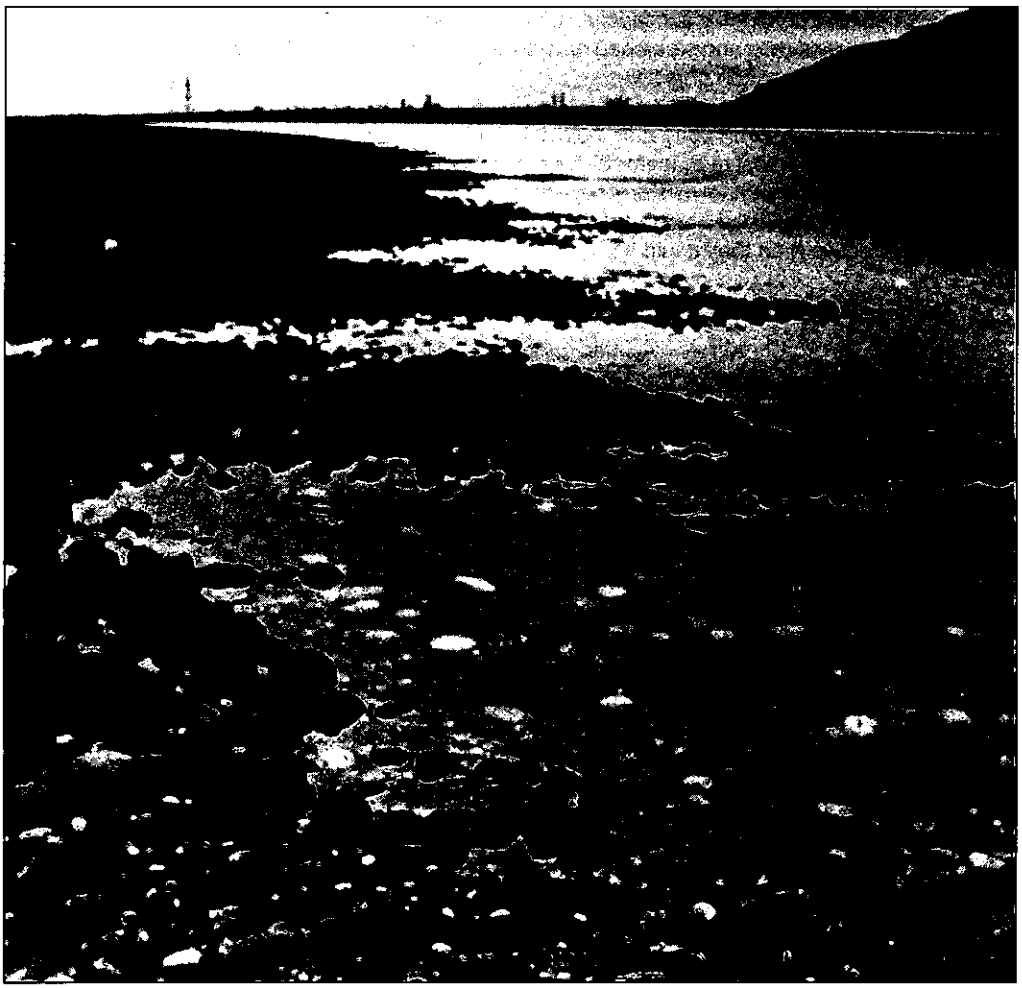
703. Measures

(a) Suitable Flows

Vernita Bar

(1) In accordance with the mid-Columbia FERC settlement agreement of March 20, 1980, and the Vernita Bar settlement agreement approved by FERC on August 21, 1984, FERC shall require Grant County Public Utility District (PUD), in cooperation with all involved parties, to monitor and test suitable flows to protect spawning, incubation and emergence of fall chinook salmon on Vernita Bar below Priest Rapids Dam. Results shall be reported to the Council and to FERC.

(2) Based on the results of the required studies, the fish and wildlife agencies, tribes and Grant County PUD, with the assistance of the Council and in consultation with the Washington Department of Ecology, will develop a flow plan to protect natural propagation of fall chinook salmon on Vernita Bar in the Hanford Reach.



(3) Upon approval by FERC and the Council, the flow plan developed in Section 703(a)(2) will be incorporated in the FERC license for Priest Rapids Dam and in the fish and wildlife program.

(4) Grant County PUD and the fish and wildlife agencies and tribes will evaluate the effectiveness of the improved flows and report the results of this evaluation to the Council and to FERC.

Background. The Vernita Bar section of the Columbia River immediately below Priest Rapids Dam in the Hanford Reach is extremely valuable to natural production of fall chinook salmon. Significant declines in production have occurred since the 1970s. The fish and wildlife agencies have shown that increasing flows above the present 36,000 cubic feet per second minimum flow level would provide increased spawning habitat.

Below Hells Canyon Dam

(5) In consultation with the fish and wildlife agencies and tribes, Bonneville shall fund studies to investigate the effect of establishing improved flows for fisheries production below Hells Canyon Dam, including a minimum flow for the spawning, incubation and rearing of salmon and steelhead and limits on river level fluctuations. These studies also shall include estimates of power losses associated with improved flows.

Background. The last remaining free-flowing stretch of the mid-Snake River is below Hells Canyon Dam. The fish and wildlife agencies and tribes believe that this stretch could be improved for fall chinook salmon and steelhead spawning by establishing minimum flows and limits on river level fluctuations.

Willamette Basin projects

(6) In consultation with the fish and wildlife agencies, the Bureau of Reclamation and the Corps of Engineers shall continue studies to establish flow guidelines for the spawning, incubation and rearing of salmon and steelhead in the Willamette Basin. The Corps shall report the results of these studies to the Council annually.

(7) Based on the results of the required studies, the fish and wildlife agencies and the Corps shall propose to the Council flow guidelines to be incorporated into the operation of dams in the Willamette Basin.

(8) Upon approval by the Council of flow guidelines for federal hydropower projects in the Willamette Basin, the federal project operators and regulators shall operate their projects in accordance with those guidelines. In the meantime, they shall meet the established minimum flows.

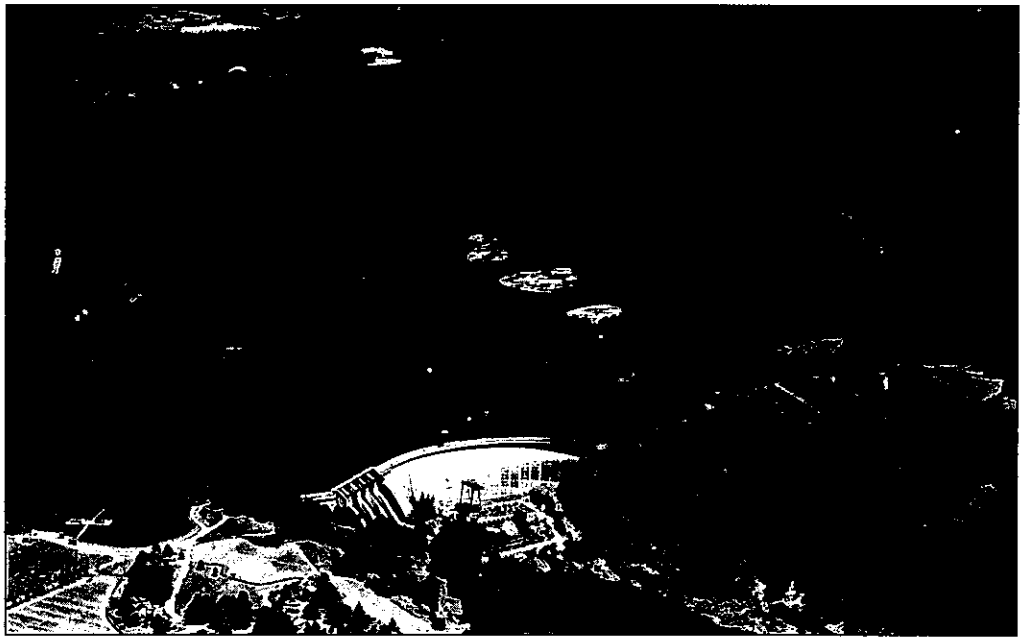
Background. Over the past several years, the Corps has coordinated most reservoir operations in the Willamette Basin with state and federal fish and wildlife agencies. The Corps has, for the most part, accepted those agencies' proposals for flow guidelines, but maintains that certain agency proposals are unacceptable because they require more storage than is available. The Corps also asserts that there are conflicting flows in the proposed guidelines and that studies are necessary to determine the effects on the entire Willamette system. The purpose of the study period is to resolve these differences.

Mayfield Dam

(9) FERC shall require Tacoma City Light to continue to implement the flows provided in the *"Flow Regulation Schedule for Mayfield Power Plant"* dated November 16, 1977. In addition, FERC shall continue to require Tacoma City Light to provide minimum flows for downstream migration below Mayfield Dam in accordance with the existing FERC license for this project.

Background. In 1977, a formal agreement was reached among the Washington Department of Fisheries, the Washington Department of Game and Tacoma City Light that provides flows to

Section 700



improve anadromous fish production below Mayfield Dam. Tacoma City Light is implementing the flow agreement. The Washington Department of Fisheries and the Washington Department of Game have requested that the agreement be included in the FERC license. This is pending.

Merwin Dam

(10) FERC shall require Pacific Power and Light Company to develop a flow plan in consultation with the fish and wildlife agencies and tribes and the Washington Department of Ecology for the spawning, incubation and rearing of salmon and steelhead below Merwin Dam on the north fork of the Lewis River. Upon approval by the Council and FERC, the flow plan will become a part of this program.

Background. Pacific Power and Light, the Washington Department of Fisheries and the Washington Department of Game are developing a flow plan for the lower Lewis River below Merwin Dam. The Council will review this plan when it becomes available.

McKenzie River

(11) Upon approval by the Council, FERC shall require the Eugene Water and Electric Board (EWEB) to fund a study of the lower McKenzie River to determine the flows required for the spawning, incubation and rearing of salmon and steelhead.

Background. The McKenzie River is the most important producer of spring chinook salmon in the Willamette Basin. The EWEB hydroelectric facilities at Leaburg and Walterville divert water from the mainstem river. The overall river flow is not affected by this non-consumptive use of water, but two sections of the river, between the intakes and the return canals, receive significantly reduced flows during certain periods. Studies by the fish and wildlife agencies indicate that greater flows are required to maintain natural propagation of anadromous fish.

Pelton and Round Butte dams

(12) FERC shall continue to require Portland General Electric Company to provide minimum flows at Pelton and Round Butte dams on the Deschutes River in accordance with the existing FERC license for these projects.

(13) FERC shall continue to require Pacific Power and Light Company to provide minimum flows at Powerdale Dam in accordance with the existing FERC license for this project. **Powerdale Dam**

(14) Upon approval by the Council, the federal project operators and regulators shall study the feasibility of improving flows for fish throughout the Columbia River Basin. These studies shall explore: Improving flows

(A) Modification of existing federal project requirements for flood control;

(B) Feasibility of constructing new reservoirs for additional storage capability, specifically the proposed Galloway Dam and Reservoir on the Weiser River in Idaho; and

(C) Feasibility of using uncontracted water stored in existing reservoirs.

Background. The use of water stored in new reservoirs has the potential for alleviating flow problems. Such additional water might be provided by the projects under study in the Yakima River Basin and by the proposed Galloway Dam and Reservoir on the Weiser River in Idaho. However, a number of issues must be considered before such an action can be taken. Among these are conflicting demands for storage water for anadromous and resident fish, costs, irrigation, flood control, recreation, power and navigation.

(15) The Bureau of Reclamation shall use the 6,000 acre-feet of storage in McKay Reservoir, which is not contracted on a long-term basis, to enhance Umatilla River flows for anadromous fish in cooperation with the fish and wildlife agencies and tribes. **McKay Reservoir**

(16) If new reservoirs are constructed for additional storage, the federal project operators and regulators shall propose dedicating a specific portion of storage necessary for the achievement of flows to protect, mitigate and enhance fish and wildlife.

(17) Bonneville shall provide power or reimbursement for operation and maintenance costs associated with provision of power to Bureau of Reclamation pumping plants designed to exchange Columbia River water for Umatilla River water. The Bureau of Reclamation must obtain consent from all affected water users and regulators and provide assurance to the Council that water exchanged to augment streamflows will be used to meet annual flow objectives established by the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Reservation of Oregon. The Oregon Water Resources Department will certify annually to the Council that the exchanged water will improve instream flows and will benefit fish. The Bureau of Reclamation shall fund state fish and wildlife agency and tribal monitoring and evaluation studies to determine the biological effectiveness of this measure. **Umatilla River**

(18) The Council supports the investigations by the Bureau of Reclamation to determine the feasibility of storage projects in the headwaters of the John Day and Umatilla basins for restoration and improvement of anadromous fish habitat. The Bureau shall provide the Council with reports on these projects.

(b) Temperature Control

(1) The Corps of Engineers shall continue to investigate the feasibility of installing devices to control the temperature of the water discharged from Detroit Dam. The Corps shall report study progress to the Council annually and shall make recommendations to the Council at the conclusion of the study. **Detroit Dam**

Background. Studies conducted by the fish and wildlife agencies and tribes indicate that delays occur in adult migration in the north fork of the Santiam River below Detroit Dam due to the low temperatures of the water released from the dam.

Cougar and Blue River dams

(2) The Corps shall continue to investigate the feasibility of installing devices to control the temperature of water discharged from Cougar and Blue River dams. The Corps shall report study progress to the Council annually and shall make recommendations to the Council at the conclusion of the study.

Background. Data on stream temperatures reveal that the operation of the Cougar and Blue River dams lowers the spring and summer water temperatures of the south fork of the McKenzie River, the Blue River and the mainstem McKenzie River near Vida. The lower water temperatures in the spring can affect natural propagation of anadromous fish.

(c) Habitat Improvement and Passage Restoration

Habitat and passage improvements

(1) Bonneville shall fund habitat and tributary passage projects as provided in action item 4.2. Upon Council approval of system plans provided for in Section 205: System Planning, Bonneville shall fund habitat and passage restoration or improvement measures in those plans, including those measures identified in the plans that are listed in Appendix A Table: Planning Inventory of Enhancement Projects.

Condit Dam

(2) FERC shall require Pacific Power and Light Company (PP&L) to design and construct facilities immediately to allow upstream and downstream migration of anadromous fish at Condit Dam. FERC shall require PP&L to assume full responsibility for annual operation and maintenance costs of these facilities.

Background. Condit Dam once had a fish ladder, but the ladder was washed out. Therefore, no passage to the upper White Salmon River currently exists for adult migrants. If fish passage were provided, 30 to 40 miles of spawning habitat would become available above Condit Dam. FERC ordered PP&L to study the feasibility of providing fish passage past the dam. This study, completed in September 1982, determined that passage is feasible.

Lower Clearwater habitat

(3) Bonneville shall fund an evaluation of the lower mainstem Clearwater River to study existing habitat and temperature regimes for spawning, incubation and rearing for salmon and steelhead. Proposals for outplanting from the Nez Perce low-capital propagation facilities (Section 703(g)(2)) will be based on the evaluation. The Nez Perce tribe shall consult with the Corps of Engineers concerning the effects of Dworshak Dam operations on the lower mainstem Clearwater River.

(d) Release Sites for Hatchery-Reared Fish

Reprogramming plan

(1) The Council will review a comprehensive plan developed by the fish and wildlife agencies and tribes for reprogramming lower river hatcheries. Where current knowledge is sufficient, certain stocks may be moved to particular upriver streams. Initial efforts shall focus on the needs of upriver stocks. The fish and wildlife agencies and the tribes will cooperate in this effort.

(2) After Council review of the reprogramming plan developed by the fish and wildlife agencies and Indian tribes, Bonneville shall provide funds to transfer a portion of the fish from existing lower Columbia River hatcheries to release sites in the upper Columbia River system to assist in restoring naturally spawning stocks, as provided in that plan.

Background. The Mitchell Act and John Day hatcheries were provided to mitigate fishery losses because of the federal development of the Columbia River Basin for hydropower and other purposes (such as irrigation and navigation) for which these projects were authorized. Reprogramming hatchery operations by developing new release strategies is intended to help rebuild upriver

runs and improve tribal fisheries. The Council strongly supports restoration of naturally spawning upriver stocks, but further consultation with the fish and wildlife agencies and tribes is required to determine a final release plan.

(e) Improved Propagation at Existing Facilities

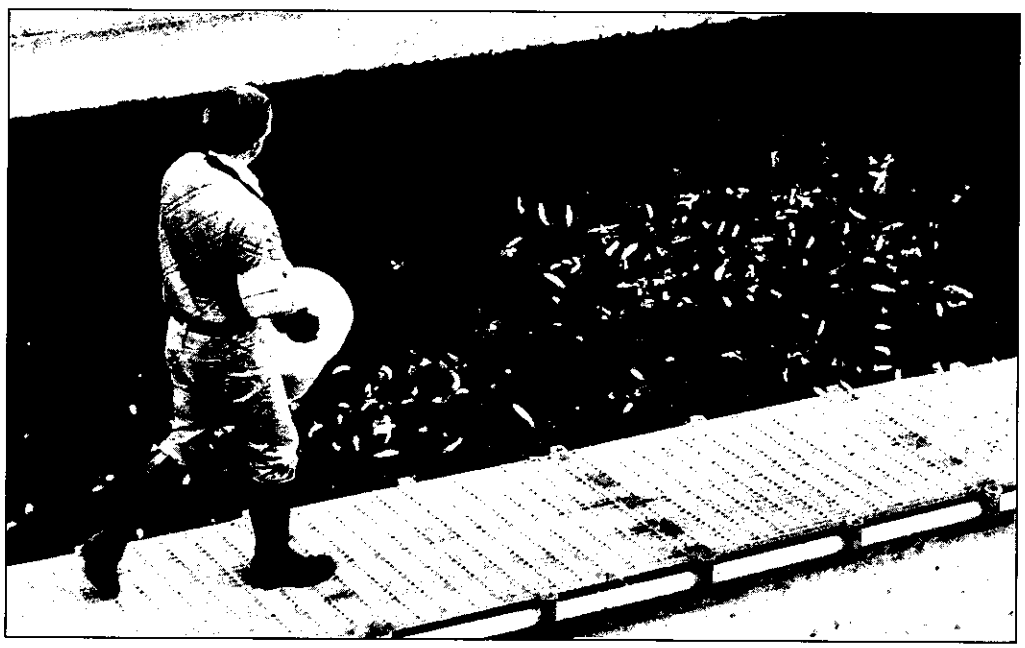
Improving hatchery production

(1) Bonneville shall fund research, development and demonstration of improved husbandry practices at hatcheries that will lead to increased production and improved fish survival to adulthood. Bonneville also shall fund tests of new techniques at Columbia River Basin artificial propagation facilities.

Background. Numerous biological and environmental factors are known to affect the quality of juvenile fish released from hatcheries. The term "husbandry" refers to the proper control of these factors. In the hatchery, the factors affecting juveniles include nutrition, rearing density, water temperature, physiological state of smoltification, dissolved oxygen and nitrogen, and type of rearing pond or raceway. For returning adults, size, location and time of release are primary factors affecting their migratory patterns.

(2) Bonneville shall fund research, development and testing of hatchery rearing operations and release strategies aimed at improving the efficiency of hatcheries and increasing the survival of artificially propagated fish to adulthood. This research, development and testing shall incorporate effective husbandry practices from Section 703(e)(1).

Background. The traditional spring outmigration period for most wild juvenile salmon and steelhead in the Columbia River Basin is in April and May. Historically, hatchery release strategies emulated wild fish outmigration in terms of the timing and size of juvenile fish released from hatcheries. But environmental conditions in the river and estuary have changed markedly due to hydroelectric development. New rearing strategies are required to match the release time of hatchery salmon and steelhead to the changed conditions of the river and estuary. Downstream migrations must be programmed to coincide with the most favorable conditions of food availability, predator abundance, river and ocean temperatures, flows and other influencing factors.



Section 700

Maintaining genetic diversity

(3) Upon approval by the Council, Bonneville shall fund an assessment of Columbia River Basin spawning stocks to ensure their proper use so that genetic integrity is maintained. Proposals for further action will be submitted to the Council on completion of the stock assessment. The assessment shall include an evaluation of all stocks in terms of the following characteristics:

(A) Species, strain or stock;

(B) Time of runs;

(C) Disease status and tolerance;

(D) Stock size and ability to reproduce;

(E) Migration characteristics;

(F) Survival and fecundity of the stock;

(G) Age composition and sizes of the various life stages;

(H) Current rearing and release methods;

(I) Anatomical and biochemical traits; and

(J) Genetic variability.

Background. Conservation of unique genetic stocks is fundamental to the vigor, resiliency and survival of a species. The results of the stock assessment studies should be helpful in developing guidelines for gene conservation, as anticipated in Section 200: Salmon and Steelhead Framework and Sections 703(d), 703(e)(1), 703(f) and 703(g).

Fish health protection

(4) Bonneville shall fund development of programs and methods to improve fish health protection in hatchery facilities. The development and related research of methods shall include:

(A) Prevention of the introduction of diseases into the Columbia River Basin;

(B) Prevention of the spread of detected fish pathogens;

(C) Improvement of breeding and rearing practices;

(D) Minimization of the impact of fish diseases on wild and cultured stocks; and

(E) Improvement in detection, diagnosis and control of fish diseases and parasites.

Background. Due to the high density of fish in hatcheries, rearing ponds and transportation systems, infectious diseases and parasites are a major concern. Sensitive, accurate and rapid diagnosis would help operators detect the presence of a disease and permit timely treatment.

Smolt survival index

(5) Upon approval by the Council, Bonneville shall provide funds to develop a sensitive, reliable index for predicting smolt quality and readiness to migrate. The index shall be validated by conducting a test using a selected species and selected hatcheries. Proposals for further action may be submitted to the Council upon completion of the test.

Background. A number of complex changes occur in salmon and steelhead that allow them to convert from freshwater residents to saltwater residents. Several biochemical, physiological, morphological and behavioral processes are involved. A greater understanding of these processes is required to improve smolt survival after their release from hatchery facilities.

(f) Construction of Major Production Facilities

Umatilla Reservation

(1) Bonneville shall fund the Confederated Tribes of the Umatilla Reservation of Oregon to operate and maintain the Bonifer and Minthorn juvenile release and adult collection and holding facilities on the reservation. Bonneville also shall fund the construction of a facility to produce approximately 160,000 pounds of summer steelhead and chinook salmon smolts for release in the Umatilla juvenile release and adult collection and holding facilities and for outplanting in the upper Umatilla River to enhance natural and hatchery production.

(A) Prior to construction of this facility, the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Reservation of Oregon will develop a facility master plan for Council approval. The master plan will include for each species:

(i) Rearing schedule and release sites and schedules;

(ii) A detailed production profile that includes the brood stock source, numbers of fish to be released, and the expected annual adult returns;

(iii) A description of related harvest plans;

(iv) Proposed management policies and hatchery practices to ensure that hatchery releases protect genetic integrity of native stocks, are disease-free, and are coordinated with other fish and wildlife agencies and tribes in the Columbia River Basin;

(v) A proposal for biological monitoring and evaluation studies to assess the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner and to assess the effects of the outplanting on resident fish populations; and

(vi) Evidence of coordination with system planning described in Section 205: System Planning.

(B) Upon approval of the master plan by the Council, Bonneville shall fund construction, operation and maintenance of the facility and the monitoring and evaluation activities designated in the master plan. Before making annual budget requests for operation and maintenance, the facility manager will develop a status report on the previous year's operations. The status report will include a production plan for the coming year and an analysis showing how the plan is consistent with salmon and steelhead management activities throughout the basin.

Background. The fish and wildlife agencies and tribes have constructed and are operating acclimation ponds on the Umatilla Reservation. Smolts would be transported to these ponds from hatchery facilities for imprinting before release into the upper Umatilla River. Returning adults would provide an improved fishery for the Umatilla tribes and other fishermen.

Acclimation ponds

(2) (A) The fish and wildlife agencies and tribes will develop jointly a plan for designing, constructing and evaluating temporary acclimation ponds. The primary purpose of the temporary acclimation ponds will be to assess the effectiveness of using acclimation ponds to improve survival of fish released in upriver habitat. If suitable release sites are not identified above McNary Dam, then sites in the John Day Pool should be considered. The plan will provide the following:

(i) A proposal for temporary acclimation sites;

(ii) Design elements that are necessary to test the effectiveness of the concept of acclimation ponds. The plan may include different technologies in different locations;

(iii) Brood stock and release guidelines for the proposed facilities to ensure that releases: a) do not adversely affect the genetic integrity of stocks potentially affected by the hatchery releases; b) are compatible with the fish naturally inhabiting the release locations; c) are disease-free; and d) are coordinated with other management and enhancement activities in the basin;

(iv) Monitoring and evaluation studies to assess the effectiveness of the facilities, including a comparison of the survival of juveniles released without benefit of acclimation with those benefiting from acclimation; and

(v) Cost estimates and a schedule for design, construction and evaluation.

(B) Upon approval by the Council of the acclimation pond plan, Bonneville shall fund design, construction and evaluation of the temporary facilities.

(C) Upon approval by the Council, Bonneville shall fund the design, construction, operation and maintenance of permanent John Day acclimation ponds. These ponds will be used to imprint fall chinook.

Background. In an effort to restore the level of adult bright fall chinook returns that were lost due to construction of John Day Dam, the Bonneville and Spring Creek fish hatcheries were expanded. Smolts from the hatcheries are released above John Day Dam. To achieve maximum smolt survival, it is believed to be necessary to hold the fish to relieve stress caused by transportation and to imprint the smolts. Council approval of permanent facilities will be based on the demonstrated effectiveness of the temporary facilities.

Yakima outplanting project

(3) Bonneville shall fund design, construction, operation and maintenance of a hatchery to enhance the fishery for the Yakima Indian Nation as well as other harvesters. [See also Section 803(d)(1): Yakima River Basin.] The hatchery will be a central outplanting facility, used to raise juvenile fish for release in the Yakima Basin and elsewhere in the Columbia River Basin. The purpose of the hatchery will be to supplement natural runs. Nothing in this measure is intended to imply that this will be the only outplanting facility for the Yakima Basin or the Columbia River Basin.

(A) Prior to design of the central outplanting facility, the Council will fund the development of a master plan for the facility. During development of the plan, the fish and wildlife agencies and tribes will be consulted. The plan will provide the following:

(i) Release sites in the Yakima Basin and elsewhere in the Columbia River Basin that will benefit from hatchery supplementation.

(ii) A detailed production profile that includes the number of fish to be released annually and expected annual adult returns, consistent with the system policies established by the Council under Section 204: System Policies for Doubling Runs.

(iii) A conceptual design of the facility that includes all elements to make it suitable for outplanting, such as satellite acclimation ponds, adult traps or transportation facilities.

(iv) Proposed management policies and procedures to ensure that hatchery releases: a) protect genetic integrity of stocks potentially affected by the hatchery releases; b) are compatible with fish naturally inhabiting the release locations; c) are disease-free; and d) are coordinated with the activities of other fish and wildlife agencies and tribes in the Columbia River Basin.

(v) An evaluation of the Outlet Creek site to verify its suitability as the central outplanting facility and to determine whether further studies of the site are necessary. The evaluation shall include recommendations for using the site as efficiently as possible.

(vi) A proposal for biological monitoring and evaluation studies, to be funded by Bonneville, to assess the effectiveness of the hatchery in meeting its biological objectives.

(vii) Preliminary cost estimates for the hatchery.

(B) Upon approval by the Council of the master plan, Bonneville shall fund the detailed design, engineering and construction of the hatchery and associated facilities.

(C) Bonneville shall fund management of operation and maintenance of the hatchery. Before making annual budget requests for operation and maintenance, the hatchery manager will develop a status report on the previous year's operations. The status report will include a production plan for the coming year and an analysis showing how the plan is consistent with salmon and steelhead management activities throughout the basin.

(D) Bonneville shall fund biological monitoring and evaluation studies identified in the master plan. The results of the studies will be used to improve management at the Yakima central outplanting facility and at similar facilities elsewhere in the basin.

Background. Much is still unknown about the impact of hatchery-produced fish on wild populations. [See Sections 206(b)(1)(D): Salmon and Steelhead Research and Evaluation and 703(h).] The design and management of this hatchery will allow fish and wildlife agencies and tribes to learn more about these impacts and to identify the best methods for carrying out hatchery production and supplementation of natural production. The Outlet Creek site, because of its water supply and available acreage, was identified by the U.S. Fish and Wildlife Service in a 1979 feasibility study, *The Yakima Fish Hatchery,* funded by Bonneville as the best location for a hatchery on the Yakima Indian Reservation. The Council believes it is important to proceed with this project as soon as possible because of the importance of the added production to be provided by the facility; the potential learning benefits of the facility; and the long lead time required for planning, design and construction of the facility.

Additional facilities

(4) Should the Council determine that additional hatchery propagation facilities are required to compensate for fish losses caused by the hydropower system, Bonneville shall provide funds to design, construct, operate and maintain such facilities.

Background. Additional hatchery capacity may be necessary for the restoration of Columbia River fish and particularly naturally spawning fish.

Northeastern Oregon projects

(5) Bonneville shall fund planning, design, construction, operation, maintenance and evaluation of artificial production facilities to raise chinook salmon and steelhead for enhancement in the Hood, Umatilla, Walla Walla, Grande Ronde and Imnaha rivers and elsewhere. The artificial production facilities shall be used to supplement natural production in these rivers.

(A) Prior to design of the facilities, Bonneville shall fund development of a master plan for the outplanting facilities, coordinated with the system plan development, as described in Section 205: System Planning. The plan will include the following:

(i) A description of release sites in northeastern Oregon that may benefit from hatchery supplementation, including the management history of each stock to be supplemented;

(ii) A detailed production profile that includes the source of brood stock, number of fish to be released annually and expected annual adult returns;

(iii) A description of related harvest plans;

(iv) A conceptual design for integrated facilities at one or more locations that includes all elements for salmon and steelhead propagation, such as satellite acclimation ponds, adult traps or transportation facilities, and an evaluation of low-capital or small-scale facilities to meet production objectives;

(v) Proposed management policies and procedures for streams receiving the fish from the facilities in order to ensure that hatchery releases are consistent with the system policies and plans adopted by the Council, as described in Section 200: Salmon and Steelhead Framework;

(vi) An evaluation of sites to verify suitability for outplanting facilities, including low-capital and small-scale applications. Evaluations shall include recommendations for using sites as efficiently as possible;

(vii) A proposal for biological monitoring and evaluation studies to assess the effectiveness of outplanting facilities in supplementing natural production in a biologically sound manner and the effects of the outplanting on resident fish populations; and

(viii) Preliminary cost estimates.

(B) Upon approval by the Council of the master plan, Bonneville shall fund the detailed design, engineering and construction of the hatchery and associated facilities.

(C) Bonneville shall fund operation and maintenance of the hatchery. Before making annual budget requests for operation and maintenance, the facility manager will develop a status report on the previous year's operations. The status report will include a production plan for the coming year and an analysis that shows how the plan is consistent with salmon and steelhead management activities throughout the basin.

(D) Bonneville shall fund biological monitoring and evaluation studies identified in the master plan. The results of the studies will be used to improve management at the facilities, as well as elsewhere in the basin.

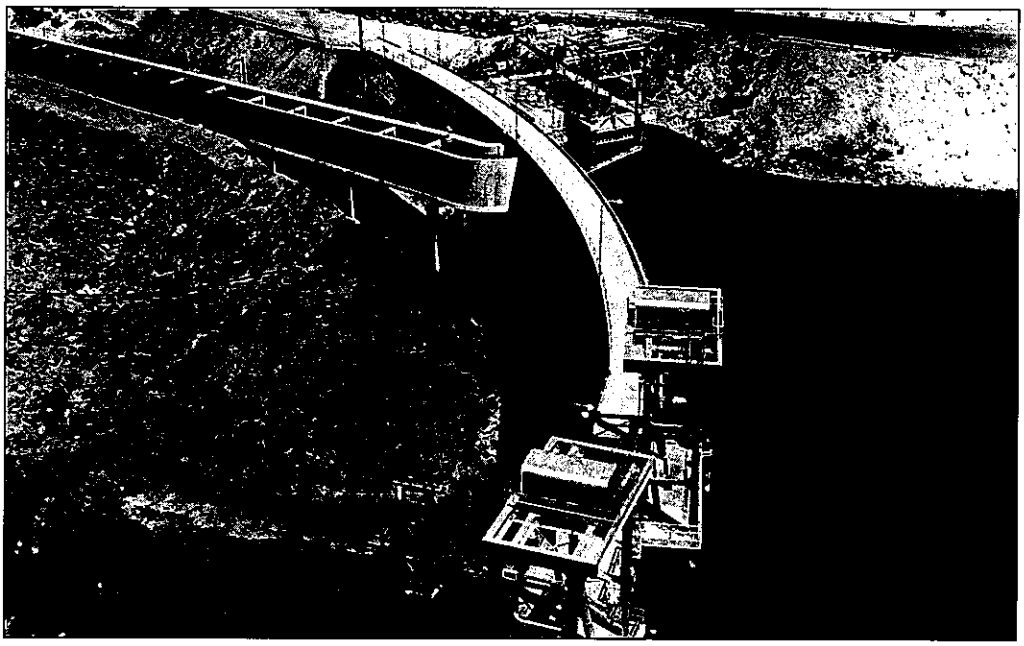
Background. The primary objective for these facilities is similar to that stated for the Yakima outplanting facility. The fish and wildlife agencies and tribes expect this facility to provide for outplanting of about 2.3 million to 3 million spring chinook juveniles in the five Oregon rivers identified in the measure. The Council maintains that the fish and wildlife agencies and tribes should play the lead role in developing the master plan for the northeastern Oregon hatchery. It also maintains that the facility need not necessarily be limited to spring chinook, as originally proposed, if other stocks would benefit from hatchery supplementation. While the focus may be on spring chinook stocks, the fish agencies and tribes may wish to consider appropriate supplementation of other stocks. Monitoring and evaluation studies should be coordinated with supplementation research and related management and with propagation activities.

(g) Construction of Low-Capital Propagation Facilities

Low-cost, small-scale hatcheries

(1) Bonneville shall provide funds to develop and test low-cost, small-scale salmon and steelhead propagation facilities adaptable to Columbia River Basin locales. The results of the studies provided for in Sections 703(e)(3)-(4) and 703(h)(1) shall be applied in the implementation of this measure. Once the concept of using low-cost, small-scale hatcheries in the Columbia River Basin has proved to be feasible, Bonneville shall take the steps necessary to use as many of these low-cost, small-scale hatcheries as possible.

Background. The major advantages of low-capital propagation are: 1) it requires a smaller water supply, and 2) it is readily adaptable to individual drainages, enabling the conservation of gene pools. The Council encourages community involvement in projects of this nature.



(2) Upon approval by the Council of design and construction plans for low-capital propagation facilities on the Nez Perce Reservation, Bonneville shall fund the construction, operation and maintenance of those facilities. The Nez Perce Tribe will develop the facility plan and will incorporate the information provided under Section 703(g)(1).

Nez Perce Reservation

Background. The Nez Perce Reservation in Idaho includes more than 300 miles of rivers and streams with suitable habitat. Upon demonstration that low-cost, small-scale salmon and steelhead propagation facilities are practicable and upon approval of the plans by the Council, Bonneville shall fund construction, operation and maintenance of low-cost, small-scale salmon and steelhead propagation facilities on the Nez Perce Reservation.

(3) Bonneville shall fund propagation of salmon and/or steelhead smolts in the 2.8-mile long fish ladder located at Pelton Dam on the Deschutes River in Oregon. This production shall be in addition to the fish propagation activities being conducted there by Portland General Electric to mitigate the effects of Pelton and Round Butte dams and will not affect the mitigation responsibilities of that company. The Oregon Department of Fish and Wildlife and the Confederated Tribes of the Warm Springs Reservation of Oregon will develop a master plan for Council approval prior to Bonneville funding of design and construction. The master plan should contain the same type of information as in other hatchery master plans for Yakima, Umatilla and northeastern Oregon facilities.

Pelton Dam

(h) Integration of Natural and Hatchery Propagation

(1) Bonneville shall fund research to determine the best methods of supplementing naturally spawning stocks with hatchery fish, particularly in the upper mainstem Snake and Columbia rivers.

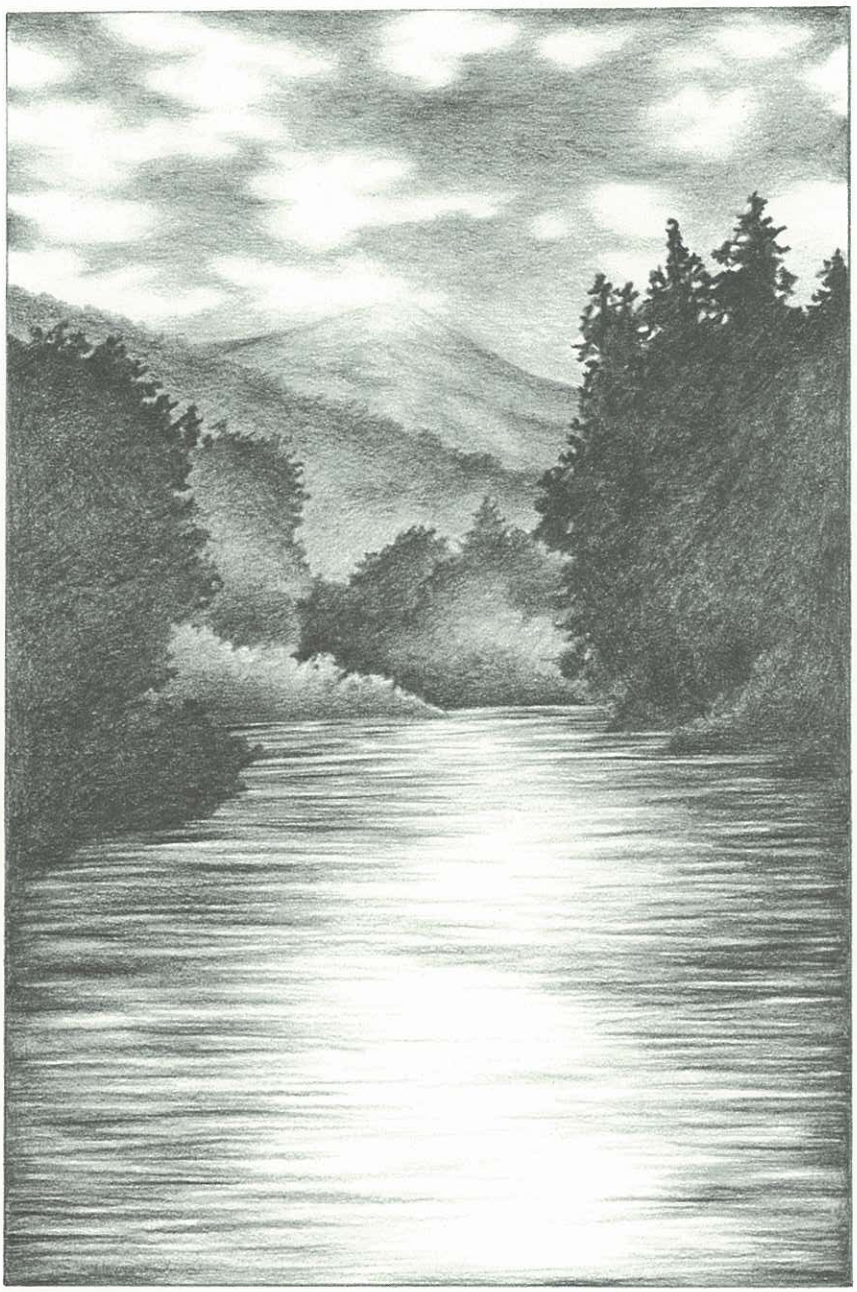
Supplementing natural stocks

(2) Bonneville shall provide funds to study the best method of supplementing natural stocks of spring chinook with hatchery stocks in the Willamette River. Based on the results of the study, the fish and wildlife agencies and tribes will develop a program for planting hatchery-reared chinook stocks. Bonneville shall fund this program upon approval by the Council.

Section 800

SALMON AND STEELHEAD

Yakima River Basin



801. The Problem

Competing needs for water

The Yakima River Basin is located east of the Cascade Range in Washington [See Figure 10 in Appendix A], where annual precipitation is very low. Irrigation has changed the Yakima River Valley from a near-desert environment to one of the most productive agricultural regions in the country. Valuable agricultural crops are grown there, thanks to a series of irrigation diversion dams, canals and ditches. Three irrigation diversion dams also divert water for hydroelectric generation. However, in a low water year, the demand for irrigation water for farming and ranching still exceeds the water supply. Available water must be allocated among competing uses, and the provision of streamflows sufficient to support anadromous and resident fish historically has received a lower priority. Yet, because the Yakima's fish habitat remains largely intact, most fish and wildlife experts consider this basin to be one of the areas with the best potential for producing anadromous fish in the Columbia River Basin. The fish in the Yakima Basin already are beginning to rebound, with 12,000 returning to spawn in 1986, compared to 2,000 in 1980.

In the past, during certain times of the year, sections of the river below some diversion dams have been dry, making fish migration impossible. Water in the pools that remain and in the river below irrigation returns reaches temperatures that are too high to support cold-water fish species. In addition, irrigation return flows carry sediment and chemicals into the Yakima River. However, water quality problems are secondary to those concerning water quantity. Additional water storage, and changes in existing storage operations and water management functions, are needed in the Yakima River Basin to satisfy fish requirements while meeting other competing demands, particularly irrigation uses.

Passage needs

In addition to water supply problems, many of the fish screens and passage facilities at the various irrigation and hydroelectric structures that control streamflows in the Yakima Basin were outdated, in ill-repair or non-existent when this program was developed in 1982.

802. The Remedy

Off-site enhancement

The Council has adopted Yakima River Basin measures primarily as off-site enhancement. Off-site enhancement is a way to compensate for fish and wildlife lost due to development and operation of a hydropower project elsewhere in the Columbia River Basin. Such enhancement is used when it is not desirable or feasible to mitigate the adverse impacts at the hydropower site where the fish were lost. This program's Yakima measures include actions to correct structural problems at irrigation diversion dams, canals and ditches that interfere with the passage of anadromous fish. These are off-site enhancement projects to mitigate the impacts of hydropower elsewhere in the basin. Measures to provide passage or protection in the lower Yakima River have received priority and are nearly completed. Once the lower-river passage problems are solved, emphasis will be placed on the upper reaches.

Passage progress

Notable progress has been made on the Yakima Basin projects. Screens and ladders have been completed at a number of diversion dams. Other passage projects are well under way or near completion. The increased fish runs recorded in 1986 underscore the Yakima River's potential as one of the most promising areas for off-site enhancement in the Columbia River Basin.

Storage studies

The Council recognizes that the water needs of the Yakima River Basin, including provision of adequate flows for fish, cannot be satisfied without additional storage, changes in existing storage operations and/or modification of water management practices. Although Bumping Lake (on the Naches arm of Yakima River in central Washington) has a long history of study as a suitable site for added storage, several other sites also have significant potential. These sites are being studied by the Bureau of Reclamation and the Washington Department of Ecology. The results of this study should be considered in identifying the site or sites to be developed for additional storage.

Outplanting facility

The Council also recognizes the critical importance of the Yakima River's potential for natural propagation and as a system for releasing hatchery fish. An outplanting facility to supplement natural production in the Yakima Basin will be developed in accordance with Section 503(c)(2): Harvest Management and Section 703(f)(3): Wild, Natural and Artificial Propagation.

The Council believes that additional water storage in the Yakima River Basin should be used primarily to provide flows to allow the rebuilding of anadromous fish populations and to protect resident fish. Recent studies to estimate the flow requirements for anadromous fish will provide the Council with better information for identifying basinwide flows for anadromous fish protection. Results of these studies also will provide a more detailed basis for determining the amount of water storage necessary for fish flows, a key factor in basin water planning and assessment of storage sites.

Efficient water use

The Council encourages more efficient use of water in the basin. Flexibility in water management might be increased through construction of reregulating dams. The Council endorses such construction as a means to allow the additional stored water to be used for both agriculture and fish enhancement.

Irrigation results in the loss of large volumes of water, primarily through transpiration, poorly maintained canals and ditches, and field flooding practices. Water also has been used for frost protection of crops, a practice that appears to be gaining popularity. Other irrigation methods could use less water. For example, irrigation waters can be distributed through closed, pressurized systems. In addition, water management alternatives, such as water banking, have been proposed.

Cooperative funding

Funding of many program measures in the Yakima River Basin is part of a cooperative effort involving Bonneville, the Bureau of Indian Affairs, the Bureau of Reclamation, the state of Washington and others. The Council anticipates that cooperative funding will continue as provided under Section 1203(d)(4): Coordination, which calls on Bonneville to work with the Council and the federal project operators to identify the most expeditious means for funding measures at federal projects.

803. Measures: Anadromous and Resident Fish

(a) Additional Water Storage

Coordination

(1) Before specifying program measures to resolve the storage problem in the Yakima River Basin, the Council will consult with the fish and wildlife agencies and tribes, especially the Yakima Indian Nation. The Council will evaluate the results of the Bureau of Reclamation and Washington Department of Ecology study of alternative storage sites and other studies of improved flows for anadromous fish. Based on this consultation and evaluation, the Council will develop measures that

Storage site identification

identify a site, or a combination of sites, and the amount of storage required. The Council believes stored water should be used primarily to protect, mitigate and enhance anadromous and resident fish in the basin. The Council also will evaluate the use of reregulating dams to provide maximum flexibility in managing the additional stored water.

(2) The Council encourages all parties to use water as efficiently as possible in order to satisfy the many needs in the Yakima River Basin; to take any interim steps to improve fish flows in the Yakima River; and to support a program of additional storage incorporating appropriate cost-sharing arrangements.

Efficient water use

(3) To reduce the amount of additional storage required, the Council will consult with water users regarding more efficient water-use practices in the basin, including alternative irrigation methods and water planning.

(4) In keeping with the provisions of Section 210, Title II of Public Law 97-293 (the Reclamation Reform Act of 1982), the Council expects that:

(A) The Secretary of the Interior will encourage the full consideration and incorporation of prudent and responsible water conservation measures in the operations of non-federal recipients of irrigation water from the Yakima Project, where such measures are shown to be economically feasible for those recipients.

(B) Each Yakima River Basin irrigation district that has entered into a repayment contract or water service contract pursuant to federal reclamation law or to the Water Supply Act of 1958, as amended (43 U.S.C. 390b), will promptly develop a water conservation plan containing definite goals, appropriate water conservation measures, and a schedule for meeting the water conservation objectives.

(C) To ensure coordination of ongoing programs, the Secretary of the Interior will enter into memoranda of agreement with federal agencies that can assist in implementing water conservation measures. Such memoranda will provide for involvement of non-federal entities, including the Council, the Washington Department of Ecology, the Yakima Indian Nation, water users' organizations and other appropriate groups, to ensure full public participation in water conservation efforts.

(b) Passage

Wapatox Power Project

(1) The Council encourages the Washington Department of Fisheries to work with Pacific Power and Light Company to install the best available fish screening devices and a bypass system at Wapatox Power Project on the Naches River. These facilities should be designed and operated to avoid unacceptable approach velocities. Those water velocities at or near the face of the screens must be between one-half foot to one foot per second to prevent the fish from being dashed against the screens by rapidly moving water.

Background. The existing screening devices and bypass system at Wapatox Dam are outdated. The screens are too small for the maximum flows experienced at the facility.

Roza Dam

(2) Bonneville shall fund the Bureau of Reclamation to renovate and repair adult and juvenile fish passage facilities at Roza Dam. The facilities shall ensure adequate fish passage, both upstream and downstream, at all times, including periods of reservoir drawdown. All needed improvements to the existing facilities associated with fish passage, including an adult barrier on Roza wasteway, shall be undertaken as part of this project. The fish and wildlife agencies and tribes shall review all designs to ensure that they meet current design standards and will provide adequate fish protection.

Prosser Dam

(3) Bonneville shall provide funds to the Bureau of Reclamation for construction of improvements and additions to Prosser Dam necessary to provide safe, efficient and timely passage of adult and juvenile fish. If modification of the two existing ladders does not provide safe and efficient passage, then a third ladder shall be constructed. The fish and wildlife agencies and tribes shall review all designs to ensure that they meet current design standards and provide adequate fish protection.

Irrigation projects

(4) After consultation with the fish and wildlife agencies, the tribes and the Bureau of Reclamation, and upon approval by the Council, Bonneville shall implement needed fish passage improvements at irrigation diversion dams, canals and ditches in the basin. Lower-river passage improvements will be made first. They will be followed by passage improvements in the upper river.

(5) Upon approval by the Council, Bonneville shall fund the design and construction of the improvements listed in Table 2. All fish screening facilities shall meet current screening design standards.

Ellensburg Town Diversion Dam

(6) Bonneville shall fund the design and construction of a low-flow vertical slot fishway and replacement of obsolete, inefficient juvenile fish screening and bypass facilities at the Ellensburg Town Diversion Dam.

Cle Elum Dam

(7) Upon approval by the Council, Bonneville shall fund a study to determine the feasibility of re-establishing runs of anadromous fish above Cle Elum Dam. If results of the study indicate that restoration is feasible, Bonneville shall fund the construction of fish passage facilities at Cle Elum Dam.

Table 2
Fish Passage Improvements to be Implemented in the Yakima River Basin

PROJECT	REQUIRED IMPROVEMENTS[1]
(A) Old Reservation Canal	Juvenile screens
(B) Easton Diversion Dam	Vertical slot fishway providing access and exit at all streamflow levels and having adequate attraction velocities Fish screening facilities on Kittitas Main Canal
(C) Snipes and Allen Canal	Fish screening and bypass facilities that will function efficiently at all flow levels
(D) Thorpe Mill Ditch	Fish screening facility
(E) Westside Ditch	Fish screening and bypass facilities
(F) Taneum Diversion Dam	Adult fish passage and fish screening and bypass facilities
(G) Marion Drain Diversion	Fish screening facilities

(c) Flows

Minimum flows

(1) Upon approval by the Council and in consultation with the Washington Department of Ecology, the Bureau of Reclamation shall provide the minimum flows required for fish passage, spawning, incubation and rearing at Prosser and Roza dams and other locations in the basin. The Council encourages Pacific Power and Light Company to work with the Washington Department of Ecology, fish and wildlife agencies and tribes to provide such flows at the Wapatox Project. The Council will specify minimum flow requirements and the location of flow control and monitoring points after evaluating the results of the instream flow studies. [See Section 803(a)(1).]

(2) Until the results of instream flow studies are available, the Council will support the establishment of interim flows upon receipt of proposals from the fish and wildlife agencies and tribes, especially the Yakima Indian Nation. Those proposals will identify specific flow control and monitoring locations and information on the adequacy and safety of the recommended flows.

(3) Before supporting any flows for fish in the Yakima Basin, the Council will consult with the System Operations and Advisory Committee, irrigation districts, Washington Department of Ecology, Bureau of Reclamation, fish and wildlife agencies and tribes.

Background. The System Operations and Advisory Committee was established as a means for fish and wildlife agencies, tribes, irrigation districts and the Bureau of Reclamation to negotiate flows to protect spawning and incubation in the Cle Elum River and elsewhere in the Yakima Basin.

(d) Artificial Propagation

Yakima Basin hatchery

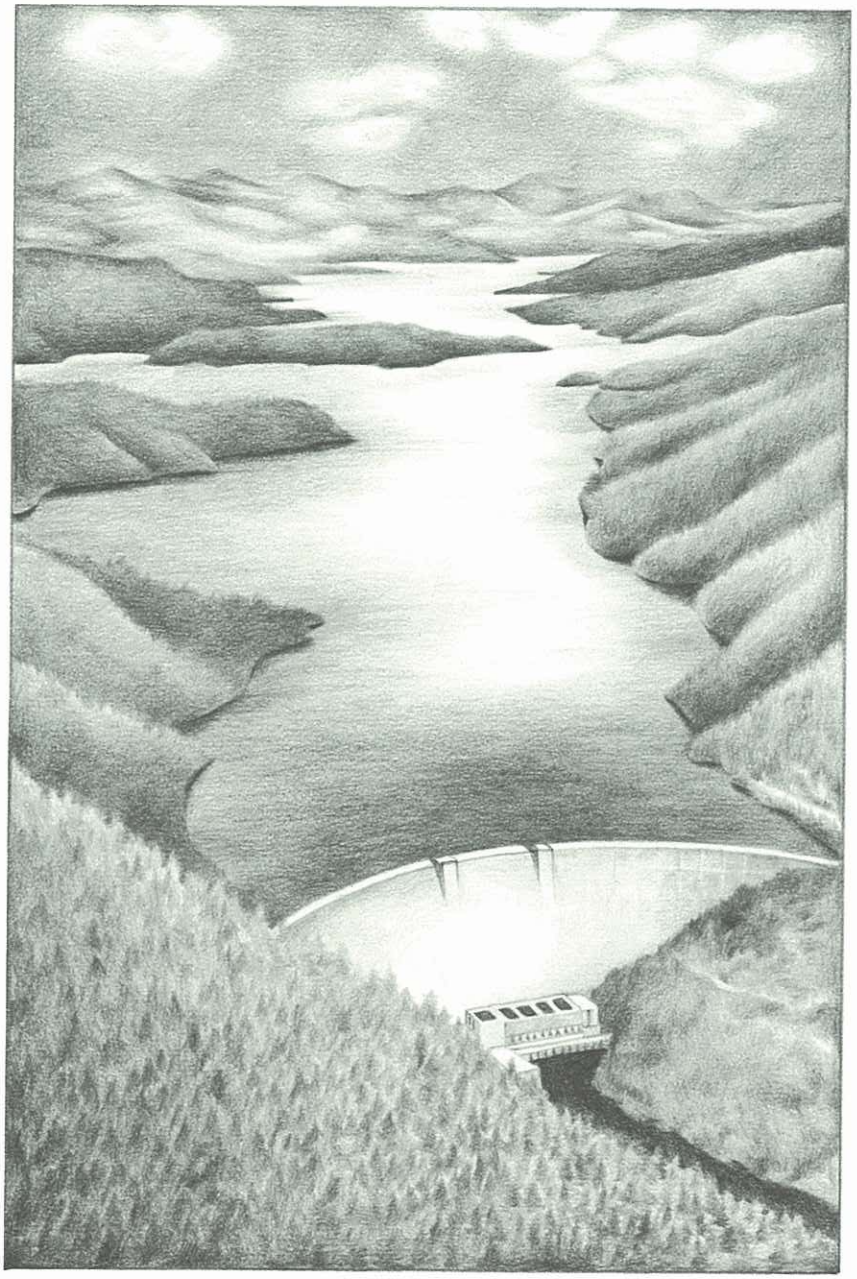
Bonneville shall fund design and construction of a hatchery for salmon and steelhead enhancement in the Yakima River Basin and elsewhere as described in Section 503(c)(2): Harvest Management and Section 703(f)(3): Wild, Natural and Artificial Propagation.

1. Some projects formerly in this table have been completed. [See Appendix B: Completed Actions.]

Section 900

RESIDENT FISH AND WILDLIFE

Resident Fish



901. The Problem

Resident fish are freshwater fish that live and migrate within the rivers, streams and lakes of the Columbia River Basin but do not travel to the ocean as do the anadromous fish described in Sections 200 through 800. Resident fish exist throughout the basin and are particularly important in areas where anadromous fish runs are blocked by natural or manmade obstructions.

Effects of dams

Hydroelectric project development has created a number of problems for resident fish. In their natural state, the Columbia River and its tributaries often ran at high volume and velocity and thereby flushed sediment downstream, keeping gravel spawning beds clean. But hydroelectric projects slowed and decreased the flow, allowing sediment to build up over the spawning beds. Sediment particles also have an affinity for chemical pollutants, creating potentially harmful concentrations in the reservoirs and other resident fish environments.

Species of interest

The white sturgeon is a species critically affected by hydroelectric development. Biologically an anadromous fish, the white sturgeon is relatively abundant in the Columbia River below Bonneville Dam. However, some populations are now confined to certain stretches of the river above Bonneville because dams have blocked migration. Because of the sturgeon's extended life cycle (approximately 20 years to reach spawning size), the white sturgeon may be depleted without an opportunity for quick restoration. Other resident fish species of special interest include the kokanee (landlocked sockeye salmon), Dolly Varden (bull trout) and westslope cutthroat trout.

As with anadromous fish, hydroelectric generation also interferes with the flows needed for resident fish spawning, incubation, emergence, rearing and migration. In addition, operating reservoirs for power purposes may impair the environment for spawning, incubation and rearing of some species. For example, discharging water from a reservoir to generate power lowers the reservoir water level, which may deprive fish eggs of the water they need; diminish the food supply; crowd the fish into a smaller aquatic living space; and change the temperature of the remaining water.

This section of the program addresses resident fish losses caused by hydropower development and operation as well as substitutions of resident fish to compensate for losses of salmon and steelhead in areas permanently blocked by hydropower projects. Measures concerning Yakima Basin resident fish are described in Section 803: Yakima River Basin. Measures for resident fish substitutions are guided by the policy stated in Section 207: Resident Fish Substitutions.

902. The Remedy

New operating procedures

The Council not only has adopted many recommendations for specific actions, but also is calling for further review and approval by the Council of new projects. One of the most important measures is a five-year program to develop new operating procedures for Hungry Horse and Libby reservoirs in Montana. These procedures will be designed to resolve potential conflicts among demands for power generation, the need for flows for anadromous and resident fish, and a healthy reservoir environment for resident fish.

Under the Council's program, limits will be developed on the drawdown of certain reservoirs for power purposes, and minimum flow requirements will be set to protect fish and their habitat. Other measures call for using storage water to maintain appropriate water temperatures, streambed protection, fish stocking, and a variety of studies on fish habitat and on the impacts of hydroelectric operation.

Resident fish hatcheries

The Council has also approved several resident fish substitution projects above Chief Joseph and Hells Canyon dams. These include a trout hatchery on the Colville Indian Reservation, two kokanee hatcheries (Galbraith Springs and Sherman Creek), a low-capital sturgeon hatchery on the Kootenai Indian Reservation, and a trout hatchery at the Fort Hall Indian Reservation.

Section 900

903. Measures

(a) Flow Requirements

Hungry Horse Dam

(1) To aid reproduction of kokanee in the Flathead River and to aid rearing of other fish species and invertebrates, the Bureau of Reclamation shall operate Hungry Horse Dam to provide the following instantaneous flows at Columbia Falls. The operation of Hungry Horse Dam to provide those flows will be coordinated fully with the Fish Passage Center, Bonneville and the Corps.

Columbia Falls flows

(A) Spawning. Flow shall not be less than 3,500 cubic feet per second (cfs) or more than 4,500 cfs from October 15 through December 15.

(B) Incubation. A minimum flow of at least 3,500 cfs shall be provided 24 hours per day from December 15 through April 30.

(C) Emergence. A minimum flow of 3,500 cfs shall be provided 24 hours per day during the period from May 1 through June 30.

(D) Other. A minimum flow of at least 3,500 cfs in the Flathead River at Columbia Falls shall be provided 24 hours per day from July 1 through October 15 to aid the rearing of Dolly Varden (bull trout), cutthroat and mountain whitefish, and to aid aquatic invertebrate production.

The Bureau of Reclamation shall report monthly to the Council the hourly average river flows. The reports shall include an estimate of the costs to the hydropower system associated with meeting these flows. The Bureau and Bonneville may modify the required flows when requested by the Montana Department of Fish, Wildlife and Parks (MDFWP) for study purposes.

Kokanee research

(2) Bonneville shall continue to fund a study to evaluate the effects of discharges from Hungry Horse Dam on the distribution and migration of kokanee spawners in the Flathead River and associated effects on power generation. Bonneville shall continue to fund the study of the success of kokanee reproduction in Flathead Lake under controlled flows. All studies conducted under this measure shall be coordinated to the fullest extent practicable. By October 1, 1989, Bonneville shall present the results of the studies to the Council. MDFWP shall make recommendations to the Council for further action and necessary program amendments. The recommendations will be coordinated with other Montana resident fish and water management studies.

Kerr Dam

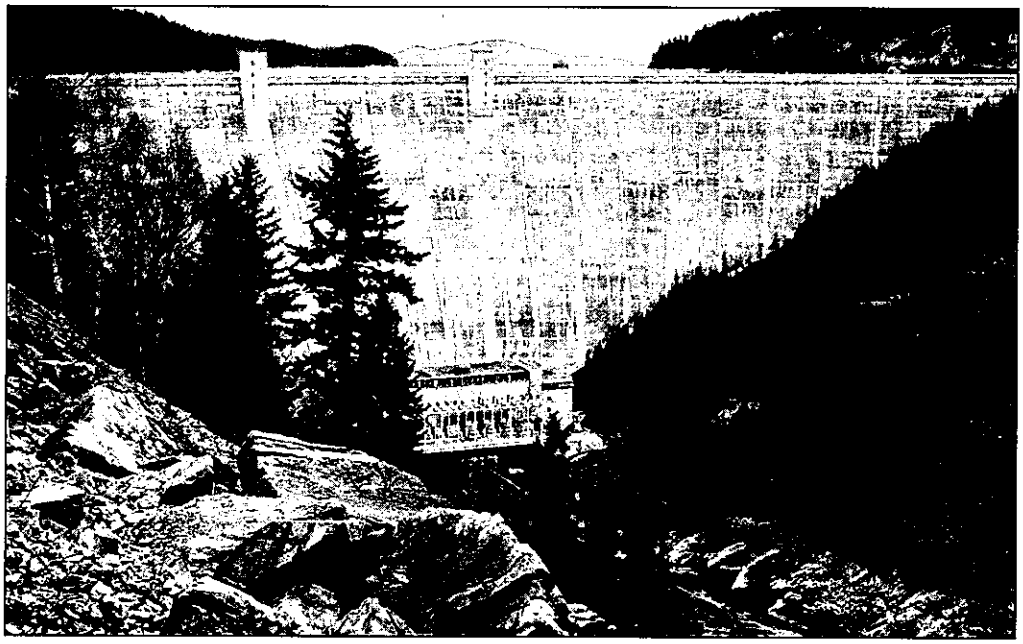
(3) Upon approval by the Council, Bonneville shall fund a study to evaluate the effects of river level fluctuations resulting from the operation of Kerr Dam on certain game fish in the lower Flathead River and tributaries. By October 1, 1989, Bonneville shall present the results of the studies to the Council. Recommendations to the Council for further action and necessary program amendments should come from the Confederated Salish-Kootenai Tribes and MDFWP.

Big Fork Dam

(4) FERC shall continue to require Pacific Power and Light Company (PP&L) to operate the Big Fork Hydroelectric Project under provisions included in the project's FERC license. PP&L and the Montana Department of Fish, Wildlife and Parks will continue to work together to ensure coordination of project operations with MDFWP fish management objectives. FERC shall require MDFWP and PP&L to examine mitigation alternatives to address losses of westslope cutthroat, rainbow, Dolly Varden (bull trout) and kokanee in the Flathead River system.

Libby Dam

(5) The Corps of Engineers shall develop operating procedures for Libby Dam to ensure that sufficient flows are provided to protect the resident fish in the Kootenai River and Lake Koocanusa. These procedures shall be implemented by November 15, 1987. They shall require a minimum flow



of 4,000 cfs except in years of extremely low runoff, when no less than 3,000 cfs shall be provided. Based on the best available historical record, and in consultation with the Montana Department of Fish, Wildlife and Parks and the Council, the Corps shall include in its operating procedures a definition of "extremely low runoff" that will permit the 4,000-cfs requirement to be met to the fullest extent practicable. Existing operating criteria shall remain in effect at Libby Dam until the new procedures are adopted. Every effort shall be made to implement the recommended minimum flows prior to November 15, 1987.

(6) If a conflict occurs between maintaining the minimum flows required by Section 903(a)(1) and maintaining reservoir levels required by Section 903(b)(1), the Bureau of Reclamation shall consult with the Montana Department of Fish, Wildlife and Parks to determine which requirements shall be preferred. If a conflict occurs between maintaining the minimum flows required by Section 903(a)(5) and maintaining the reservoir levels required by Section 903(b)(1), the Corps of Engineers shall consult with the Montana Department of Fish, Wildlife and Parks to determine which requirement shall be preferred.

Conflicts with drawdown constraints

(7) Bonneville shall fund studies to determine the flows required to ensure successful migration, spawning and rearing of rainbow and cutthroat trout in certain tributaries of the Kootenai River (Callahan, Quartz, Libby and O'Brien creeks, and the Fisher River) and tributaries to Lake Koocanusa (Graves, Deep, Big, Bristow, Barron and Fivemile creeks).

Research

(8) The Bureau of Reclamation shall ensure that Anderson Ranch Dam is operated to maintain established minimum flow levels for the wintering and spawning of trout in the south fork of the Boise River.

Anderson Ranch Dam

(b) Drawdown Requirements

(1) The Bureau of Reclamation and the Corps of Engineers, in consultation with the Council and the Montana Department of Fish, Wildlife and Parks, shall develop operating procedures to limit

Hungry Horse and Libby reservoirs

drawdown of Hungry Horse and Libby reservoirs for power purposes to protect resident fish to the fullest extent practicable. These procedures shall be developed by March 1, 1988, and shall incorporate the following conditions:

(A) Except in years of extreme runoff, drawdown for power purposes shall not exceed 85 feet at Hungry Horse Reservoir and 90 to 110 feet at Libby Reservoir;

(B) "Extreme runoff" shall be defined on the basis of the best available historical record, so that the drawdown limits can be expected to be met in 80 percent of all years;

(C) Bonneville shall fund studies to evaluate the effect of the operating procedures on resident fisheries. These shall include a study of the effects of Libby Dam operations on reproduction and rearing of white sturgeon in the Kootenai River. The study shall assess when and where fish are present, food requirements and sources, effects of pollutants, population recovery and propagation methods; and

(D) In years when the drawdown limit is exceeded for power purposes, Bonneville shall fund the mitigation of fish losses to the extent those losses are caused by power operations.

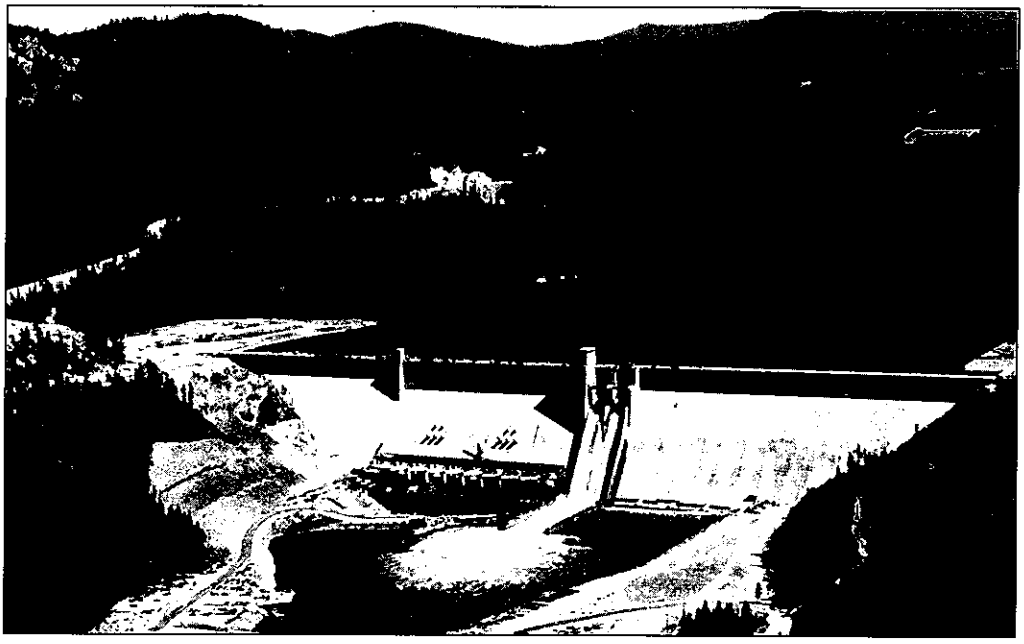
(2) The Bureau of Reclamation and the Corps of Engineers shall implement the operating procedures for Hungry Horse and Libby reservoirs. In the meantime, these agencies shall make every effort to comply with the drawdown limits.

Research

(3) Bonneville shall fund the following research to develop reservoir operating procedures:

(A) Establishment of reservoir levels necessary to maintain or enhance fisheries;

(B) Analysis of the relationship between the drawdown limit and fish flow measures set for resident and anadromous fish in this program, including the water budget measures in Section 300: Water Budget and Mainstem Flows;



(C) Development of alternative means to resolve any conflicts between the drawdown limits and the requirements for fish flows; and

(D) Determination and analysis of the probable effects of drawdown limits on the power system.

Bonneville shall present the results of the studies to the Council by March 1, 1988. MDFWP shall make proposals for further action and necessary program amendments to the Council at that time.

Mitigation projects

(4) Bonneville shall fund the design, construction, operation and maintenance of mitigation projects in the Flathead River and Flathead Lake system to supplement natural propagation of fish in the river. These projects counter the effects of habitat loss in and below the South Fork of the Flathead River caused by dam construction and by drawdown and discharges of water from Hungry Horse Reservoir. Bonneville shall fund a study to determine levels of production necessary to mitigate the effects of the hydropower system and shall submit the results of the study to the Council for review prior to approval of mitigation measures. The study shall be completed, and Bonneville shall present the results to the Council by November 15, 1987. MDFWP shall make recommendations for further action and necessary program amendments at that time.

Hungry Horse and Kerr dams

(5) In coordination with Section 903(a)(2), Bonneville shall continue to fund the study to develop measures for improving the success of kokanee reproduction in Flathead Lake. The study shall investigate the following factors related to lake drawdown caused by the operation of Hungry Horse and Kerr dams for hydroelectric purposes:

(A) The effect of operation of Kerr and Hungry Horse dams on water levels in Flathead Lake;

(B) The effect of drawdown amounts and timing on distribution and reproductive success of kokanee spawning in Flathead Lake;

(C) The relative success of shoreline spawning in Flathead Lake; and

(D) The influence of groundwater on the survival of eggs deposited in shallow water in Flathead Lake areas where groundwater may be depleted by lake drawdown.

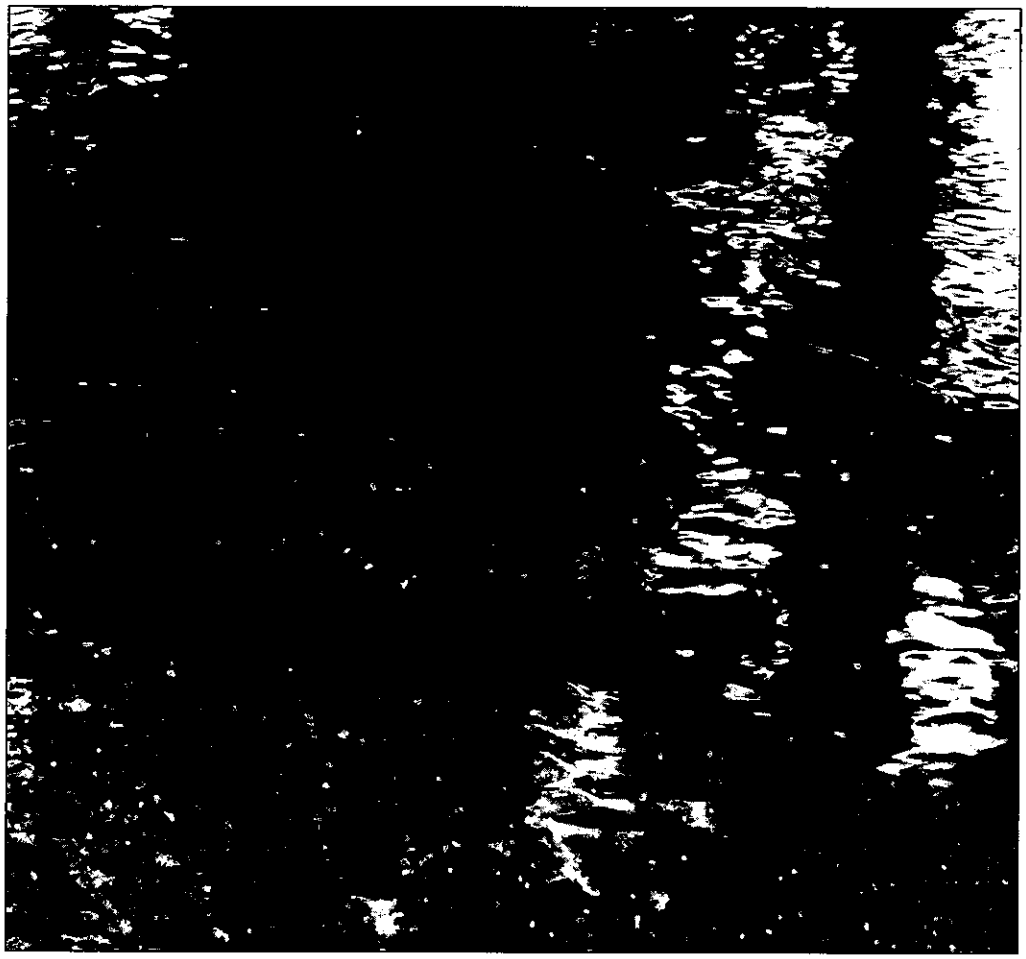
These studies shall be conducted in cooperation with the Confederated Salish-Kootenai Tribes, Montana Power Company, Montana Department of Natural Resources and Conservation, and the Bureau of Reclamation. By October 1, 1989, Bonneville shall present the results of these studies to the Council. The recommendations for further action and necessary program amendments shall be coordinated with the above agencies and tribes and with other Montana resident fish projects. Proposals for further action also shall be submitted to the Council at that time.

(6) Bonneville shall fund a study to evaluate the effects of Kerr Dam operation on certain game fish, including bass, Dolly Varden (bull trout) and kokanee, in the South Bay of Flathead Lake. All studies conducted under this measure shall be coordinated to the fullest extent practicable. By October 1, 1989, Bonneville will present the study results to the Council. MDFWP and the Confederated Salish-Kootenai Tribes shall make recommendations to the Council for further action and necessary program amendments. The recommendations shall be coordinated with other Montana resident fish studies.

Flint Creek Project

(7) To maintain habitat conditions suitable for the survival of resident fish in Georgetown Lake, future operations of the Flint Creek project shall not be altered from past practices without considering and incorporating the multiple uses of the project, including the needs of the fish.

Section 900



Milltown Dam

(8) Upon completion of planning for Milltown Dam, FERC shall require the Montana Power Company to fund an evaluation of the proposed operating procedures to determine whether they will protect resident fish downstream from the project. The study will include an analysis of suspended sediments, associated heavy metals, and organic pollutants, as well as an evaluation of the potential effect of these pollutants on resident fish. If the investigations reveal that an adverse effect on the fish will result from the proposed operation, then alternatives for mitigation of that effect will be proposed to the Council.

Post Falls Dam

(9) FERC shall require the Washington Water Power Company to continue the existing operation of Post Falls Dam to minimize its impact on the fish in Lake Coeur d'Alene and the Spokane River. The Council expects the Washington Water Power Company to consult with the Coeur d'Alene Tribe, the Idaho Department of Fish and Game, and other interested fish and wildlife agencies and tribes to develop and initiate an evaluation of the effects of hydropower operations at Post Falls Dam on fish in Lake Coeur d'Alene and the Spokane River. Proposals for further action may be made on the basis of the evaluation.

Banks Lake

(10) The Bureau of Reclamation, in consultation with the fish and wildlife agencies, tribes and the Washington Department of Ecology, shall develop operating procedures for Banks Lake designed to protect reproduction of kokanee. The Bureau shall submit to the Council proposed procedures for the drawdown of Banks Lake.

(c) Temperature Control

The Bureau of Reclamation, the Corps of Engineers and other project operators, in consultation with the Council, tribes and fish and wildlife agencies, shall use storage, where existing structures allow, to maintain water temperatures within the best ranges for fish habitat.

(d) Streambed Protection

Bonneville shall fund the removal of materials that have accumulated in Kootenai River tributary deltas below Libby Dam as a result of the dam's construction and operation, because these materials interfere with the migration of spawning fish.

(e) Additional Mitigation and Enhancement Measures

(1) Bonneville shall fund research to determine the impact of development and operation of the hydropower system on sturgeon in the Columbia River Basin. These studies may include: 1) habitat requirements, 2) maintenance of genetic integrity, 3) stock assessment, 4) potential for artificial propagation, and 5) migrating potential. Specific recommendations for the protection, mitigation and enhancement of sturgeon may be submitted to the Council upon completion of these studies.

Sturgeon

(2) The Corps of Engineers, in consultation with the fish and wildlife agencies and tribes, shall continue the existing program for fish stocking in Dworshak Reservoir.

Dworshak Reservoir

(3) The Idaho Department of Fish and Game (IDFG) will provide information to the Council on whether habitat in the Clearwater River below its north fork is suitable for rainbow trout. If the habitat is suitable and production of rainbow trout will not conflict with production of chinook salmon, IDFG will provide a plan to stock the river with rainbow trout. IDFG will coordinate development of this plan with the Nez Perce Tribe. Bonneville shall fund the program for stocking.

Clearwater River

(4) Bonneville shall fund a study to assess the impacts of the original construction and current operation of Dworshak Dam on the resident fishery. This study will include the following research concerns of the Nez Perce Tribe: 1) population dynamics of kokanee, 2) reservoir productivity, 3) food habits of rainbow trout, 4) population dynamics and habitat preferences of smallmouth bass, and 5) the status of forage species. This study effort will be coordinated with the Corps. Recommendations detailing specific protection, mitigation and enhancement opportunities, consistent with the requirements of Section 903(f)(1), may be submitted to the Council.

Dworshak Dam

(5) The Corps shall fund a study to evaluate the existing and potential salmonid and spiny-rayed fish stocks and their habitat in the Pend Oreille River from Lake Pend Oreille downstream to Albeni Falls Dam.

Albeni Falls Dam

(6) FERC shall require Montana Power Company to provide permanent funding to purchase 10,000 acre-feet of water from Painted Rocks Reservoir to maintain summer and fall flows for resident fish in the Bitterroot River. These flows are intended as mitigation for the impacts of the Thompson Falls projects on resident fish. The 10,000 acre-feet will be in addition to the 3,200 acre-feet base flow and 5,000 acre-feet already purchased in perpetuity by the Montana Department of Fish, Wildlife and Parks, Western Mountain Fish and Game Association, and Ravalli County Fish and Wildlife Association.

Painted Rocks Reservoir

(7) Bonneville shall fund efforts to increase the number of rainbow trout in the Kootenai River by planting fingerling trout of a suitable stock for the river habitat. Bonneville also shall fund efforts to restore sturgeon and ling (burbot) populations in that river.

Kootenai River

Clark Fork River

(8) The Montana Department of Fish, Wildlife and Parks and the Washington Water Power Company will conduct the following research in the lower Clark Fork drainage:

(A) Assess the existing habitat suitability for species now present and those designated for possible introductions. Assess spawning, rearing, food and cover habitats, and hydrological, limnological and other water quality conditions; and

(B) Determine the most feasible methods to improve habitat suitability or increase habitat availability for desirable species, considering particular species needs, project operations, costs and other constraints.

Hills Creek Reservoir

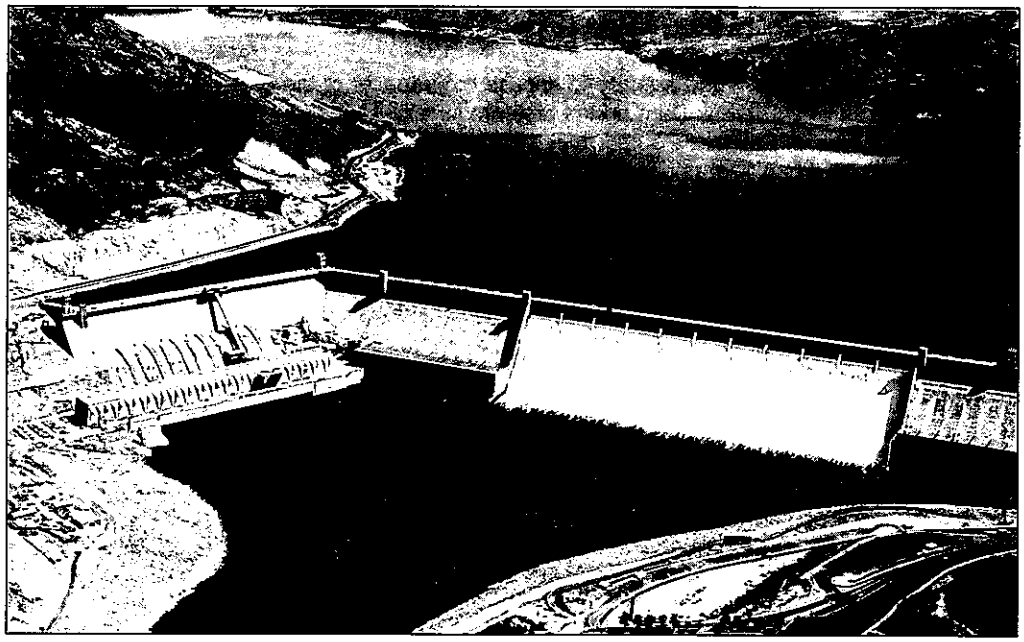
(9) The Corps shall fund additional test vegetation planting at Hills Creek Reservoir and evaluation of the results. Based on the results of these tests, Bonneville shall fund a feasibility study to identify which hydroelectric projects in the basin would benefit from such revegetation improvements. Results of this feasibility study and recommendations for protection, mitigation and enhancement opportunities may be submitted to the Council.

Owyhee, Warm Springs and Beulah reservoirs

(10) The Bureau of Reclamation shall consult with the Oregon Department of Fish and Wildlife and affected irrigation districts to explore the potential for releasing surplus water when it is available from Owyhee, Warm Springs and Beulah reservoirs. Such releases would be made during the non-irrigation season to benefit downstream resident fish.

Banks Lake

(11) The Bureau of Reclamation, or the appropriate irrigation districts, shall fund maintenance of the barrier net system at the outlet from Banks Lake into the main irrigation canal to conserve the spawning population of kokanee in the lake. The purpose of this measure is to prevent the migration of kokanee resulting from reservoir fluctuations caused by hydroelectric operation of Grand Coulee Dam.



(f) Review of Amendment Applications

This section applies only to proposals for projects addressing hydropower-related losses of resident fish, not to projects substituting resident fish for losses of salmon and steelhead. The Council's substitution policy is described in Section 207: Resident Fish Substitutions Policy.

In reviewing applications to amend the program to add resident fish projects, the Council will consider whether the proposed projects are supported by: a) documentation of or agreement on resident fish losses attributable to the hydroelectric facility at issue; b) evidence that significant biological gains will be achieved by the expenditure; and c) evidence that the project will result in no significant conflict with efforts to restore anadromous fish.

Background. Resident fish have been affected significantly by changes in habitat and blockage of migration due to hydroelectric development. The nature and extent of those effects have not been identified sufficiently to permit development of specific goals for on-site or off-site mitigation. In some cases, resident fish may have been enhanced by hydroelectric development. The specific criteria listed above for new resident fish projects are intended to help define the general standards for program measures established in the Northwest Power Act.

(g) Resident Fish Substitutions (See associated policy in Section 207: Resident Fish Substitutions Policy.)

(1) Bonneville shall fund the following resident fish substitution activities and projects in the blocked area above Chief Joseph Dam to partially mitigate for salmon and steelhead losses incurred as a result of the construction and operation of Chief Joseph and Grand Coulee dams:

Chief Joseph Dam

(A) Design, construction, operation and maintenance of a resident trout hatchery on the Colville Indian Reservation. The Council expects that the most current technologies will be used in designing the hatchery.

Colville Indian Reservation

(B) A baseline stream survey of tributaries located on the Coeur d'Alene Indian Reservation to compile information on improving spawning habitat, rearing habitat, and access to spawning tributaries for cutthroat and Dolly Varden (bull trout) and to evaluate the existing fish stocks. If justified by the results of the survey, fund the design, construction and operation of a cutthroat and Dolly Varden (bull trout) hatchery on the Coeur d'Alene Reservation; necessary habitat improvement projects; and a three-year monitoring program to evaluate the effectiveness of the hatchery and habitat improvement projects. If the baseline survey indicates a better alternative than construction of a fish hatchery, the Coeur d'Alene Tribe will submit an alternative plan for consideration in program amendment proceedings.

Coeur d'Alene Indian Reservation

(C) Design, construction, operation and maintenance of two kokanee salmon hatcheries: one at Galbraith Springs and one at Sherman Creek. The Sherman Creek hatchery will be used as an imprinting site and egg collection facility to provide a source of kokanee fry for: i) stocking into Banks Lake and ii) transferring to Galbraith Springs hatchery for rearing to fingerling size before planting into Lake Roosevelt. Decisions on hatchery production, stocking and outplanting locations will be coordinated by a three-member committee consisting of one representative each appointed by the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians, and the Washington Department of Game.

Galbraith Springs

Sherman Creek

Lake Roosevelt

(D) Capital, operation and maintenance of pilot projects for improving habitat and passage into and out of Lake Roosevelt tributary streams for rainbow trout. The aim of this measure is to emphasize natural production by: i) facilitating passage of migratory rainbow trout between Lake Roosevelt and its tributary streams and ii) improving fry and fingerling rearing habitat in these streams.

Monitoring

(E) Monitoring to evaluate the effectiveness of the above measures. The monitoring program shall include the following components: i) a year-round creel census survey to determine angler use, composition and rates of catch, growth and condition of fish; ii) assessment of feeding habitats of kokanee, rainbow and walleye and densities of their preferred prey; iii) comparison of rainbow trout adult and fingerling abundance in tributaries before and after habitat and passage improvements are made; and iv) a mark-recapture study designed to assess the effectiveness of different kokanee release and outplanting sites. This outplanting study will focus on kokanee migratory tendencies and distribution in Lake Roosevelt after their release and homing back to the outplanting sites during spawning migration.

Drawdown

(F) Implementation of these measures shall not affect drawdown of Lake Roosevelt and Banks Lake as needed for power generation and downstream salmon and steelhead purposes.

Kalispel Indian Reservation

(G) An assessment of fishery improvement opportunities in the Pend Oreille River within the boundaries of the Kalispel Indian Reservation. This survey will provide: i) baseline information about existing fish populations and habitat and ii) information on possible means of improving fisheries. When the assessments are completed, recommendations for projects will be submitted to the Council.

Kootenai Indian Reservation

(H) Design, construction, operation and maintenance of a low-capital sturgeon hatchery on the Kootenai Indian Reservation. Bonneville and the Kootenai Tribe of Idaho shall explore alternative ways to make effective use of the hatchery facility year-round.

(I) A survey of the Kootenai River downstream from Bonners Ferry, Idaho, to the Canadian border to: i) evaluate the effectiveness of the hatchery and ii) assess the impact of water-level fluctuations caused by Libby Dam on hatchery operation for outplanting of sturgeon in the Idaho portion of the Kootenai River.

Above Hells Canyon Dam

(2) The following resident fish substitution actions in the blocked area above Hells Canyon Dam will be funded by the appropriate party or parties to partially mitigate for salmon and steelhead losses incurred as a result of the construction and operation of federal and non-federal hydropower projects in this blocked area:

Duck Valley Reservation

(A) Resident fish projects at the Duck Valley Indian Reservation, as off-site enhancement, to include:

(i) annual stocking of catchable and fingerling trout of the appropriate stocks in reservation lakes and streams;

(ii) review of reservation surface water and groundwater suitability for resident fish production facilities;

(iii) evaluation of alternative sources of catchable and fingerling resident fish;

(iv) analysis of feasibility of developing an additional lake fishery at Coyote Sink; and

(v) review of resident fish habitats and cost estimates for any required protective measures.

(B) Design, construction, placement and evaluation of shoreline habitat in C.J. Strike Reservoir, in consultation with the Idaho Power Company, to provide for improvement of resident fish populations. **C.J. Strike Reservoir**

(C) Propagation and annual release of 400,000 kokanee fry annually into Lucky Peak Reservoir and the construction and operation of a kokanee spawning trap at Lucky Peak Reservoir to take approximately 500,000 eggs. This project shall be coordinated with the Corps. **Lucky Peak Reservoir**

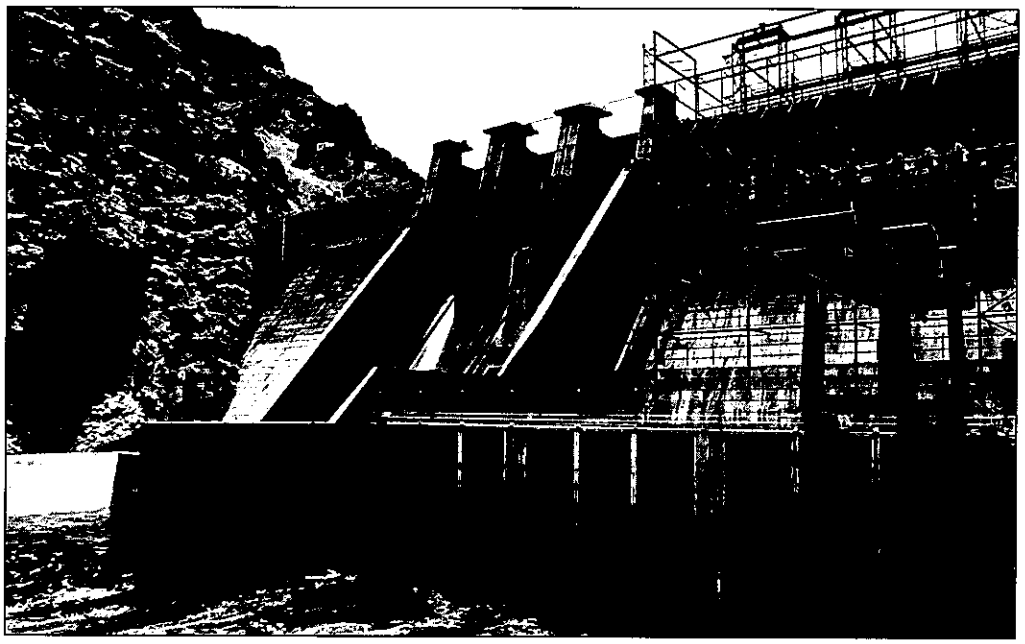
(D) Design, construction, operation and maintenance of a resident trout hatchery on the Fort Hall Reservation. **Fort Hall Reservation**

(E) Habitat restoration and enhancement activities in Spring Creek and Clear Creek along the Fort Hall Bottoms located on the Fort Hall Reservation.

(F) Habitat improvement measures to enhance redband trout and smallmouth bass in the Malheur River Basin. **Malheur River Basin**

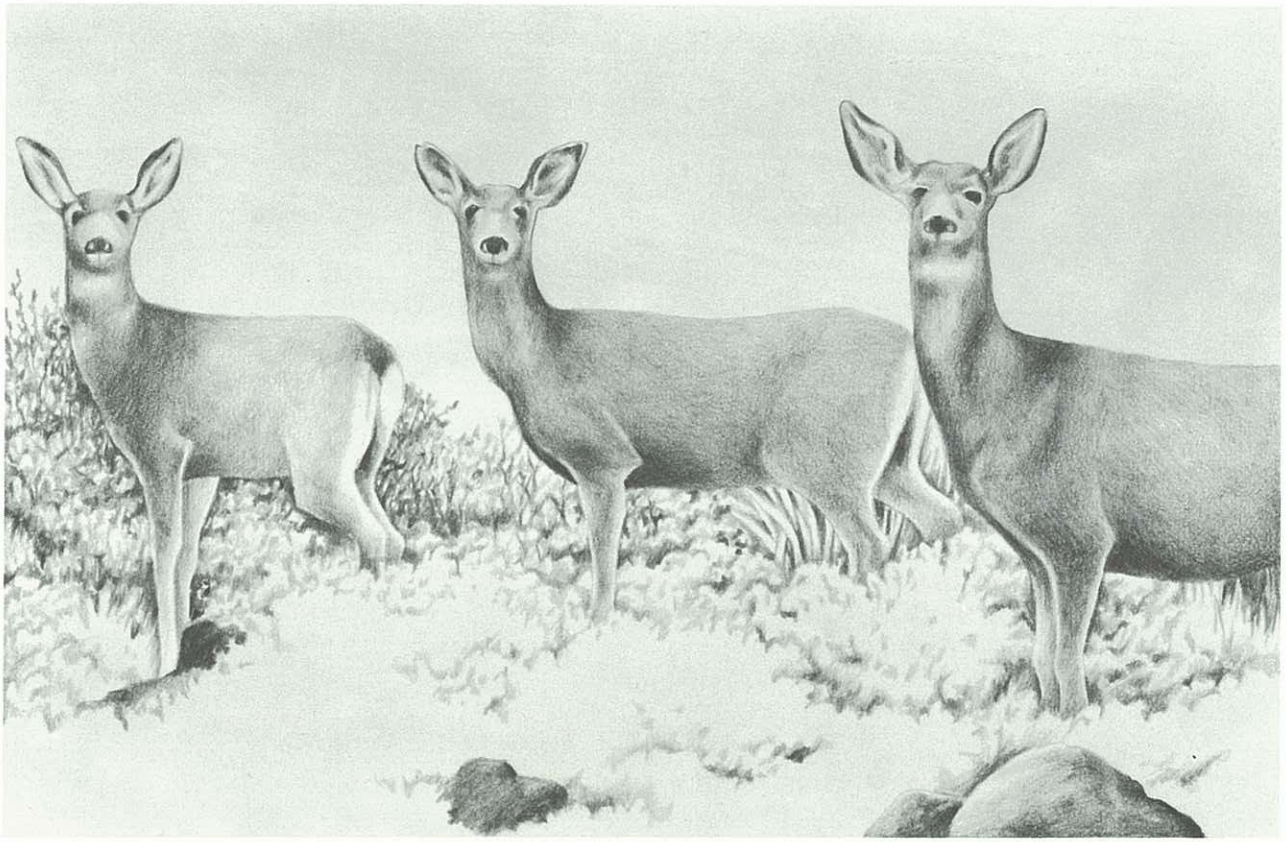
(G) Propagation and annual release of 1 million coho fingerlings into Cascade Reservoir and the construction, operation and maintenance of additional hatchery capacity to allow for the propagation of these coho. This project shall be coordinated with the Bureau of Reclamation. **Cascade Reservoir**

(H) Evaluation of the current operating procedures of American Falls Dam to determine the impact of those procedures on native fish populations. **American Falls Dam**



RESIDENT FISH AND WILDLIFE

Wildlife



1001. The Problem

Habitat losses

The development of the hydropower system in the Columbia River Basin has had far-reaching effects on many species of wildlife as well as on fish. Some floodplain and riparian habitats important to wildlife were inundated when reservoirs were filled. In some cases, fluctuating water levels caused by dam operations have created barren vegetation zones, which expose wildlife to increased predation. In addition to these reservoir-related effects, a number of other activities associated with hydroelectric development have altered land and stream areas in ways that severely affect wildlife. These activities include construction of roads and facilities, draining and filling of wetlands, stream channelization and shoreline riprapping (using large rocks or boulders to reduce erosion along streambanks). Finally, in some cases the construction and maintenance of power transmission corridors has altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries.

Beneficial effects

While the development of the hydropower system has caused major negative effects on wildlife, it also has resulted in a number of beneficial effects. For example, the creation of reservoirs has provided important resting, feeding and wintering habitat for waterfowl. In addition, where reservoir storage is used for irrigation as well as power generation, the irrigation water has promoted extensive growth of grass and food that could not otherwise exist in such a dry climate. These areas provide important habitat for wildlife. Programs to protect, mitigate and enhance wildlife affected by hydroelectric development should consider the net effects of that development on wildlife.

1002. The Remedy

Mitigation process

To address the effects of hydropower development and operations on wildlife in the Columbia River Basin, the Council established a process to mitigate wildlife losses. That process includes development of status reports on wildlife planning and mitigation programs at each hydroelectric project in the Columbia Basin; statements identifying losses of wildlife or wildlife habitat; mitigation plans; and the subsequent incorporation of approved plans or appropriate alternatives into the fish and wildlife program. [See Section 1003(b) and Tables 3 and 4.]

In 1987, the Council added wildlife mitigation plans for Montana's Hungry Horse and Libby dams to the program. [See Table 4.] During that process, the Council decided that wildlife plans should be considered in Section 1300 amendment proceedings before they are added to the program for funding.

The Council also has adopted measures to describe special considerations when land acquisition is proposed as a mitigation tool and to ensure that wildlife interests are represented in future Columbia River Basin hydropower system matters, including transmission corridors. [See Sections 1003(a) and (c)-(d).]

1003. Measures

(a) Wildlife Representation

Equitable treatment for wildlife

(1) The Council will ensure, through monitoring and future measures if necessary, that wildlife is considered in all matters concerning the planning, management and operation of the Columbia River Basin hydropower system where it is appropriate to provide equitable treatment for wildlife resources. In developing consultation and coordination arrangements pursuant to Section 1203(c): Coordination, the federal project operators and regulators shall give particular attention to fish and wildlife agencies and interested tribes when carrying out activities that affect wildlife and its habitat.

Wildlife coordinator

(2) The Council will establish a wildlife management coordinator position. The coordinator will act as a liaison between the wildlife and power interests and will coordinate and monitor the Council's wildlife program.

(b) Mitigation Planning and Implementation

Mitigation status reports

(1) Status Reports. Upon approval by the Council, Bonneville shall fund a review and analysis of the status of past, present and proposed wildlife planning and mitigation programs at each hydroelectric project in the Columbia River Basin. These status reports will evaluate:

(A) The need for baseline inventory data and the required level of detail of this data on all hydroelectric projects in the Columbia River Basin;

(B) The extent to which wildlife populations have been affected by hydroelectric projects;

(C) The extent to which wildlife populations have been enhanced by construction of hydroelectric projects;

(D) The extent to which previous programs have succeeded in mitigating wildlife losses; and

(E) Losses of and continuing changes in island, shore and other floodplain habitat in areas affected by each dam.

This review and analysis, with specific proposals, will be reported to the Council. These status reports will provide the basis for developing the mitigation and enhancement plans described in the following measures.

Losses statements

(2) Losses Statements. Upon completion of the mitigation status reports developed pursuant to Section 1003(b)(1), Bonneville shall initiate consultations on each project or series of projects to discuss the need for and direction of further studies. These consultations will be held with the appropriate fish and wildlife agencies, tribes, federal project operators and regulators, and Bonneville customers. The Council's wildlife coordinator will participate in all such discussions. If Bonneville and the Council's wildlife coordinator determine that the consultations, Section 1003(b)(1) status reports, and/or Section 1003(b)(5) options indicate that loss statements would be appropriate, then Bonneville shall fund studies to develop statements of wildlife and/or wildlife habitat losses at the projects listed in Table 3. These statements shall take into account all existing information pertinent to the project area and shall address both realized and potential positive and negative effects. The lead agency conducting the studies described in this measure is expected to comply with the provisions of Sections 1203(c)(2) and (4): Coordination.

Mitigation plans

(3) Mitigation Plans. Upon completion of the Section 1003(b)(2) studies, the appropriate fish and wildlife agencies, tribes, Bonneville and project operators shall review the results and discuss the options available to provide wildlife protection, mitigation and enhancement in accordance with the Northwest Power Act. The Council's wildlife coordinator will participate in such discussions. Based on these discussions, Bonneville shall fund the development of mitigation plans for each of these projects. The entity or entities preparing each plan shall document how it complies with Sections 4(h)(5)-(6) and (10)(A) of the Northwest Power Act. Such plans will be submitted to the Council for review and approval.

Program amendments

(4) Amendments. Upon Council review of the proposed mitigation plans developed pursuant to Sections 1003(b)(3) or (5), the Council will amend the mitigation plans or appropriate alternatives into this program in accordance with Section 1300: Amendments. After mitigation plans are amended into the program, Bonneville or the appropriate project operator shall fund implementation as specified in Table 4.

(5) **Agreements.** If it is determined, in consultations or in any planning stage throughout the Section 1003(b) process, that a satisfactory level of protection, mitigation or enhancement can be agreed upon by all parties for a particular facility, then the need for further planning will be eliminated.

Background. The Council intends to provide a systemwide program for addressing the effects of development and operation of the Columbia River Basin hydropower system on wildlife through this process of developing mitigation status reports, loss statements and plans for protection, mitigation or enhancement, followed by funding. The Council recognizes the importance of ongoing wildlife programs established by the U.S. Fish and Wildlife Service, state fish and wildlife agencies, the tribes and others in the protection of wildlife in the Columbia River Basin. Such programs will be identified according to species to permit any entity to manage its land voluntarily in support of this program. The voluntary programs will be listed in the plans for protection, mitigation or enhancement. By identifying specific ongoing programs in this fashion, the appropriate entity will be able to protect listed wildlife species.

(c) Transmission Systems

Bonneville shall negotiate agreements with each of the four states in the region, in consultation with the appropriate fish and wildlife agencies and tribes, regarding transmission corridors and their effects on wildlife and habitat. Bonneville shall submit a report to the Council on the status of such negotiations.

(d) Acquisition of Wildlife Habitat

(1) The Council will review recommendations for land acquisition or an appropriate alternative to acquisition, according to the following process:

(A) The appropriate agencies, tribes and project operators must document or agree on the need for and level of mitigation at the hydropower project. This information should be developed from the process outlined in Section 1003(b);

(B) A plan for implementing the mitigation project must be developed based on the best available scientific knowledge. The plan also must show how the proposed mitigation project would be the alternative with the minimum economic cost, while accomplishing the biological objectives of the mitigation plan as expressed in Sections 1003(b)(3) or (5) and meeting the standards of Sections 4(h)(5) and (6) of the Northwest Power Act;

(C) Documentation of consultation and coordination activities pursuant to Section 1203(c): Coordination must be provided; and,

(D) A detailed management plan for the proposed mitigation, which explains the participation, responsibilities and authorities of all parties involved, must be submitted. The plan also should include a schedule outlining the proposed mitigation activities; identifying pertinent laws and regulations; explaining the operation and maintenance requirements associated with the measure; specifying a biological objective for mitigation; and describing a plan for monitoring progress toward that objective.

(2) The Council will consider recommending approval of funding for the acquisition of suitable off-site or on-site wildlife habitat, or an appropriate alternative to acquisition, in order to protect, mitigate and enhance wildlife at appropriate projects listed in Table 3. Approval will be based on the results of Section 1003(b) reports, studies and plans and the process established in Section 1003(d)(1).

Table 3
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1003(b)

Project or Area	Council Concerns
Bonneville Dam	Emphasis should be placed on identifying losses of wildlife habitat from inundation, erosion and, more recently, the 3-foot fluctuations in pool levels. Wildlife mitigation reports for the second powerhouse developed under the Fish and Wildlife Coordination Act should be the basis for developing future mitigation measures.
Dworshak Dam	The effects on wildlife of the initial inundation and current project operation at Dworshak Dam should be analyzed. In developing the Sections 1003(b)(2)-(3) studies and plans for the Dworshak facility, the following elements proposed by the Nez Perce Tribe will be incorporated: (A) Evaluation of the effects of altered water temperature and flow level regimes on aquatic mammals in the mainstem Clearwater River below Dworshak Reservoir; (B) Identification of any effects of the hydroelectric operation on osprey and bald eagles downstream from Dworshak Reservoir; (C) Evaluation of the impacts of hydroelectric generation on waterfowl production on the mainstem Clearwater River below the confluence of the mainstem and the north fork; and (D) Evaluation of the hazards posed to deer and elk by the formation of ice on Dworshak Reservoir. When preparing the Section 1003(b) studies and plans, all affected parties will coordinate in an effort to incorporate the results of these studies into the mitigation plan developed for the Dworshak facility.
John Day Dam	Public Law 89-298, passed by Congress in 1965, authorized the Corps to acquire land to mitigate losses and enhance wildlife at the John Day Project. Further mitigation, if needed, should be directed toward current dam operations and their effects on wildlife.

Table 3
(continued)

McNary Dam	Wildlife agencies believe the adverse effects of McNary Dam have been only partially addressed and that further mitigation is needed. The potential impacts of a new second powerhouse proposed at McNary Dam are to be addressed under the terms of Section 1100: Future Hydroelectric Development.
Hells Canyon Complex	The three dams in the Hells Canyon Complex were authorized for construction under FERC licensing. Mitigation provisions were included for loss of upland bird and waterfowl habitat by the acquisition of three islands in the free-flowing stretch of the Snake River above the Brownlee pool. However, no mitigation was included for the loss of big game and terrestrial mammal habitat. While developing the Section 1003(b) process for the Hells Canyon Complex, the lead agency should consult with the U.S. Forest Service in the Wallowa-Whitman National Forest and incorporate, if appropriate, the mitigation and enhancement opportunities to benefit wildlife at Kirkwood Bar and Pittsburg Landing.
Hanford Reach (Hydropower system impacts)	Further information should be obtained and analyzed to determine the best mix of activities to benefit wildlife resources in the Hanford Reach. Water-level fluctuations in the Hanford Reach are attributable to hydropower system operations and not to the operations of particular dams.
Grand Coulee Dam	Impacts to wildlife from the initial inundation and current water-level fluctuations should be analyzed thoroughly. In developing the Sections 1003(b)(2)-(3) studies and plans for Grand Coulee Dam, an effort will be made to address the concerns of the Colville Confederated Tribes regarding wildlife and wildlife habitat lost on the Colville Reservation portion of Lake Roosevelt as a direct result of habitat inundated by the construction of Grand Coulee Dam. All affected parties will coordinate when preparing the Section 1003(b) studies and plans to incorporate the results of that effort into the mitigation plan developed for Grand Coulee Dam.

Table 3
(continued)

Columbia River Gorge between the Hood and Sandy rivers (Hydropower system impacts)	Upon completion of the Section 1003(b)(1) studies for the mainstem projects, the U.S. Forest Service (Mt. Hood National Forest), Oregon Department of Fish and Wildlife, and Washington Department of Game will undertake an on-site survey within the Columbia River Gorge to identify wildlife, wildlife habitat and enhancement opportunities. This survey will be completed on both sides of the Columbia between the Hood and Sandy rivers. This survey will be coordinated with the Corps. The development of the survey and resulting recommendations will follow the process explained in Section 1003(b).
Kerr Dam	A comprehensive mitigation and enhancement plan to counter the effects on wildlife and wildlife habitat of both original construction of and current operating procedures at the Kerr Dam needs to be completed. The study should include an evaluation of the following effects associated with Flathead Lake: (A) The effects of water-level fluctuations and reservoir drawdown; (B) The loss of habitat due to erosion, especially on the north shore; and (C) Production losses and habitat requirements for waterfowl, bald eagles, furbearers and osprey. In addition, the study should evaluate the effects of water-level fluctuations on waterfowl, bald eagle and deer habitats along the lower Flathead River. Interim Measures: The Montana Department of Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service will provide the Council with a set of site-specific interim corrective measures to be implemented on the north shore of Flathead Lake to mitigate erosion, while the comprehensive mitigation and enhancement plan is being developed under Section 1003(b).

Table 3
(continued)

Albany, Albeni Falls, American Falls, Anderson Ranch, Ashton, Baker, Bend, Black Canyon, Bliss, Boundary, Box Canyon, Bull Run (PGE), Bull Run (Portland), C.J. Strike, Cabinet Gorge, Carmen-Smith, Cascade Expansion, Chandler, Chelan, Chief Joseph, Cline Falls, Condit, Cougar, Detroit/Big Cliff, Dexter, Dryden, Faraday, Foster, Green Peter/ Foster, Hills Creek, Ice Harbor, Idaho Falls, Leaburg, Little Falls, Little Goose, Long Lake, Lookout Point, Lower Malad, Lower Monumental, Lower Salmon Falls, Mayfield/ Mossyrock, Minidoka, North Fork, Oak Grove, Palisades, Pelton, Pelton Reregulating, Post Falls, Powerdale, Priest Rapids, River Mill, Rock Creek, Rock Island, Rocky Reach, Round Butte, Roza, Shoshone Falls, Smith, Spokane, Stayton, Sullivan, Swan Falls, The Dalles, Thousand Springs, Trail Bridge, Twin Falls, Upper Malad, Upper Salmon Falls, Wallowa Falls, Walterville, Wanapum, Wapato, Wells, and Yale/ Merwin/Swift projects.	Further analysis may be needed to determine if the mitigation provided to offset the effects of the initial inundation and current fluctuation in the water levels in the following projects is sufficient. Mitigation has been implemented at Wells, Rocky Reach, Chief Joseph Units 16-27, Wanapum, Priest Rapids and Albeni Falls projects or dams. A mitigation study was completed on The Dalles project in 1981. Mitigation studies are either in the final stages of development or are being implemented for the Yale, Merwin and Swift projects. The Washington Department of Game is working with the licensee for the Mayfield and Mossyrock projects to develop a mitigation plan. Supporting information on the success of these mitigation plans should be submitted as part of the report called for in Section 1003(b)(1).

Table 4
Wildlife Mitigation Projects

Project or Area	Target Species	Wildlife or Habitat Losses Attributable to Hydropower	Mitigation Goal Projects/Schedule
Hungry Horse Dam	Elk/ Mule Deer	133 elk 6,650 acres of winter range	Bonneville shall fund projects to enhance and maintain winter range on Flathead National Forest lands to support a target carrying capacity of an additional 133 elk. Total number of acres to be treated will be established when the increase in carrying capacity for winter range enhancement is determined. An initial limit of 6,650 acres of winter range will be enhanced until increased carrying capacity is determined. Year 1, advanced design. Years 1-5, implement, test and monitor; report to Council for further action.
	Black Bear	27-34 animals 8,590 acres of critical habitat	Bonneville shall fund projects to protect 8,590 acres of riparian habitat and travel corridors through the acquisition of conservation easements. Years 1-2, advanced design; interagency coordination; prioritizing sites; appraisals. Upon completion, acquire easements.
	Grizzly Bear	2-4 animals 8,590 acres of critical habitat	
	Waterfowl	1,863 acres (1,146 acres of prime habitat)	Bonneville shall fund projects to protect and/ or enhance 1,146 acres of wetland habitat in Flathead Valley. Same schedule as bear projects.
	Terrestrial Furbearers	11,050 acres	Bonneville shall negotiate cooperative agreements with state and federal agencies and private landholders to protect 11,050 acres of selected old-growth forest stands. Years 1-2, advanced design; report to Council for further action.
Libby Dam	White-tailed Deer	1,340 animals 8,745 acres of winter range	Bonneville shall fund projects to enhance and maintain winter range in northwestern Montana to support a target carrying capacity of an additional 1,340 white-tailed deer. Total number of acres to be treated will be established when the increase in carrying capacity for winter-range enhancement is determined. An initial limit of 8,745 acres will be enhanced until increased carrying capacity is determined. Years 1-2, advanced design. Years 3-10, implement and monitor.

Table 4
(continued)

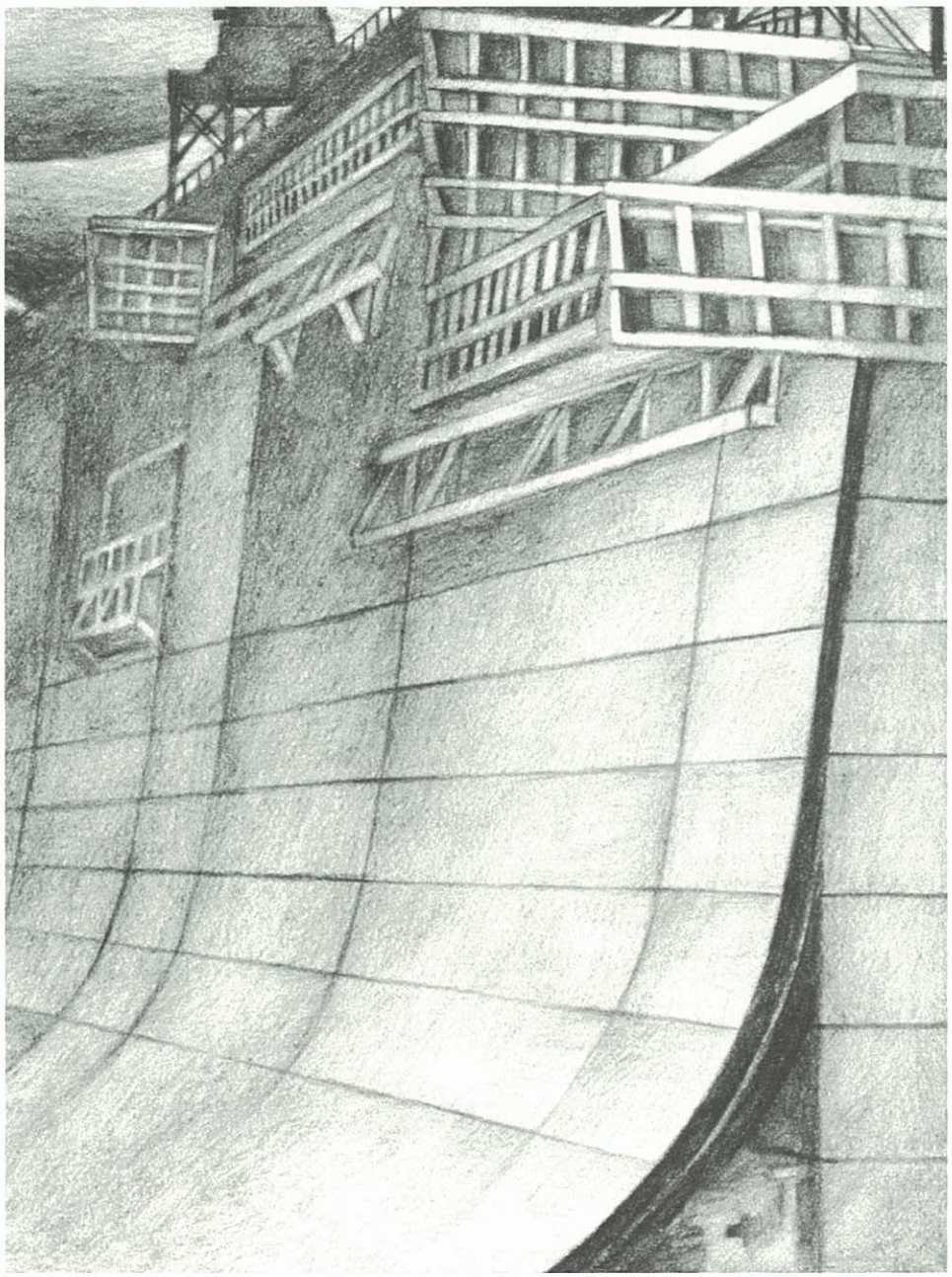
Project or Area	Target Species	Wildlife or Habitat Losses Attributable to Hydropower	Mitigation Goal Projects/Schedule
	Mule Deer	485 animals 10,586 acres	Bonneville shall fund projects to enhance and maintain winter range on Kootenai National Forest lands adjacent to Lake Koocanusa to support a target carrying capacity of an additional 485 mule deer. Total number of acres to be treated will be established when the increase in carrying capacity is determined. An initial limit of 10,586 acres will be enhanced until increased carrying capacity is determined. Year 1, advanced design. Years 2-10, implement and monitor.
	Bighorn Sheep	66 sheep 3,190 acres	Bonneville shall fund projects to enhance and maintain winter/spring range on Kootenai National Forest lands adjacent to Lake Koocanusa to support a target carrying capacity of an additional 66 sheep. Total number of acres to be treated will be established when the increase in carrying capacity for habitat enhancement is determined. An initial limit of 3,190 acres will be enhanced until increased carrying capacity is determined. Year 1, advance design. Years 2-10, implement and monitor.
	Columbian Sharp-tailed Grouse	2,462 acres	Bonneville shall fund projects to protect 2,462 acres of prairie habitat within the vicinity of Tobacco Plains. Years 1-2, advanced design. Years 3-10, acquire easements.
	Waterfowl	10,460 acres (3,418 acres of prime habitat)	Bonneville shall fund projects to protect and/or enhance 3,418 acres of wetland habitat within the Flathead Valley. Years 1-2, advanced design. Years 3-10, upon completion of design, implement projects.

Further Action: Bonneville shall consult with the Montana Department of Fish, Wildlife and Parks, the Corps, Bureau of Reclamation and Bonneville customers to explore alternative methods, including a trust fund, for financing wildlife mitigation measures at Hungry Horse and Libby dams. If all relevant parties reach agreement on a suitable method for financing and on an alternative package of mitigation projects, Bonneville shall fund the projects covered by that agreement, upon approval by the Council.

Section 1100

GENERAL

Future Hydroelectric Development



Future Hydroelectric Development — Section 1100

1101. The Problem

Much of this program has focused on mitigating damage done to Columbia River Basin fish and wildlife by hydropower development and operations in the past. But the future is equally important. The Corps of Engineers and the Bureau of Reclamation continue to study the need for additional federal hydroelectric projects and to plan for new development in the basin. However, most new hydroelectric development will be accomplished by private or non-federal public entities licensed by the Federal Energy Regulatory Commission (FERC). FERC has at least 115 applications pending for hydroelectric development in Idaho, Oregon, Montana and Washington and at least 92 outstanding preliminary permits (indicating ongoing project feasibility studies) in those four states. Many of those applications and permits are for projects throughout the Columbia River Basin. From 20 to 50 small or medium hydroelectric projects are proposed for tributary drainage basins that contain important anadromous fish habitat.

Dam applications pending

Many of the proposals are for hydroelectric projects that would produce less than 5 megawatts of electricity. Although individual small projects may have no significant adverse effects on the fish and wildlife resources of the basin, the cumulative effects of such development throughout a river basin could be quite harmful. Improvements are needed in the decision-making on proposed hydropower development, so that cumulative effects are fully taken into account.

Cumulative effects

1102. The Remedy

The Council finds that future hydroelectric developers in the basin should be required to mitigate harm to fish and wildlife and has adopted program measures calling for such mitigation. New hydroelectric development has the potential to cause further damage to the basin's fish and wildlife resources as well as to negate ongoing Council efforts to remedy damage caused by the existing hydropower system. Federal agencies also should assess and mitigate the cumulative effects of multiple hydroelectric projects on fish and wildlife. Additional improvements are needed in methods for assessing cumulative effects and for incorporating such assessments into federal review processes.

Mitigation required

The Council also supports the concept of protecting some streams and wildlife habitats from all hydroelectric development, where such development would have major negative effects that could not be reversed. The Council will designate areas in the basin to be protected from new hydroelectric development after analyzing alternative means of developing a system for protecting critical fish and wildlife habitat areas. That analysis would take into account the power supply trade-offs involved.

Protected areas

The Council also intends to continue to review applications for FERC permits and licenses and for Corps of Engineers and Bureau of Reclamation proposals for hydroelectric development. The purpose of this review is to identify program measures related to the proposed development in order to ensure that any new development in the basin is consistent with this fish and wildlife program and the Council's Northwest Power Plan. The Council's reviews would complement and recognize, not supplant, the role of the fish and wildlife agencies and tribes in reviewing proposals for hydroelectric projects.

Section 1100

1103. Measures

(a) Conditions of Development

Project requirements for fish protection

(1) FERC, the Corps, the Bureau of Reclamation and Bonneville shall not license, exempt from license, relicense, propose, recommend, agree to acquire power from, grant billing credits for, or otherwise support any hydroelectric development in the Columbia River Basin without providing for:

(A) Consultation with the fish and wildlife agencies and tribes and the Council throughout study, design, construction and operation of the project;

(B) Specific plans for flows and fish facilities prior to construction;

(C) The best available means for aiding downstream and upstream migration of salmon and steelhead;

(D) Flows and reservoir levels of sufficient quantity and quality to protect spawning, incubation, rearing and migration;

(E) Full compensation for unavoidable fish losses or fish habitat losses through habitat restoration or replacement, appropriate propagation, or similar measures consistent with the provisions of this program;

(F) Assurance that the project will not inundate the usual and accustomed fishing and hunting places of any tribe;

(G) Assurance that the project will not degrade fish habitat or reduce numbers of fish in such a way that the exercise of treaty rights will be diminished; and

(H) Assurance that all fish protection measures are fully operational at the time the project begins operation.

Project requirements for wildlife protection

(2) FERC, the Corps, the Bureau of Reclamation and Bonneville shall not license, relicense, exempt from license, propose, recommend, agree to acquire power from, or otherwise support any hydroelectric development in the Columbia River Basin without specifically providing for these development conditions:

(A) Consulting with the wildlife agencies and tribes and the Council throughout study, design, construction and operation of the project;

(B) Avoiding inundation of wildlife habitat, insofar as practical;

(C) Timing construction activities, insofar as practical, to reduce adverse effects on nesting and wintering grounds;

(D) Locating temporary access roads in areas to be inundated;

(E) Constructing subimpoundments and using all suitable excavated material to create islands, if appropriate, before the reservoir is filled;

(F) Avoiding all unnecessary or premature clearing of land before filling the reservoir;

(G) Providing artificial nest structures when appropriate;

(H) Avoiding construction, insofar as practical, within 250 meters of active raptor nests;

(I) Avoiding critical riparian habitat (as designated in consultation with the fish and wildlife agencies and tribes) when clearing, riprapping, dredging, disposing of spoils and wastes, constructing diversions, and relocating structures and facilities;

(J) Replacing riparian vegetation if natural revegetation is inadequate;

(K) Creating subimpoundments by diking backwater slough areas, creating islands and nesting areas;

(L) Regulating water levels to reduce adverse effects on wildlife during critical wildlife periods (as defined in consultation with the fish and wildlife agencies and tribes);

(M) Improving the wildlife capacity of undisturbed portions of new project areas (through such activities as managing vegetation, reducing disturbance, and supplying food, cover and water) as compensation for otherwise unmitigated harm to wildlife and wildlife habitat in other parts of the project area;

(N) Acquiring land or management rights where necessary to compensate for lost wildlife habitat at the same time other project land is acquired and including the associated costs in project cost estimates;

(O) Funding operation and management of the acquired wildlife land for the life of the project;

(P) Granting management easement rights on the acquired wildlife lands to appropriate management entities; and

(Q) Collecting data needed to monitor and evaluate the results of the wildlife protection efforts.

Explanation

(3) All licenses for hydroelectric projects or documents that propose, recommend or otherwise support hydroelectric development shall explain in detail how the provisions of Sections 1103(a)(1)-(2) will be accomplished or the reasons why the provisions cannot be incorporated into the project.

(b) Cumulative Effects

Consolidated project reviews

(1) The federal project operators and regulators shall review simultaneously all applications or proposals for hydroelectric development in a single river drainage, through consolidated hearings, environmental impact statements or assessments, or other appropriate methods. This review shall assess cumulative environmental effects of existing and proposed hydroelectric development on fish and wildlife.

(2) Upon approval by the Council, Bonneville shall fund a study to develop criteria and methods for assessing potential cumulative effects of hydroelectric development on fish and wildlife. The study also shall develop a method for incorporating these assessments into federal processes for review, authorization or other support of hydroelectric development.

(c) Critical Habitat for Fish and Wildlife

Protected areas

(1) Upon approval by the Council, Bonneville shall fund an 18-month study of alternative means for classifying and designating certain streams and wildlife habitat that should be protected from all future hydroelectric development. The study shall draw on existing information on the hydroelectric potential of such streams, as well as the value of their fish and wildlife resources.

(2) Based on the results of this study and the provisions of the Northwest Power Act, the Council will designate stream reaches and wildlife habitat areas that shall be protected from further hydroelectric development. In the interim, the Council will advise all federal project operators, regulators, land managers and appropriate agencies that the study is under way and will provide them with the full list of habitat areas proposed during development of this program for protection from all hydroelectric development.

(d) New Screen Design

Bonneville shall fund studies to determine the effectiveness of new designs for turbine intake screens and their suitability for application at small hydroelectric projects.

(e) Consistency

Program consistency

(1) FERC shall require all applicants for licenses (including license renewals, amendments and exemptions) and preliminary permits in the Columbia River Basin to demonstrate in their applications how the proposed project would take this program into account to the fullest extent practicable.

Council review

(2) FERC shall provide the Council with copies of all applications for licenses (including license renewals, amendments and exemptions) and preliminary permits in the Columbia River Basin so that the Council can comment in a timely manner on the consistency of the proposed project with this fish and wildlife program. This provision is not intended to supplant review of such applications by the fish and wildlife agencies and tribes.

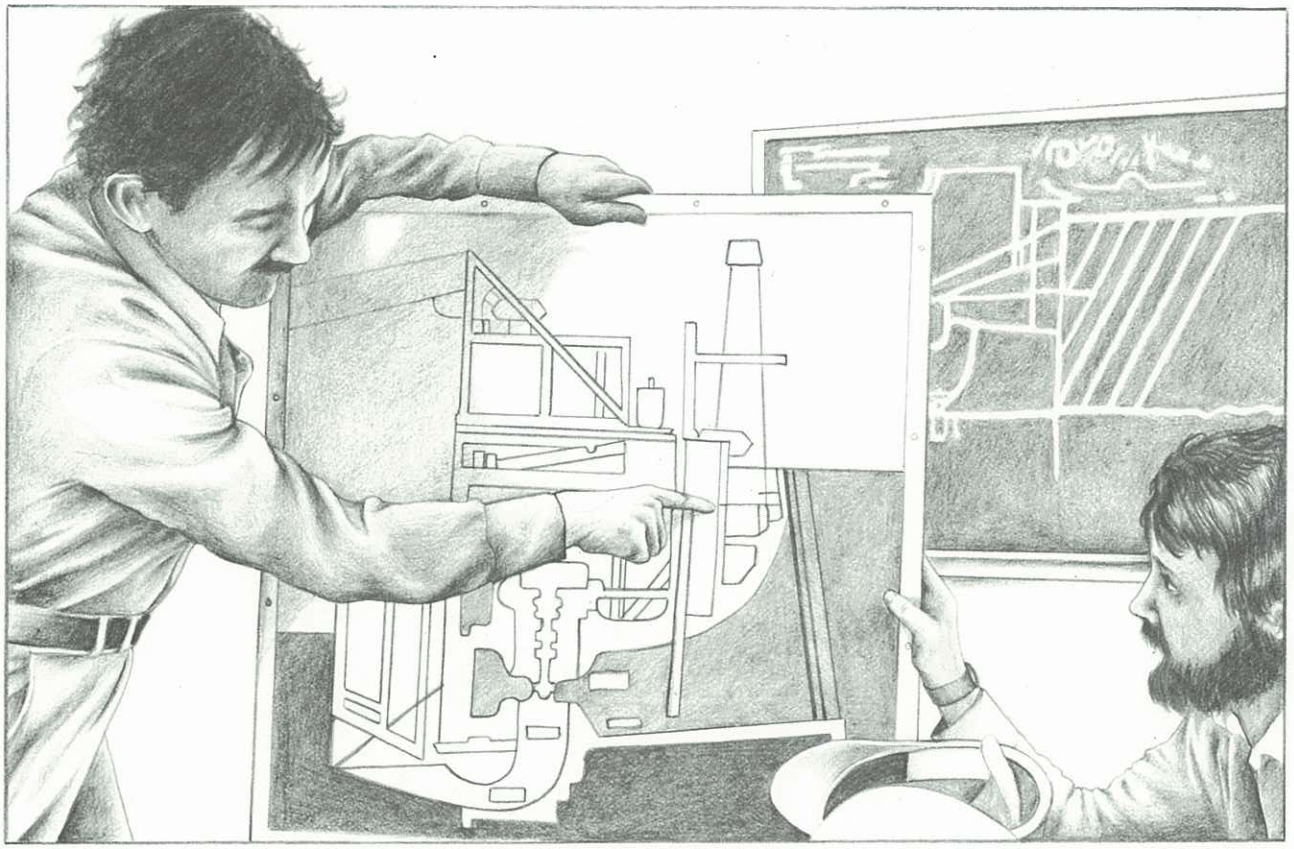
(3) The Council expects federal and state fish and wildlife agencies to incorporate pertinent elements of the fish and wildlife program in the terms and conditions they apply to projects exempted from licensing under FERC exemption procedures. The Council also requests federal land managers to incorporate this program into their permit procedures related to hydroelectric development on lands they manage.

(4) The Corps, the Bureau of Reclamation, and any other federal agency studying or proposing hydroelectric development in the Columbia River Basin shall provide opportunity for Council review and comment.

Section 1200

GENERAL

Coordination



1201. The Problem

Competing interests

While the Columbia River and its tributaries are a great natural resource, they are not an unlimited resource. Competing interests and uses of the river system require unprecedented coordination and communications to achieve an equitable allocation of that resource. Not only must fish and wildlife interests realize parity with power interests today, but the decades of harm done to fish and wildlife prior to that parity must be addressed.

Responsibilities of operators and regulators

The Northwest Power Act directs the federal project operators and regulators to implement the Council's fish and wildlife program and to accommodate the needs of fish and wildlife in their hydroelectric activities. Specifically, the Act requires the Bonneville Power Administration and the federal agencies that manage, operate and regulate the federal and non-federal hydroelectric facilities in the Columbia River Basin to take the Council's program "into account at each relevant stage of decision-making processes to the fullest extent practicable." Those agencies also are to provide "equitable treatment" to fish and wildlife by managing and operating their water power projects to protect, mitigate and enhance fish and wildlife while fulfilling the other purposes of those projects. Furthermore, they are to fulfill those responsibilities in consultation and coordination with the fish and wildlife agencies, tribes, and affected project operators.

Bonneville's role

The Northwest Power Act anticipates that Bonneville will play an active role in this program's implementation by requiring the agency to take the necessary steps to ensure the "timely implementation" of the Act in a "sound and businesslike manner." In addition to fulfilling the duties imposed on the other agencies, Bonneville is to use the powers provided by the Act and other relevant laws, and the finances available in the Bonneville fund, to protect, mitigate and enhance fish and wildlife. These actions are to be consistent with both the requirements of the Act and with the Council's program. Bonneville has the authority to buy, sell and exchange electrical power, provide transmission services, propose power rates, and participate in power system planning and operations.

With the Division Engineer for the Corps of Engineers, the Bonneville Administrator also acts as the United States Entity in carrying out the provisions of the Columbia River Treaty regarding use of Columbia River Basin water stored in Canadian reservoirs. All these provisions indicate that the federal project operators and regulators, particularly Bonneville, are expected to ensure that their decisions reflect this program and other requirements related to fish and wildlife.

1202. The Remedy

Program measures as hard constraints

The Council believes that the Northwest Power Act required changes in planning, operations, regulation and other decision-making processes to implement this program and fulfill the Act's fish and wildlife objectives. To address that necessity, the Council has adopted measures designed to ensure that program measures are viewed as hard constraints on the hydroelectric power system to the full extent required by the Act. Bonneville is to act in a manner that is consistent with the program when it signs contracts, grants billing credits, acquires resources, and takes other action pertinent to this program. FERC is to initiate appropriate proceedings to implement program measures promptly at non-federal projects.

All federal project operators and regulators are to integrate program water flow measures into power system rule curves; consider the use of Canadian storage as a source for water for fish flows; and maintain all fish facilities at their projects in good repair. The Council also urges these operators and regulators to develop mutually satisfactory consultation and coordination arrangements with fish and wildlife agencies and tribes. Ultimately, the Council expects the federal project operators and regulators to implement program measures or explain in detail why they cannot do so.

Section 1200

Bonneville funding

The Council concluded that Bonneville funding of program measures requires special attention. It has added measures related to compensation by Bonneville for certain costs and losses of power incurred by non-federal project operators and allocation by Bonneville of the costs of implementing measures at federal projects. The Council has included an explanation of what it means when it specifies that "Bonneville shall fund" a program measure "upon Council approval." In addition, this program recognizes the special concerns that must be taken into account when Bonneville funds program activities on Indian reservations.

1203. Measures

(a) Program Implementation

Constraints

(1) Federal project operators and regulators shall treat this program as a hard constraint in power system planning, operations, regulation and in decision-making under the Pacific Northwest Coordination Agreement. Bonneville shall use its financial and legal authorities in a manner consistent with the program. Federal project operators and regulators shall take each measure in the program into account at each relevant stage of decision-making to the fullest extent practicable and otherwise satisfy the requirements of the Northwest Power Act, including their obligation to provide equitable treatment of fish and wildlife in relation to other project purposes.

(2) Federal project operators and regulators shall integrate relevant fish program measures (such as the water budget, flow requirements and drawdown limitations) into power system rule curves.

(3) With respect to Bonneville, the requirements of Sections 1203(a)(1)-(2) shall apply to relevant decisions on contracts, billing credits, resource acquisitions, environmental cost/benefit analyses, power supply forecasting, rates, power scheduling, intertie arrangements, use of advance energy withdrawals, and other pertinent planning and operations.

Compliance

(4) To take this program into account to the fullest extent practicable as required by the Act, the federal project operators and regulators must provide in a timely manner:

(A) Plans indicating that the agency will implement the program measures, or

(B) Explanations, with supporting information, of why it will not be physically, legally or otherwise possible to implement the program measures, including a description of all possible allowances available to permit implementation.

These written materials shall be provided to interested parties and to the Council for review and comment prior to a final decision.

(b) Use of Canadian Storage Water

In determining the sources of water for fish and power flows, the federal project operators and regulators shall consider the use of Columbia River Basin water stored in Canadian reservoirs as well as such water stored in reservoirs in the United States. If an exchange of notes is necessary to provide release of Canadian storage water, the United States Entity (the Corps of Engineers and Bonneville), under the lead of the U.S. Department of State, shall use its best efforts to accomplish such an exchange. The federal project operators and regulators shall accommodate fish flows in all planning, management and operations conducted under the Columbia River Treaty between the United States and Canada.

(c) Consultation and Coordination

(1) The federal project operators and regulators shall work with the fish and wildlife agencies and tribes to develop mutually satisfactory arrangements for implementing the consultation and coordination requirements in Section 4(h) of the Northwest Power Act. They shall submit proposed consultation and coordination processes to the Council.

(2) Throughout the implementation of this program, the Council expects the following entities to consult to the fullest extent possible at each stage of program implementation, especially in the development of research plans:

(A) The fish and wildlife agencies;

(B) Tribes; and

(C) Project operators and regulators.

The Council expects that study plans will be designed in cooperation with all affected parties. The primary objective of consultation in developing research plans is to reach agreements among all parties on the design, scope and measurement of results used in each of the plans.

(3) The Council will encourage improved coordination of fish and wildlife efforts by consulting with fish and wildlife agencies, Columbia River Basin Indian tribes, federal project operators and regulators, Bonneville customers, federal and state water and land management agencies, irrigation districts, academic experts and interested citizen groups.

(4) The Council recognizes that the activities of the fish and wildlife agencies, Indian tribes, federal project operators and regulators, Bonneville customers, and federal and state water and land management agencies all could affect the success of ratepayer investments in improving salmon and steelhead production. The Northwest Power Act suggests developing agreements to coordinate administration and funding of measures addressing hydropower impacts with activities addressing non-hydropower impacts. The Council encourages such agreements to ensure that non-hydropower activities do not negate the effects of expenditures under the Council's program.

(d) Bonneville Funding

(1) The Council expects Bonneville to initiate appropriate proceedings promptly to respond to any requests for compensation made pursuant to Section 4(h)(11)(A)(ii) of the Northwest Power Act.

Background. Section 4(h)(11)(A)(ii) of the Act states that: "If, and to the extent that [the federal project operators and regulators] as a result of [taking the Council's program into account to the fullest extent practicable at each relevant stage of decision-making processes] impose upon any non-federal electric power project measures to protect, mitigate and enhance fish and wildlife that are not attributable to the development and operation of such project, then the resulting monetary costs and power losses (if any) shall be borne by the [Bonneville] Administrator in accordance with [Subsection 4(h) of the Northwest Power Act]."

(2) Pursuant to the requirements of Sections 4(h)(5)(A) through 4(h)(11) of the Act, Bonneville shall fund those program measures that have been approved for funding by the Council. To promote coordination and efficiency and eliminate duplication, Bonneville shall submit the following to the Council: notices of program interest; requests for proposals; proposed contracts; and a statement explaining how each proposed contract will implement a particular program measure. Bonneville also shall inform the Council of any other fish and wildlife-related activities it plans to conduct and shall provide the Council an opportunity to comment on the design of such projects.

(3) The Council will continue to use its intergovernmental agreement with Bonneville to ensure an expedited review of all funding proposals in accordance with Section 1203(d)(2).

(4) Where the Council has specified in this program that "Bonneville shall fund" program measures at federal projects, Bonneville immediately shall initiate discussions with the appropriate federal project operator and the Council to determine the most expeditious means for funding those measures. The amounts expended by Bonneville pursuant to this program shall be allocated as appropriate by Bonneville, in consultation with the Corps of Engineers and the Bureau of Reclamation, among the various hydroelectric projects of the Federal Columbia River Power system. Those funds shall be allocated to the various project purposes in accordance with existing accounting procedures for the Federal Columbia River Power System.

Background. This provision reflects the requirements of Section 4(h)(10)(C) of the Northwest Power Act as well as the Council's expectation that existing sources of funding, rather than ratepayer funding, may be appropriate for some program measures at federal projects.

(5) Where the Council has specified in this program that Bonneville shall fund a program measure upon Council approval, Bonneville shall fund that measure when the Council approves it for funding purposes. A program amendment will not be required prior to such funding.

Tribal rights

(6) In selecting among alternative means for funding program activities on Indian reservations, Bonneville shall choose a means that fully complements the activities of the affected Indian tribe and recognizes the unique rights and concerns of Indian tribes with respect to reserved Indian lands.

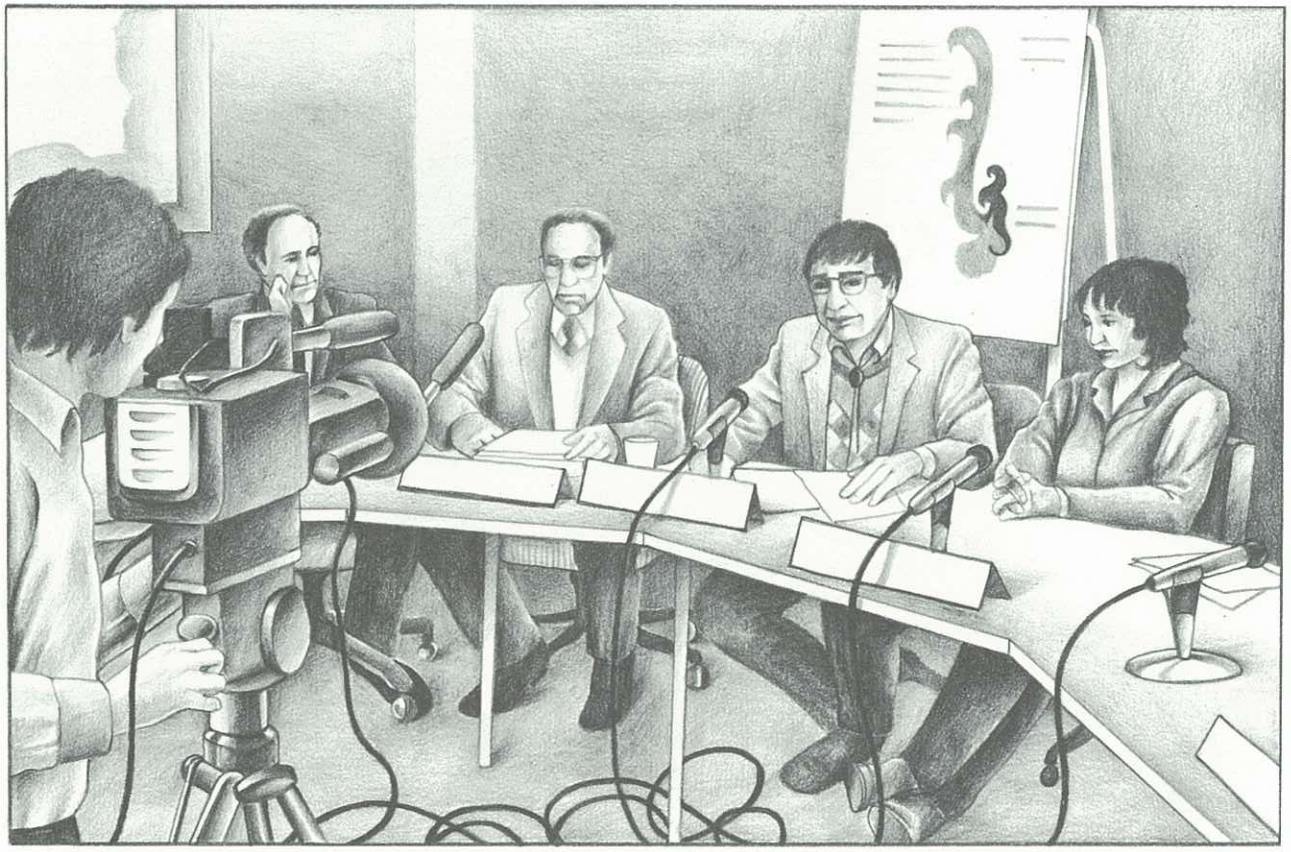
Background. The Council recognizes that Bonneville must carry out its funding responsibilities under the terms of federal law. Among pertinent federal laws are Constitutional provisions, treaties, executive orders, legislation, regulations and court decisions that define the unique rights and concerns of Indian tribes. As a result, the Council expects that the first step in any Bonneville funding on reserved Indian lands would be Bonneville consultation with tribal leaders on all pertinent legal, policy and technical matters.

(7) Monetary costs and electric power losses resulting from the implementation of the program shall be allocated by the Bonneville Administrator consistent with individual project impacts and systemwide objectives of Section 4(h) of the Northwest Power Act.

Section 1300

GENERAL

Amendments



1301. The Problem

Amendment history

Congress gave the Council one year to develop a program that would address the complex and long-term technical, legal, economic and political problems associated with the effects of hydroelectric power development on fish and wildlife in the Columbia River Basin. In 1982, the Council published its fish and wildlife program to respond to these problems. Programwide amendment processes were completed in 1984 and 1987. Amendments of some individual program sections were approved in 1985 and 1986.

The Council is aware, however, that this program is unlikely to please all interested parties or anticipate all implementation problems. If the program is to be effective, the Council must be able to change the program as needed. Also, the program must be improved on the basis of evaluating program measures, research results, changing technology, legal developments, efforts to coordinate the Council's program with programs aimed at non-hydroelectric effects on fish and wildlife and other significant developments.

1302. The Remedy

Resolution of concerns

By law, the Council must open the program for review at least once every five years. In addition to this requirement, the Council has provided for amendment of the program at any time through motion of the Council. Such a motion either may be initiated by the Council itself or may be in response to the recommendations of interested entities or individuals. The Council encourages critics of the program to resolve their concerns by consulting with the Council and undertaking to amend the program, rather than engaging in divisive, time-consuming and expensive court proceedings.

Amendment process

Whether an amendment is proposed by the Council or recommended by another entity, amendments to the program must satisfy the standards established by the Northwest Power Act. [For list of criteria, see Section 102: How the Program Is Developed and Amended.] The amendment process also must satisfy the Act's requirements for public comment and consultation. In addition, the process must accommodate the provision in Section 4(g)(3) of the Northwest Power Act for incorporating objectives of the various states and tribes into the program; the requirement of Section 4(h)(2) that the Council consider program amendments before review or major revision of the Northwest Power Plan; and the direction in Section 4(h)(9) to act on recommendations within one year after they are received.

1303. Measures

(a) Council Motion

The Council on its own motion may consider a program amendment at any time. In doing so, it will provide for public comment, consultation and adherence to the requirements of the Act, as described in Section 1303(d). Any party may request that the Council consider a program amendment on its own motion, by submitting an amendment application as provided for in Section 1303(c). The Council may, at its discretion, choose whether or not to consider such a program amendment. If the Council chooses not to consider a program amendment, the amendment application will be returned by the Council and may be resubmitted during the next review period under Section 1303(b).

(b) Recommendations for Amendments

The Northwest Power Act requires the Council to review the Northwest Conservation and Electric Power Plan at least every five years and to request recommendations to amend the Columbia River Basin Fish and Wildlife Program "prior to the development or review of the plan, or any major revision thereto." The Council may, at its discretion, request recommendations to amend the fish and wildlife program, or any portion of it, more frequently than every five years and independently of revisions to the power plan.

(c) Application Forms

The Council will prepare application forms specifying the Council's requirements for information to amend the program. The application form will require the following items:

(1) A proposed amendment;

(2) A description of how the proposed amendment qualifies as a "recommendation" under Section 4(h)(2) of the Act;

(3) A detailed description of how the proposed amendment would satisfy the standards of Sections 4(h)(5)-(6) of the Act, including:

(A) A description and analysis of all available scientific knowledge related to the proposed amendment;

(B) An estimate of the costs, losses of power and impact on rates, if any, that would result if the amendment were adopted; and

(C) A plan and schedule for funding and implementing the proposed amendment.

(4) A verification of the facts stated in the application, signed by the person who prepared the application and the person authorizing the application; and

(5) If the application is submitted by a state, state subdivision or tribe under Section 4(g)(3) of the Act, a certification that the state, subdivision or tribe has adopted the recommended objective, and Bonneville has reviewed it.

(d) Council Review

(1) The Council will review and then propose action on each application for amendment accepted for consideration. In considering the applications, the Council will consult with appropriate power managers, operators and regulators, fish and wildlife agencies, tribes and Bonneville customers; will provide public notice and an opportunity for comment (in writing and at public hearings) on the proposed Council actions; and will otherwise adhere to the requirements of the Act.

(2) Following public comment and consultation, the Council will act on each recommended amendment by:

(A) Adopting it;

(B) Adopting it with modifications based on the comments and consultations; or

(C) Rejecting it for failure to conform to the statutory standards for program elements.

(3) The Council will act on each recommended amendment within one year after receiving it.

Section 1400

GENERAL

Five-Year Action Plan 1987-1991

1401. The Problem

Sequence of implementation

When it was first adopted in 1982, the Council's Columbia River Basin Fish and Wildlife Program contained more than 220 measures to be implemented. Some of the action items in that program included deadlines for completion. Otherwise, the program set no priorities and left the details of implementation to Bonneville, the other federal implementing agencies, and the fish and wildlife agencies and tribes. Those entities had difficulty agreeing on the appropriate sequence for implementation, scheduling priorities, objectives, and mechanisms for measuring progress and evaluating results. Consequently, implementation of some measures was delayed while priorities were debated. Given the number of program measures and the complexity of their implementation and funding, designation of interim objectives and more definite scheduling direction clearly was warranted.

1402. The Remedy

The program was amended in 1984 to include an Action Plan to provide interim objectives and scheduling direction. In 1987, that section was refined, and the duration was extended to 1991. The Five-Year Action Plan schedules priority activities for Fiscal Years 1987-1991. The Council believes an Action Plan will speed and improve program implementation by:

- Providing a more solid and focused basis for budgeting and planning by the implementing agencies;
- Establishing a clear way to judge the success of program implementation;
- Encouraging the fish and wildlife agencies and tribes to set short-term priorities and begin planning to meet long-term resource needs; and,
- Helping the Council improve its efforts to report to the region and Congress on significant fish and wildlife issues.

The interim goals and objectives for this Action Plan are set forth below.

The Action Plan indicates measures to be implemented within the next five years. Most dates for measures in the other program sections have been deleted. The Action Plan now serves as the primary scheduling section for program implementation. The Council has given serious consideration to priorities and constraints in establishing the Action Plan schedules. It anticipates that the implementing agencies will explore every avenue available to them to ensure that these schedules are met.

The Action Plan does not add new measures to the program nor indicate that measures not in the Action Plan should not be implemented. It is simply a schedule for implementation of priority activities. Program measures not in the Action Plan should be implemented as soon as possible after measures in the Action Plan are completed or as soon as the implementing agency can do so after giving first priority to Action Plan items. All measures will be implemented over time. Parties that want to reschedule measures not in the Action Plan may bring those measures to the attention of the Council by using the amendment process. [See Section 1300: Amendments.]

Flexibility

Dynamic Action Plan

The Council chose a five-year action period to take into account the planning and budgeting requirements of the federal implementing agencies and the lead time needed for major capital

expenditures on construction of fish screens, bypass systems and hatcheries. The Council recognizes that it will not be able to anticipate all scheduling difficulties for the next five years. It also appreciates the importance of maintaining a dynamic action plan that can be changed to accommodate new information, technological advances and unforeseen problems, solutions and needs. These will be identified in regular program monitoring and upon completion of the system-wide planning of salmon and steelhead efforts, the protected areas study, and other major planning efforts.

The Council plans to review and update the Action Plan periodically to ensure that the schedules remain feasible and to reflect other changing circumstances. The amendment process allows the Council to update and extend the Action Plan as needed. [See Section 1300: Amendments.] The Council can amend the program, including the Action Plan, on its own motion in 60 days or less in the case of an emergency.

Action Parties

Implementors

The Council has identified action items to be implemented by Bonneville, the Corps, the Bureau of Reclamation and FERC, which are the four federal agencies charged with program implementation under the Northwest Power Act. [See Section 104: Role of the Council and Other Agencies.] The actions of those agencies must complement the activities of the fish and wildlife agencies and tribes charged with enhancement and harvest management responsibilities in the Columbia River Basin. The Council also has identified key activities to be undertaken by the fish and wildlife agencies, tribes and by the Council itself. Communications and coordination with federal and state land and water management agencies and with members of fishing groups and other interested citizens also are crucial to the success of the program.

Interim Goals and Objectives

Salmon and Steelhead

Doubling runs

The Northwest Power Act places a special emphasis on the Columbia River Basin's anadromous fish because of their particular importance to the social and economic well-being of the Pacific Northwest and the nation. This Action Plan reflects that emphasis. As stated in Section 200: Salmon and Steelhead Framework, the interim goal for salmon and steelhead is to double the runs in a biologically sound manner. In the next five years, the Council will emphasize these objectives in aiming toward achieving that goal:

- Support systemwide planning of future enhancement efforts.
- Improve mainstem flows.
- Improve survival at mainstem hydroelectric facilities.
- Increase production through a selective mix of off-site enhancement measures.
- Support harvest management that aids rebuilding of runs.
- Improve monitoring, evaluation and research.
- Support conditions on new hydroelectric development to protect salmon and steelhead and their habitat.

Wildlife and Resident Fish

The Action Plan addresses the need to protect, mitigate and enhance wildlife to the extent it has been affected by hydroelectric operation and development. The Action Plan calls for continued mitigation planning; initiation of two major mitigation efforts to address the effects of Hungry Horse and Libby dams in Montana; and continued conditions on new hydroelectric development to avoid adverse effects on wildlife.

For resident fish, the Action Plan proposes actions where conflicts with anadromous fish goals would be nonexistent or inconsequential; where significant biological gains can be achieved; and where a clear link to the effects of hydropower development and operation can be identified. The Action Plan calls for particular emphasis on resident fish measures in Montana and in the areas blocked to salmon and steelhead production by hydropower development and operation above Chief Joseph and Hells Canyon dams. It also continues to call for conditions on new hydroelectric development to protect resident fish.

Format

The Action Plan includes no measures not already adopted by the Council in the other program sections. As a result, the action items are abbreviated summaries of program measures. Cross-references to the complete program measures are in brackets after each action item. Reference to the complete measure is needed for a full understanding of the action expected.

1403. Action Items

1. Support systemwide planning of future enhancement efforts.

To achieve the salmon and steelhead goal of doubling the runs, a systemwide planning effort will be needed to ensure integration and consistency with that goal and associated policies. System planning will include planning at the subbasin level to identify local opportunities for and constraints on future enhancement efforts.

Fish and Wildlife Agencies and Tribes Actions

1.1 Submit a proposed work plan for system planning to the Council by May 1987. Include a proposed budget identifying requests for Council funding and proposals for fish and wildlife agency and tribal funding or support. [Section 205 and Appendix A.]

1.2 Submit system plans to the Council in Fiscal Year 1989. [Section 205 and Appendix A.]

Council Actions

1.3 Review and approve a work plan for system planning after public review and consultation on the proposed work plan developed by the fish and wildlife agencies and tribes. Share costs of carrying out the work plan with the fish and wildlife agencies and tribes. [Section 205 and Appendix A.]

1.4 Consult regularly with policy leaders on major issues raised in system planning. [Section 205 and Appendix A.]

2. Improve mainstem flows.

Implementation of the water budget is under way and will continue throughout the next five years. The Council considers long-term evaluation and resolution of implementation problems to be essential. The Council also recognizes the need for adequate flows during other periods of the year to protect salmon and steelhead.

The objectives for the next five years are to provide flows in the mainstem Columbia and Snake rivers during the April 15 through June 15 migration period to shorten smolt travel time, and to continue to evaluate water budget effectiveness. Emphasis should be placed on the need for sound biological information. Annual evaluation and monitoring of smolt migration and travel times also is expected to continue. One long-range goal is to provide necessary information to determine whether the present water budget is successful in improving smolt survival.

The Council supports efforts by the federal project operators to evaluate the feasibility of improving water budget flows by modifying flood control requirements, constructing new reservoirs, and using uncontracted storage water. The Council recognizes that a number of implementation issues remain unresolved. The Council plans to work with all parties to evaluate alternative water budget accounting and implementation procedures and to help resolve disputes.

Bonneville Actions

2.1 Continue to implement water budget measures, including funding of fish passage managers and, if necessary, tribal coordination expenses. [Sections 303(a)-(c).]

2.2 Continue to fund the smolt monitoring program. [Section 303(d).]

Bureau of Reclamation Actions

2.3 Continue to implement water budget measures. [Sections 303(a)-(c).]

2.4 By November 1988, provide a report to the Council evaluating the feasibility of constructing new reservoirs and using uncontracted stored water to provide improved water budget flows, particularly in the Snake River Basin. [Sections 703(a)(14)(B)-(C).]

Corps Actions

2.5 Continue to implement water budget measures and coordinate with the fish passage managers. [Sections 303(a)-(c).]

2.6 Provide a report evaluating the feasibility of modifying flood control rule curves and constructing new reservoirs to provide improved water budget flows, particularly in the Snake River Basin. Report on rule curve modifications by November 1987. Report to the Council on all items by November 1988. [Sections 303(a)(6) and 703(a)(14)(A)-(B).]

FERC Action (Grant County PUD)

2.7 Provide suitable flows for spawning, incubation and emergence of fall chinook salmon on Vernita Bar below Priest Rapids Dam. Continue flow studies and monitoring in cooperation with all involved parties. [Sections 703(a)(1)-(4).]

Fish Passage Managers Action

2.8 Provide an annual report by November 1 of each year. Provide a smolt monitoring program by December 1 of each year. [Sections 303(c)-(d).]

Council Action

2.9 Continue to evaluate water budget reports; review results of alternative water budget implementation procedures; and help resolve water budget disputes. [Sections 303(c)(1) and (e)(1)-(2).]

3. Improve survival at mainstem hydroelectric facilities.

This section outlines actions for improving adult and juvenile passage at mainstem hydroelectric projects through use of spill, mechanical bypass systems, fishway operating procedures and other means. During the next five years, particular emphasis must be placed upon actions that improve passage and survival at all mainstem projects. Thus, a high priority is assigned to installation and evaluation of juvenile and adult passage systems at those projects.

Early resolution of mainstem passage problems is a prerequisite to rebuilding upriver runs and protecting ratepayer investments in upriver mitigation and enhancement activities. To evaluate the success of measures in this part of the Action Plan, passage plans for individual projects are called for, along with annual systemwide passage plans that combine and coordinate the individual plans. Selected tributary passage work also is included in this section.

Bonneville Action

3.1 Test and evaluate an alternative conduit system for juvenile fish by November 15, 1987. Report results to the Council by January 1988. [Section 403(d)(2).]

Corps Actions

3.2 *All projects except Bonneville Dam.*

3.2.1 Implement an annual smolt transportation program according to provisions developed by the fish and wildlife agencies and tribes. [Section 403(b)(12)(A).]

3.2.2 Complete construction of new fish transportation barges by April 1, 1989. [Section 403(b)(12)(B).]

3.2.3 Implement research to evaluate the benefits of smolt transportation as specified in Section 403(b)(12)(C).

3.2.4 Develop and implement a coordinated systemwide annual juvenile passage plan to achieve at least a 90 percent smolt survival level at each project as specified in Section 403(b)(1), including provisions for variable spill levels to achieve greater than 90 percent smolt survival in years when water is above the critical level. Submit the plan to the Council by March 1 and implement it by April 1 of each year. [Sections 403(b)(1)-(12).]

3.2.5 Incorporate studies to investigate spill effectiveness and hourly fish passage patterns into the five-year research work plan. [See Section 206(c) and action item 6.6.] These studies shall be consistent with the research program in Section 206.

3.2.6 Continue to implement adult fish flow, spill and fishway criteria and evaluate measures to protect adult passage at each project. [Sections 603(a)(1)-(3), (b)(1)-(2).]

3.3 *Bonneville Dam*

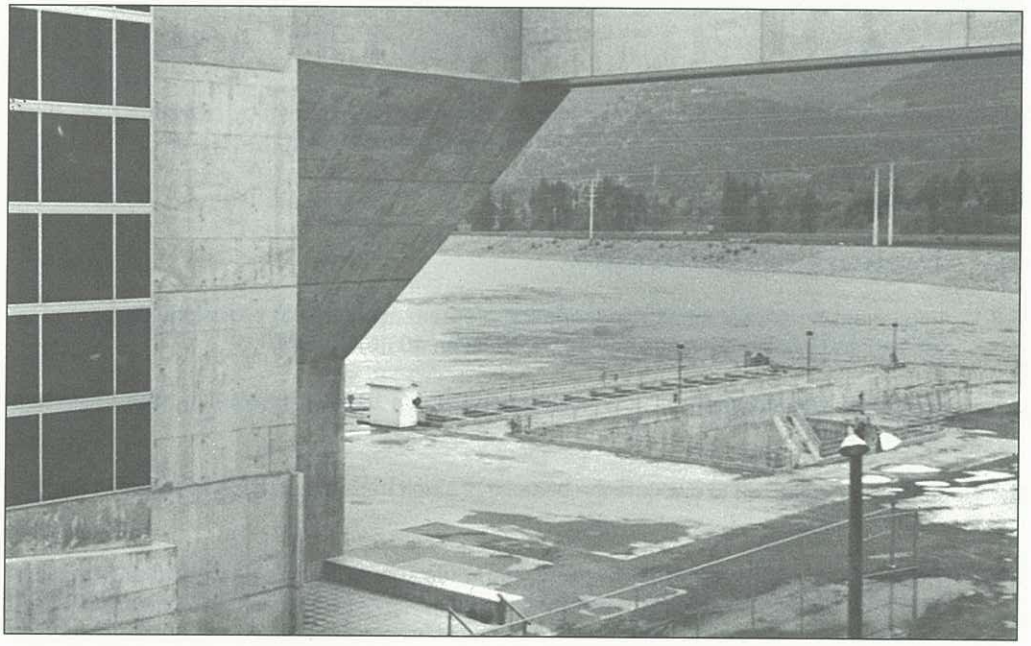
3.3.1 Develop and submit to the Council a coordinated interim juvenile passage plan by March 1 and implement the plan by April 1 each year until problems with juvenile fish passage efficiency at the second powerhouse are resolved. [Section 403(b)(6).]

3.3.2 For Bonneville Dam second powerhouse, continue feasibility studies on alternative methods to improve juvenile fish guidance. By January 1988, provide to the Council a status report that includes a work schedule and costs for modifications, with expected incremental fish guidance improvement. Continue to provide such status reports to the Council annually until an 85 percent juvenile fish passage efficiency is achieved. [Section 403(b)(6).]

3.4 *The Dalles Dam*

3.4.1 Develop and submit to the Council a coordinated interim juvenile passage plan each year by March 1. Implement the plan by April 1 each year until a bypass system is installed. [Sections 403(b)(1) and (5).]

3.4.2 Complete biological and prototype testing of extended turbine intake screens by April 1991. [Section 403(b)(5)(B).]



3.4.3 Complete the design and installation of a juvenile fish screening and bypass system by April 1, 1993. [Section 403(b)(5)(C).]

3.5 *John Day Dam*

3.5.1 Develop and submit to the Council a coordinated interim juvenile passage plan each year by March 1. Implement the plan by April 1 of each year. [Section 403(b)(4).]

3.5.2 Complete installation of a juvenile fish screening and bypass system by March 30, 1987. [Section 403(b)(3).]

3.5.3 Continue to evaluate and improve the effectiveness of the juvenile bypass system. [Section 403(b)(3).]

3.6 *McNary Dam*

3.6.1 Continue to evaluate and improve the effectiveness of the juvenile bypass system. [Section 403(b)(2).]

3.6.2 Develop and submit to the Council by April 1988 a feasibility study of alternative juvenile fish collection and holding facilities, including estimated costs, survival levels, recommendations for a preferred alternative and an implementation schedule for installation of the expanded facilities. [Section 403(b)(12).]

3.6.3 Complete design and installation of expanded juvenile fish collection and holding facilities by April 1, 1993. [Section 403(b)(11).]

3.6.4 Complete design and installation of an extended-length screening system by April 1, 1994. [Section 403(b)(2).]

3.7 *Ice Harbor Dam*

3.7.1 Develop and submit a coordinated interim juvenile passage plan to the Council each year by March 1. Implement the plan by April 1 each year until a bypass system is installed. [Sections 403(b)(1) and (b)(10)(A).]

3.7.2 Complete biological and prototype testing by September 30, 1987. [Section 403(b)(10)(C).]

3.7.3 Complete a sluiceway injury and mortality study after fish and wildlife agencies and tribes approve the use of research fish for the study. [Section 403(b)(10)(B).]

3.7.4 Develop and submit to the Council by May 1, 1987, a feasibility study of alternative juvenile fish passage plans, including estimated costs and survival levels, recommendations and an implementation schedule for installation of a permanent bypass system. [Section 403(b)(10)(D).]

3.7.5 Complete design and installation of a juvenile fish screening and bypass system by April 1, 1990. [Section 403(b)(10).]

3.7.6 Complete design and installation of a new juvenile fish bypass channel by April 1, 1991. [Section 403(b)(10).]

Section 1400

3.8 *Lower Monumental Dam*

3.8.1 Develop and submit to the Council an annual coordinated interim juvenile passage plan by March 1 each year. Implement the plan by April 1 each year until a bypass system is installed. [Sections 403(b)(1) and (b)(9)(A).]

3.8.2 Develop and submit to the Council by April 1, 1987, a feasibility study of a juvenile fish bypass system, including estimated costs and survival levels, recommendations for a preferred alternative and an implementation schedule for installation of a permanent screening and bypass system. [Section 403(b)(9)(B).]

3.8.3 Design and install a powerhouse screening and bypass system by April 1, 1990. [Section 403(b)(9).]

3.8.4 If feasible and appropriate, design and install holding and loading facilities for juvenile fish transportation by April 1, 1991. [Sections 403(b)(9)(B) and (b)(12)(A).]

3.9 *Little Goose Dam*

3.9.1 Incorporate results of Bonneville's alternative conduit system study in the design of scheduled bypass system improvements. Coordinate the study with Bonneville. [Sections 403(b)(8) and (d)(2).]

3.9.2 Continue to evaluate and improve the effectiveness of the juvenile bypass system. Complete ongoing engineering feasibility study and initial design of test deflector and gate-raise modifications to improve fish guidance efficiency in Fiscal Year 1987. [Section 403(b)(8).]

3.9.3 Schedule final design and structural modifications so that improved juvenile fish bypass, collection and holding facilities are completed and operational by April 1, 1989. [Sections 403(b)(8) and (11).]

3.10 *Lower Granite Dam*

3.10.1 Continue to evaluate and improve the effectiveness of the juvenile bypass system. Complete ongoing engineering feasibility study and initial design of test deflector and gate-raise modifications to improve fish guidance efficiency in Fiscal Year 1987. [Section 403(b)(7).]

3.10.2 Schedule final design and structural modifications so that improved juvenile fish bypass facilities are completed and operational by April 1, 1989. [Sections 403(b)(7) and (11).]

FERC Actions

3.11 *Grant County Public Utility District (PUD)—Priest Rapids/Wanapum Dams*

3.11.1 Continue short-haul transport research at Priest Rapids Dam. [Sections 403(a)(4)-(5).]

3.11.2 Develop a prototype turbine intake deflection screening and bypass system at Priest Rapids Dam. Conduct tests of the prototype bypass system. [Section 403(a)(3)(A).]

3.11.3 Continue spill effectiveness tests at Wanapum Dam to evaluate the forebay guidance net. [Sections 403(a)(3)(B) and (a)(10).]

3.11.4 Develop an analysis of bypass alternatives and a schedule for installation of turbine intake deflection screening and bypass system, or other equally effective bypass system, at Priest Rapids and Wanapum dams. Complete and submit a schedule when approved by the Mid-Columbia Coordinating Committee.[1] [Section 403(a)(3).]

3.11.5 Evaluate short-haul transportation versus turbine bypass collection test results. Coordinate with the fish and wildlife agencies and tribes. [Sections 403(a)(4)-(9).]

3.11.6 Install permanent juvenile bypass systems by March 20, 1988, at Priest Rapids and Wanapum dams, or by another date as specified by the Mid-Columbia Coordinating Committee. [Sections 403(a)(3)-(9).]

3.12 *Chelan County PUD—Rocky Reach and Rock Island Dams*

3.12.1 Continue design and modeling studies at Rock Island Dam to determine the most effective bypass system. [Section 403(a)(2)(A).]

3.12.2 Develop an analysis of bypass alternatives and a schedule for installation of a turbine intake deflection screening and bypass system, or other equally effective bypass system, at Rock Island Dam. Report results of analysis and provide a schedule for implementation to the Council by January 1988. [Section 403(a)(2).]

3.12.3 Continue bypass system prototype testing and evaluation at Rocky Reach Dam. [Section 403(a)(2)(A).]

3.12.4 Install permanent juvenile bypass system at Rocky Reach Dam by March 20, 1989, or by another date as specified by the Mid-Columbia Coordinating Committee. [Section 403(a)(2)(B).]

3.13 *Douglas County PUD—Wells Dam*

3.13.1 Continue prototype spillway bypass system development and juvenile fish passage testing. [Section 403(a)(1).]

3.13.2 Install permanent juvenile passage modifications by March 20, 1988, or by another date as specified by the Mid-Columbia Coordinating Committee. [Section 403(a)(1)(C).]

3.14 *All Mid-Columbia Projects (Grant, Chelan and Douglas Counties PUDs)*

3.14.1 Develop and implement annual juvenile passage plans in accordance with the terms of the 1984-87 FERC mid-Columbia settlement agreement and Section 403(a)(10).

3.14.2 Develop and implement adult fishway operating criteria. [Sections 603(a)(1)-(2) and (b)(1).]

3.14.3 Continue to evaluate adult fish counts as needed. [Section 603(d)(1).]

3.14.4 Consult and coordinate with all interested parties on all mid-Columbia passage, flow and spill measures. [Section 403(a)(11).]

1. This committee includes representatives of the fish and wildlife agencies, Indian tribes, mid-Columbia public utility districts and power purchasers.

Fish and Wildlife Agencies and Tribes Action

3.15 In consultation with the Corps of Engineers, develop provisions for annual transportation of salmon and steelhead smolts by the Corps, as specified in Section 403(b)(12)(A). Submit these provisions to the Corps of Engineers by January 15 of each year. [Section 403(b)(12)(A).]

4. Increase systemwide production capability through a selective mix of off-site enhancement measures.

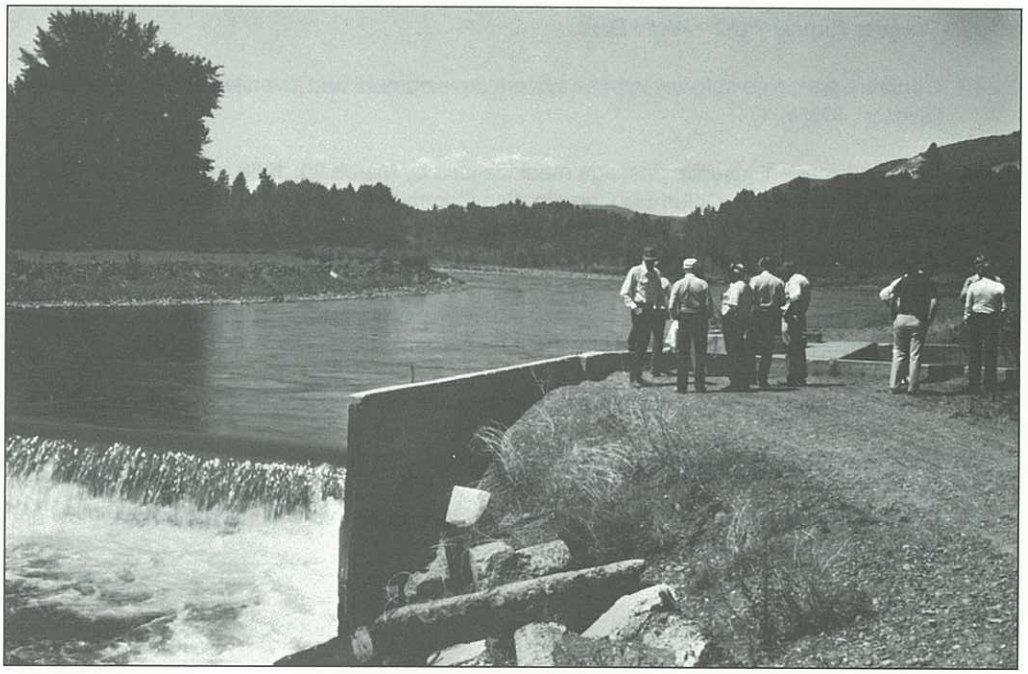
In the next five years the Council expects the production capability of the basin to improve through a mix of off-site enhancement measures. The particular emphasis of these measures is to improve all stocks of fish, but especially those that are wild or naturally spawning stocks and those that are not subject to substantial ocean harvest, such as upper Columbia spring chinook and Snake River summer chinook, steelhead and sockeye.

To provide a mix of measures, the following program areas will be emphasized: 1) habitat and passage restoration; 2) improved production practices at existing hatcheries; 3) new production facilities; and 4) development of cooperative hatchery reprogramming.

Habitat and Passage Restoration

Bonneville Actions

4.1 Design fishway and bypass for Ellensburg Town Diversion Dam by October 1987, and complete construction by October 1988. Delay in this schedule may be acceptable if consolidation with other districts proves feasible and would provide greater biological benefits. [Sections 803(b)(6) and 1203(d)(4).]



4.2 Consult with the project sponsors to determine whether the following projects are needed in the immediate future. If they are, complete them by 1991. [Sections 205, 703(c)(1), 803(b)-Table 2, and Appendix A Table.]

Habitat and Tributary Passage Projects (action item 4.2)

Subbasin	Bonneville Project Number	Title
COLUMBIA RIVER BASIN BELOW BONNEVILLE DAM:		
Willamette Subbasin	84-011	■ Collawash Falls Passage ■ Fish Creek, Wash Creek Habitat Improvement ■ Fish Creek Evaluation ■ Hot Springs Fork Passage and Habitat Improvement ■ Oak Grove Habitat Improvement
COLUMBIA RIVER BASIN ABOVE BONNEVILLE DAM:		
Hood River Subbasin	84-011	■ Lake Branch Creek Habitat Improvement
	84-011	■ Fifteenmile Creek Habitat Improvement (U.S. Forest Service)
	86-79	■ Fifteenmile Creek Habitat Improvement (Oregon Department of Fish and Wildlife)
Deschutes Subbasin	81-108	■ Warm Springs Habitat/Production Potential Assessment
	86-121	■ Trout Creek Enhancement—Implementation
John Day Subbasin	84-008	■ North Fork John Day River Habitat Improvement ■ North Fork John Day River Tributaries Habitat Improvement
	84-021	■ Mainstem John Day River Habitat Improvement ■ Middle Fork John Day River Habitat Improvement ■ North Fork John Day River Habitat Improvement
	84-022	■ Mainstem and Upper John Day River Habitat Improvement
	85-071	■ Izee Falls Passage
Umatilla Subbasin	83-436	■ Threemile Dam Passage
	87-100	UMATILLA HABITAT IMPROVEMENTS: ■ Meacham Creek Habitat Improvement ■ North Fork Meacham Creek Habitat Improvement ■ Birch Creek Habitat Improvement ■ East Fork Birch Creek Habitat Improvement ■ West Fork Birch Creek Habitat Improvement ■ Buckaroo Creek Habitat Improvement ■ Ryan Creek Habitat Improvement ■ Mainstem Umatilla River Habitat Improvement

Habitat and Tributary Passage Projects (action item 4.2) *(continued)*

		■ North Fork Umatilla River Habitat Improvement ■ South Fork Umatilla River Habitat Improvement ■ Squaw Creek Habitat Improvement
	87-104	PASSAGE IMPROVEMENTS, UMATILLA RIVER WATER DIVERSIONS: ■ Threemile Dam (West Extension) Upstream and Downstream Passage Improvements ■ Westland Smolt Trapping Facility Expansion ■ Umatilla Adult and Smolt Trucking Program Expansion ■ Westland Diversion Upstream and Downstream Passage Improvement ■ Stanfield Diversion Upstream and Downstream Passage Improvement ■ Cold Springs Diversion Upstream and Downstream Passage Improvement ■ Maxwell Diversion Upstream and Downstream Passage Improvement
Yakima Subbasin	86-075	■ Little Naches River Passage YAKIMA RIVER PASSAGE IMPROVEMENTS:[2] ■ Prosser Screens and Ladders (USBR) ■ Roza Screens and Ladders (USBR) ■ Easton Screens and Ladders (USBR) ■ Ellensburg Town Diversion Dam Screens and Ladders (USBR/BPA) ■ Westside Screen (BPA) ■ Thorpe Mill Screen (BPA/USBR) ■ Old Reservation Canal Screen (BPA) ■ Marion Drain Ladder (BPA) ■ Taneum Creek Screens and Ladders (BPA/USBR) ■ Snipes/Allen Screen (BPA)
Clearwater Subbasin	84-005	■ Red River Habitat Improvement ■ Crooked River Habitat Improvement
	87-112	■ Orofino Creek Passage
Grande Ronde Subbasin	84-009[3]	■ Upper Grande Ronde and Tributaries Habitat Improvement ■ Joseph Creek and Tributaries Habitat Improvement (USFS)
	84-025[3]	■ Upper Grande Ronde and Tributaries Habitat Improvement ■ Joseph Creek and Tributaries Habitat Improvement (ODFW)

2. Action on the Yakima passage improvements is a coordinated effort of Bonneville (BPA), the Bureau of Reclamation (USBR) and the Bureau of Indian Affairs (BIA). [See Section 1203(d)(4).] As specified in action items 4.1, 4.3, 4.4 and 4.5, these projects are to be completed in 1987 and 1988, not 1991 as specified for other projects in this action item.

3. The U.S. Forest Service (USFS) and the Oregon Department of Fish and Wildlife (ODFW) are each sponsoring separate improvement projects in these areas.

Habitat and Tributary Passage Projects (action item 4.2) (continued)

	87-115	■ Grande Ronde Monitoring
Salmon Subbasin	83-07	■ South Fork Salmon River Tributaries Fish Passage
	83-359	■ Bear Valley Creek Habitat Improvement ■ Yankee Fork Jordan Creek Habitat Improvement ■ East Fork Salmon River Habitat Improvement
	83-415	■ Alturas Lake Creek Passage ■ Upper Salmon River Passage
	84-023	■ Camas Creek Habitat Improvement
	84-024	■ Marsh Creek Habitat Improvement ■ Elk Creek Habitat Improvement ■ Upper Salmon River Habitat Improvement ■ Bear Valley Creek Habitat Improvement ■ Valley Creek Habitat Improvement
	84-028	■ Lemhi River Rehabilitation
	84-029	■ Panther Creek Habitat Evaluation

Projects may be delayed or deleted from this list upon showing the Council, in program amendment proceedings, that feasibility studies or other new scientific information indicate that the project will not protect, mitigate or enhance salmon or steelhead nor otherwise meet the standards of the Northwest Power Act. Additional projects from the Appendix A Table: Planning Inventory of Enhancement Projects may be added to this list upon completion of system and subbasin planning, if consistent with those plans.

Bonneville and Bureau of Reclamation Actions

4.3 Complete construction of juvenile fish passage facilities at Roza Dam by March 1, 1987. Complete construction of adult facilities by March 1, 1988. [Sections 803(b)(2) and 1203(d)(4).]

4.4 Complete construction of juvenile fish passage facilities at Prosser Dam by March 1, 1987. Complete construction of adult facilities by December 1, 1987. [Sections 803(b)(3) and 1203(d)(4).]

4.5 By December 1, 1988, complete construction of all Yakima River fish passage improvements listed in Table 2 of Section 803(b). Perform post-construction evaluations to determine the success of passage improvements. [Sections 803(b) and 1203(d)(4).]

4.6 Beginning in the spring of 1987, provide power or repay operating and maintenance costs and carry out related tasks associated with the implementation of a water exchange to improve instream flows in the Umatilla River in coordination with the Oregon Department of Fish and Wildlife, the Oregon Water Resources Department and the Confederated Tribes of the Umatilla Reservation of Oregon, as specified in Section 703(a)(17). [Section 703(a)(17).]

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Bureau of Reclamation Actions

4.7 Provide minimum flows for fish in the Yakima Basin. [Section 803(c)(1).]

4.8 Include a report on progress in examining the feasibility of new storage in the John Day and Umatilla basins to provide instream flows for anadromous fish in the annual progress report submitted under action item 10.2. [Section 703(a)(18).]

FERC Actions

4.9 *Pacific Power and Light Company*

4.9.1 Provide for construction of passage facilities at Condit Dam by November 15, 1991. [Section 703(c)(2).]

4.10 *Portland General Electric Company*

4.10.1 Complete juvenile bypass system studies at Marmot Dam and the Sullivan Plant and propose corrective action. [Sections 403(c)(1)-(2).]

4.11 *Eugene Water and Electric Board*

4.11.1 Complete changes or modifications to the bypass system at the Leaburg Canal facility by November 15, 1987. [Section 403(c)(4).]

4.11.2 Report to the Council on juvenile migrant bypass facilities studies at the Walterville Canal power project by November 15, 1987. Install facilities by November 15, 1989. [Section 403(c)(5).]

Council Actions

4.12 Consult on a regular basis on water conservation, storage and flows in the Yakima Basin. [Sections 803(a) and (c).]

4.13 Continue monitoring of passage work under Section 803(b).

Production Facilities and Practices

Bonneville Actions

4.14 *John Day acclimation facility*

4.14.1 Upon approval by the Council of the plan prepared by the fish and wildlife agencies and tribes (action item 4.19.1), complete construction of temporary facilities by spring 1988. [Section 703(f)(2).]

4.15 *Yakima hatchery*

4.15.1 Upon approval by the Council of the master plan (action item 4.20), fund design and construction beginning in Fiscal Year 1988. [Section 703(f)(3).]

4.16 *Northeastern Oregon spring chinook outplanting facilities*

4.16.1 Fund development of a master plan for northeastern Oregon production and outplanting facilities in Fiscal Year 1988 or earlier. [Section 703(f)(5)(A).]

4.16.2 Upon Council approval of the master plan, fund design, engineering and construction of facilities. [Section 703(f)(5)(B).]

4.17 *Other production facilities*

4.17.1 Operate and maintain juvenile release and adult collection and holding facilities on the Umatilla Reservation. [Section 703(f)(1).]

4.17.2 Upon Council approval of the Umatilla hatchery master plan, fund construction of the expanded facility. [Section 703(f)(1).]

4.17.3 Design low-capital production facility on the Nez Perce Reservation, and initiate construction by May 1989. [Section 703(g)(2).]

4.17.4 Fund the habitat survey associated with action item 4.17.3. [Section 703(c)(3).]

4.17.5 Fund the Willamette Basin Study Plan. Coordinate this study with the supplementation work plan to be developed under Section 206(b)(1)(D). [Section 703(h)(2).]

4.17.6 Upon Council approval of the master plan, fund propagation of salmon and/or steelhead in the Pelton Dam fish ladder. [Section 703(g)(3).]

Fish and Wildlife Agencies and Tribes Actions

4.18 Prepare master plans for Council approval for the expanded Umatilla hatchery and the new Pelton Dam fish ladder production. [Sections 703(f)(1)(A) and (g)(3).]

4.19 *John Day acclimation facilities*

4.19.1 Provide the Council with the site survey report and a plan for design, construction and monitoring of John Day acclimation ponds by September 1987. [Section 703(f)(2).]

4.19.2 Report to the Council on the results of the monitoring studies conducted to determine the effectiveness of acclimation ponds in improving adult smolt survival. [Section 703(f)(2).]

Council Actions

4.20 Review master plans for the Yakima and Umatilla outplanting facilities, the Pelton Dam fish ladder and the northeastern Oregon production facilities. [Sections 703(f)(1), (f)(3)(B), (f)(5)(B) and (g)(3).]

Cooperative Reprogramming

Bonneville Action

4.21 Upon Council review of a reprogramming plan developed by the fish and wildlife agencies and tribes, fund hatchery releases in the upper Columbia to assist in restoring naturally spawning stocks. [Section 703(d)(2).]

Fish and Wildlife Agencies and Tribes Action

4.22 Submit to the Council a joint plan for reprogramming hatchery operations. [Section 703(d)(1).]

Council Action

4.23 Review the joint plan for reprogramming lower river hatcheries developed by the fish and wildlife agencies and tribes. [Section 703(d)(1).]

5. Support harvest management that aids rebuilding of upriver runs.

As described in Sections 200 and 500, harvest management and regulation must support the ratepayers' investments in mainstem improvements and in production. The Council's five-year objective is to support controls on harvest as needed to help significant rebuilding of Columbia River Basin salmon and steelhead runs.

Bonneville Actions

5.1 Share funding with the fishery management agencies for continuation of a five-year demonstration program to determine the effectiveness of using electrophoresis as a fishery management tool. (This program began in 1985.) [Section 503(b)(1).]

Fish and Wildlife Agencies and Tribes Actions

5.2 In round-table discussions, report to the Council on escapement objectives, harvest levels and regulations for all runs and their relationship to the program goal and policies. [Sections 203 and 204.]

5.3 Report to the Council on the effectiveness of known-stock fishery demonstration programs funded pursuant to Section 503(b)(3). [Section 503(b)(3).]

Council Actions

5.4 Consult on harvest management issues prior to establishment of harvest seasons. [Section 503(a)(1).]

5.5 Consult on the development of the management plan required by the Salmon and Steelhead Conservation and Enhancement Act of 1980 (16 U.S.C. 3311). [Section 503(a)(1).]

5.6 Monitor United States/Canada Pacific Salmon Treaty implementation to encourage maximum consistency with the Council's fish and wildlife program. Provide testimony and comment as needed. [Section 503(a)(1).]

6. Improve monitoring, evaluation and research.

The program establishes principles for salmon and steelhead research; identifies areas for allocation of research funds during the next five years; and establishes criteria for developing a monitoring and evaluation program to assess long-term research needs. The Council also calls for establishment of technical work groups and the development of five-year work plans to further research efforts.

Bonneville Actions

6.1 In Fiscal Year 1987, begin to fund establishment of technical work groups to carry out the tasks identified in Section 206(b).

6.2 In Fiscal Year 1988, begin to fund research in the five-year work plans as approved by the Council. [Sections 206(b), 403, 703(e) and (h).]

6.3 Fund data collection for a hatchery data base as approved by the Council in response to proposals developed by the system monitoring and evaluation work group. [Section 206(e).]

6.4 Fund data collection for a natural production data base as approved by the Council in response to proposals developed by the system monitoring and evaluation work group. [Section 206(e).]

6.5 In Fiscal Year 1987, pending development of five-year work plans in areas of emphasis for research under Section 206(b), fund only high-priority projects in the areas of emphasis. [Section 206(b).]

Corps Action

6.6 Continue to implement the research planning process through the Fish Passage Development and Evaluation Program, as provided in Section 206(c). By August 1987, submit to the Council five-year work plans, developed in coordination with Bonneville-funded technical work groups. [Sections 206(b)-(c).]

Bonneville-funded Technical Work Groups

6.7 By August 1987, submit to the Council five-year work plans for each of the areas of emphasis listed in program Section 206(b)(1). [Section 206(b)(1).]

Council Actions

6.8 Review five-year work plans in the six areas of emphasis for research. [Sections 206(b)-(c).]

6.9 Sponsor annual and five-year round-table discussions with project operators, Bonneville, harvest managers, hatchery managers, fish and wildlife managers, and land and water managers. [Section 204.]

6.10 Implement the System Monitoring and Evaluation Program beginning in Fiscal Year 1987. [Section 206(d).]

6.11 Prior to revision of its Northwest Power Plan, and at least every five years, the Council will request recommendations for amendment of the Columbia River Basin Fish and Wildlife Program. [Section 1303(b).]

Bonneville, Bureau of Reclamation, Corps and FERC Action

6.12 All federal project operators and regulators shall continue to coordinate and consult, as indicated in Section 1203.

7. Implement resident fish projects in priority areas.

Activities in the resident fish area will be limited over the next five years to projects that do not conflict with anadromous fish measures and that directly address losses due to hydroelectric development. Emphasis will be given to projects that substitute resident fish for lost salmon and steelhead in areas above Chief Joseph and Hells Canyon dams and that address resident fish needs in Montana as a result of the development and operation of Hungry Horse and Libby dams. The Council also will continue to support conditions to protect resident fish from new hydroelectric development.

Section 1400

Resident Fish Substitution Projects

Bonneville Actions

7.1 Complete construction of the Colville hatchery by March 1989. Fund operation and maintenance of the hatchery. [Section 903(g)(1)(A).]

7.2 Fund stream survey; the design, construction, operation and maintenance of a cutthroat and Dolly Varden (bull trout) hatchery on the Coeur d'Alene Reservation; habitat improvement projects; and a three-year monitoring program. [Section 903(g)(1)(B).]

7.3 Fund design, construction, operation and maintenance of kokanee salmon hatcheries at Galbraith Springs and at Sherman Creek, starting in Fiscal Year 1988. Fund monitoring programs to evaluate the effectiveness of this action. [Section 903(g)(1)(C).]

7.4 Fund design, construction, operation and maintenance for habitat and passage improvement projects on Lake Roosevelt tributary streams, starting in Fiscal Year 1989. Fund monitoring programs to evaluate the effectiveness of this action. [Section 903(g)(1)(D).]

7.5 Fund design, construction and operation of a sturgeon hatchery on the Kootenai Indian Reservation, starting in Fiscal Year 1988. Fund an evaluation study for the effectiveness of the hatchery. [Section 903(g)(1)(H).]

7.6 Fund a study to assess the impact of water-level fluctuations on sturgeon in the Idaho portion of the Kootenai River, starting in Fiscal Year 1989. [Section 903(g)(1)(I).]

7.7 After Council consultation under action item 7.9, fund an assessment of fishery improvement opportunities on the Pend Oreille River within the boundaries of the Kalispel Reservation, starting in Fiscal Year 1988. [Section 903(g)(1)(G).]

Council Actions

7.8 Consult with Bonneville, the Bureau of Reclamation, the Corps, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, appropriate Indian tribes and appropriate FERC licensees to develop funding mechanisms and scheduling for resident fish substitution projects above Hells Canyon Dam. [Section 903(g)(2).]

7.9 Prior to Bonneville funding of an assessment of fishery improvement opportunities on the Pend Oreille River under action item 7.7, the Council will consult with the Kalispel Tribe, Bonneville, Bonneville customers and other interested parties on potential enhancement opportunities and on the scope and design of the studies. [Section 903(g)(1)(G).]

Appropriate Parties

7.10 Fund projects as provided in Section 903(g)(2) and action item 7.8. [Section 903(g)(2).]

Other Resident Fish Actions

Bonneville Actions

7.11 In consultation with the Montana Department of Fish, Wildlife and Parks (MDFWP), the Confederated Salish-Kootenai Tribes and the U.S. Fish and Wildlife Service, continue ongoing work and present the results of the studies to the Council. MDFWP, the Confederated Salish-Kootenai Tribes and the U.S. Fish and Wildlife Service shall submit recommendations for future action to the Council by October 1, 1989. [Sections 903(a)(2),(3), (a)(7), (b)(1)(C)-(D) and (b)(3), (5) and (6).]

7.12 Continue ongoing sturgeon studies. [Section 903(e)(1).]

7.13 Initiate removal of accumulated materials in the Kootenai River where appropriate. [Section 903(d).]

7.14 Initiate assessment of impacts of the construction and current operation of Dworshak Dam on resident fish. [Section 903(e)(4).]

7.15 In consultation with the Montana Department of Fish, Wildlife and Parks (MDFWP), the Confederated Salish-Kootenai Tribes and the U.S. Fish and Wildlife Service, continue ongoing work and present results of the studies to the Council. The MDFWP, Confederated Salish-Kootenai Tribes and the U.S. Fish and Wildlife Service will submit recommendations for further action to the Council, based on drawdown and related studies in Montana, by March 1, 1988. [Sections 903(b)(3)-(4).]

Bureau of Reclamation Actions

7.16 Develop and implement operating procedures for resident fish at Hungry Horse Dam on the schedules provided in Sections 903(a)(1) and (6), (b)(1)-(2).

7.17 Ensure that Anderson Ranch Dam is operated to maintain established minimum flows. [Section 903(a)(8).]

7.18 Install a barrier net system at Banks Lake. [Section 903(e)(11).]

Corps Actions

7.19 Develop and implement operating procedures for resident fish at Libby Reservoir on the schedules provided in Sections 903(a)(5), (b)(1)-(2).

7.20 Continue existing resident fish stocking program at Dworshak Dam. Coordinate with fish and wildlife agencies and tribes. [Section 903(e)(2).]

FERC Actions

7.21 Maintain minimum flows between Big Fork Dam and the powerhouse. Examine mitigation alternatives. [Section 903(a)(4).]

7.22 Initiate evaluation of operating procedures at Milltown Dam. [Section 903(b)(8).]

7.23 Continue existing operations at Post Falls Dam. [Section 903(b)(9).]

7.24 Ensure that Montana Power Company funds water purchase at Painted Rocks Reservoir to provide instream flows for resident fish. [Section 903(e)(6).]

7.25 Ensure that Washington Water Power Company, in coordination with the Montana Department of Fish, Wildlife and Parks, conducts research on the lower Clark Fork drainage. [Section 903(e)(8).]

8. Develop and implement plans to mitigate hydropower-related losses of wildlife.

The wildlife section of the program sets out a means for assessing the extent of hydroelectric effects on wildlife and for developing and implementing mitigation plans to address those effects. During

the next five years, mitigation efforts will be undertaken in the areas affected by Hungry Horse and Libby dams in Montana. Other mitigation proposals may be reviewed by the Council in future program amendment proceedings. The Council's wildlife coordinator will continue to monitor progress and help schedule implementation. The Council also will continue to support protection of wildlife from new hydroelectric development.

Bonneville Actions

8.1 Fund loss statements when needs are identified. [Section 1003(b)(2).]

8.2 Initiate consultation on loss statements when the statements are completed. [Sections 1003(b)(3) and (5).]

8.3 Where appropriate, fund the development of mitigation plans for projects as specified in Section 1003(b) and Table 3. [Sections 1003(b)(3) and (5), (d)(1)-(2) and Table 4.]

8.4 In 1987, initiate advance design of white-tailed deer, mule deer, Columbian sharp-tailed grouse and waterfowl projects and continue implementation and monitoring of the bighorn sheep project, all designed to mitigate the effects of Libby Dam. [Section 1003(b)(4) and Table 4.]

8.5 In 1988, continue advance design of the white-tailed deer, waterfowl, and Columbian sharp-tailed grouse projects; begin implementation and monitoring of the mule deer project; and continue implementation and monitoring of the bighorn sheep project, all associated with mitigation of the effects of Libby Dam. [Section 1003(b)(4) and Table 4.]

8.6 In 1989, begin implementation and monitoring of the white-tailed deer and waterfowl projects; begin acquisition of easements for Columbian sharp-tailed grouse; and continue implementation and monitoring of the mule deer and bighorn sheep projects, all as mitigation of the effects of Libby Dam. [Section 1003(b)(4) and Table 4.]

8.7 In 1990 and 1991, continue implementation and monitoring of the white-tailed deer, mule deer, bighorn sheep and waterfowl projects, and continue acquisition of easements for Columbian sharp-tailed grouse, all as mitigation of the effects of Libby Dam. [Section 1003(b)(4) and Table 4.]

8.8 In 1987, initiate advanced design of and begin to implement the elk/mule deer project. Begin advanced design, interagency coordination, identification of priorities among sites, and appraisals for the black bear/grizzly bear, waterfowl and terrestrial furbearer projects, as part of Hungry Horse Dam mitigation. [Section 1003(b)(4) and Table 4.]

8.9 In 1988, continue advanced design of waterfowl, terrestrial furbearer and black bear/grizzly bear projects; and continue implementation and monitoring of the elk/mule deer project at Hungry Horse Dam. [Section 1003(b)(4) and Table 4.]

8.10 In 1989-1991, begin and/or continue implementation of the elk/mule deer, black bear/grizzly bear and waterfowl projects, as part of Hungry Horse Dam mitigation. [Section 1003(b)(4) and Table 4.]

8.11 Explore the possibility of establishing a trust or using other innovative funding mechanisms to fund Hungry Horse and Libby dam mitigation. Report back to Council by May 1987. [Section 1003(b)(4) and Table 4.]

Bureau of Reclamation, Corps and FERC Actions

8.12 Where indicated, implement mitigation plans after Council's amendment of plans into the program. [Sections 1003(b)(4)-(5) and Table 4.]

8.13 When and where feasible, implement on a voluntary basis, management plans designed to protect wildlife and wildlife habitat identified in Section 1003. [Section 1003(b).]

Fish and Wildlife Agencies and Tribes Actions

8.14 Upon completion of mitigation status reports and in consultation with affected parties, identify needs and priorities for development of loss statements and mitigation plans. [Sections 1003(b)(1)-(3).]

8.15 Work directly with non-federal project operators to develop wildlife mitigation plans to address the effects of non-federal projects, as provided in Sections 1003(b)(5) and 1403 (action item 8.13). [Section 1003(b)(5).]

Council Action

8.16 Review proposed mitigation plans and amend those proposals or appropriate alternatives into the program. [Sections 1003(b)(3)-(5) and (d)(1)-(2).]

9. Support conditions on new hydroelectric development to protect fish and wildlife and their habitat.

The Council has emphasized throughout its program that new hydroelectric development in the Columbia River Basin must take into account fish and wildlife protection. The Council will continue to emphasize that concern in the next five years, particularly by improving methods for assessing cumulative effects and by designating protected areas.

Bonneville, Bureau of Reclamation, Corps and FERC Actions

9.1 Continue to apply Sections 1103(a)-(c) and (e) to all new projects.

9.2 If new reservoirs are constructed, dedicate specific portions of storage to protect, mitigate and enhance fish and wildlife. [Section 703(a)(16).]

Bonneville Actions

9.3 By June 1987, complete study and develop methods for assessing cumulative effects of hydropower development on fish and wildlife. [Section 1103(b)(2).]

9.4 Develop new designs for turbine intake screens. Complete tests and report to the Council by January 1989. If studies are being conducted elsewhere, provide documentation and results to the Council. [Section 1103(d)(1).]

Council Actions

9.5 Complete the Council portion of the protected areas study and designate protected areas. [Section 1103(c)(2).]

9.6 Review Action Plan and other program sections in light of protected-area designations. [Section 1103(c).]

9.7 Work with FERC on assessment of new hydropower projects and incorporation of protected-area designations into FERC decision-making. [Sections 1103(c)(2) and (e).]

10. Improve work plan and budget procedures.

To promote program implementation by federal project operators and regulators in accordance with the Northwest Power Act, the Council calls for work plans and spending reports to be used in improving program effectiveness.

Bonneville, Bureau of Reclamation, Corps and FERC Actions[4]

10.1 By September 15 of each year, submit expenditure and obligation plans to the Council. Thereafter, submit quarterly updates of the expenditure and obligation information to the Council. Also submit to the Council a review of the previous year's expenditures and obligations. The review should compare projected expenditures and obligations to actual ones. Report expenditures for each program measure or related project. Bonneville also will submit notices of program interest, proposed contracts, and requests for proposals under the terms of the intergovernmental agreement with the Council. [Sections 1203(a), (c) and (d).]

10.2 By September 15 of each year, submit a work plan for the upcoming fiscal year describing plans for implementing this Action Plan. Each work plan shall contain:

1. A report of progress to date on each action item.

2. A description of the activities to be undertaken under each action item, including:

a) The objective of each activity;

b) The schedule for each activity, including key decision points and major milestones;

c) Estimated costs of each major action.

[Sections 1203(a)(4) and (d).]

10.3 In developing work plans, consult with the Council, fish and wildlife agencies, tribes, hydropower project operators and regulators, and other interested parties. [Section 1203(c).]

Council Actions

10.4 Review and comment on the plans submitted under action items 10.1, 10.2 and 10.3, in consultation with interested parties. [Sections 1203(a)(4), (c)(3) and (d)(3).]

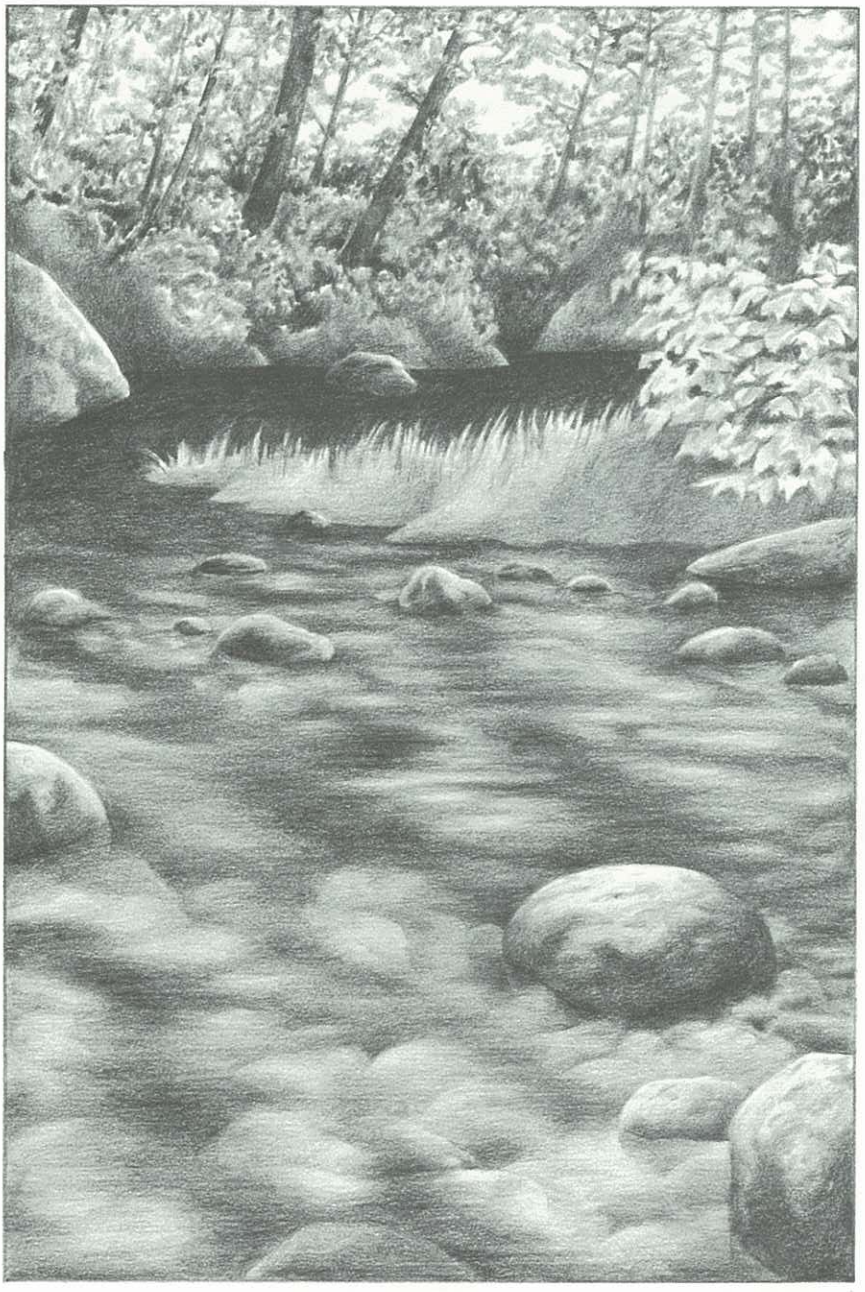
10.5 Schedule periodic consultations with affected parties to review budgets proposed by federal implementing agencies. [Sections 1203(a) and (d).]

4. FERC may wish to address some or part of this action item through its licensees, in consultation with the Council.

Section 1500

GENERAL

Disclaimers



1501. Disclaimers

Nothing in this program will:

(1) Affect or modify any treaty or other right of an Indian tribe;

(2) Authorize the appropriation of water by any federal, state, or local agency, Indian tribe or any other entity or individual;

(3) Affect the rights or jurisdictions of the United States, the states, Indian tribes, or other entities over waters of any river, stream or groundwater resource;

(4) Alter, amend, repeal, interpret, modify or conflict with any interstate compact;

(5) Alter or establish the respective rights of the United States, states, Indian tribes or any person with respect to any water or water-related right;

(6) Affect the validity of any existing license, permit or certificate issued by any federal agency pursuant to federal law; or

(7) Otherwise conflict with the savings provisions in Section 10 of the Northwest Power Act.

1502. Scope

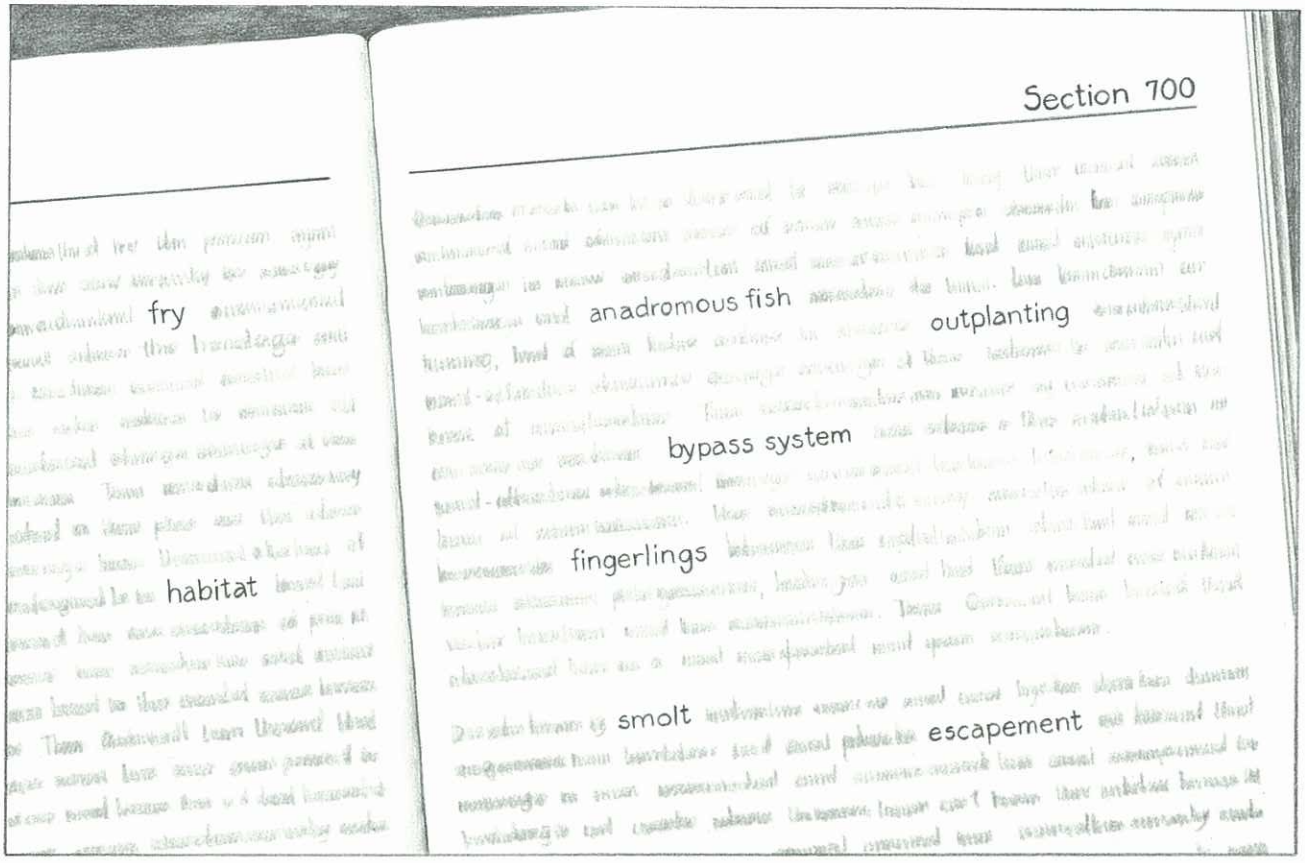
This program applies solely to fish and wildlife, including related spawning grounds and habitat, located on the Columbia River and its tributaries. Nothing in this program alters, modifies or affects in any way the laws applicable to rivers or river systems, including electric power facilities related thereto, other than the Columbia River and its tributaries, or affects the rights and obligations of any agency, entity, or person under such laws.

1503. Validity

If any provision of this program or the application of any provision is held invalid, no other provision of this program or its application will be affected as a result.

GENERAL

Glossary



Glossary[1]

Section 1600

acclimation pond—Concrete or earthen pond or a temporary structure used for rearing and imprinting juvenile fish in the water of a particular stream before their release into that stream.

Act—See Northwest Power Act.

adaptive management—A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as vehicles for learning. Projects are designed and implemented as experiments so that even if they fail, they provide useful information for future actions. Monitoring and evaluation are emphasized so that the interaction of different elements of the system are better understood.

af (acre-foot)—Unit of volume measurement used to describe a quantity of water stored in a reservoir. One acre-foot of water covers one acre to a depth of one foot or 325,850 gallons.

anadromous fish—Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn. For example, salmon or steelhead trout.

approach velocities—Water velocities at or near the face of a fish screen.

artificial production or artificial propagation—Spawning, incubating, hatching or rearing fish in a hatchery or other facility constructed for fish production.

attraction—Drawing fish to dam fishways or spillways through the use of water flows.

barrier net—A net system that is placed across a river, stream or channel to block the passage of fish from dam turbine intakes or other hazards without blocking the water flow.

baseline stream survey—A survey of the physical and biological resources and characteristics of a stream.

base load—The minimum load in a power system over a given period of time. Base load resources run continually except during maintenance and outages.

billing credits—Under the Northwest Power Act, a payment by Bonneville to a customer (in cash or offsets against billings) for actions taken by that customer to reduce Bonneville's obligations to acquire new resources.

blocked areas—Areas in the Columbia River Basin where hydroelectric projects have created permanent barriers to anadromous fish runs. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller locations.

Bonneville Power Administration (Bonneville)—The sole federal power marketing agency in the Northwest and the region's major wholesaler of electricity. Created by Congress in 1937, Bonneville sells power to public and private utilities, direct service industrial customers, and various public agencies in the states of Washington, Oregon, Idaho, Montana west of the Continental Divide, (and parts of Montana east of the Divide) and smaller adjacent areas of California, Nevada, Utah and Wyoming. The Northwest Power Act charges Bonneville with additional duties related to energy conservation, resource acquisition, and fish and wildlife.

brood stock—Adult fish used to propagate the subsequent generation of hatchery fish.

1. The definitions in this list have no legal significance and are provided only for clarification of terms used throughout this program.

Section 1600

Bureau of Reclamation, U.S. Department of the Interior—An agency that 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 and several projects on the Yakima River.

bypass system—A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.

carrying capacity—The number of individuals of one species that the resources of a habitat can support.

cfs (cubic feet per second)—A unit used to measure water flow.

collection and bypass system—A system at a dam that collects and holds the fish approaching the dam for later transportation or moves them through or around the dam without going through the turbine units.

Columbia River Compact—An interstate compact between the states of Oregon and Washington by which the states jointly regulate fish in the Columbia River.

Columbia River Inter-Tribal Fish Commission—The Commission is the coordinating body of the Yakima, Nez Perce, Umatilla and Warm Springs Indian tribes. These tribes all signed the 1855 treaties that reserved their rights to Columbia River salmon and steelhead, certain wildlife and other resources.

Columbia River system—The Columbia River and its tributaries.

Columbia River Treaty—The treaty between the United States and Canada for the joint development of the Columbia River. It became effective on September 16, 1964.

Corps of Engineers, U.S. Department of the Army (Corps)—An agency with the responsibility for design, construction and operation of civil works, including multipurpose dams and navigation projects.

creel census survey—The collection of data concerning the number of fish caught by sport fishers on a particular stream or in a particular area.

critical period—The sequence of low water conditions during which the hydropower system's lowest amount of energy can be generated while drafting storage reservoirs from full to empty. Under the Pacific Northwest Coordination Agreement, the critical period is based on the lowest multimonth streamflow observed since 1928. Based on analysis of flows at The Dalles, this streamflow is also the lowest since recordkeeping began in 1879.

critical water—The low streamflow conditions in the critical period, under which the hydropower system will generate only about 12,300 average megawatts. In an average year, the Northwest hydropower system will produce about 16,400 average megawatts.

drawdown—The release of water from a reservoir for power generation, flood control, irrigation or other water management activity.

electrophoresis—A technique that allows biologists to determine fish origins by analyzing the genetic variation in fish body fluid and muscle tissue. The technique is used to determine which stocks are being caught in ocean fisheries in order to better regulate ocean fishing.

emergence — The act of fish leaving their incubation environment in the gravel to forage for food.

escapement — The number of salmon and steelhead that return to a specified point of measurement after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.

estuary — The part of the wide lower course of a river where its current is met and influenced by the tides.

Federal Energy Regulatory Commission (FERC) — The Commission issues and regulates licenses for construction and operation of non-federal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects.

federal land managers — This category includes the Bureau of Indian Affairs; the Bureau of Land Management; the National Park Service, all part of the U.S. Department of the Interior; and the Forest Service, U.S. Department of Agriculture.

federal project operators and regulators — Federal agencies that operate or regulate hydroelectric projects in the Columbia River Basin. They include the Bonneville Power Administration, the Bureau of Indian Affairs, the Bureau of Reclamation, the Corps of Engineers and the Federal Energy Regulatory Commission.

fingerling — A young fish from the time of the disappearance of the yolk sac to the end of the first year of growth. It ranges in size from approximately 1 to 3 inches.

firm energy load carrying capability (FELCC) — The amount of firm energy that can be produced from a hydropower system based on the system's lowest recorded streamflows and the maximum amount of reservoir storage currently available to the system.

firm energy or firm power — Electric energy that is considered assurable to the customers to meet all agreed upon portions of the customers' load requirements over a defined period.

fish and wildlife agencies — This category includes the Fish and Wildlife Service, U.S. Department of the Interior; the Idaho Department of Fish and Game; the Montana Department of Fish, Wildlife and Parks; the National Marine Fisheries Service, U.S. Department of Commerce; the Oregon Department of Fish and Wildlife; the Washington Department of Fisheries; and the Washington Department of Game.

fish flows — Artificially increased flows in the river system called for in the fish and wildlife program to quickly move the young fish down the river during their spring migration period. (See water budget.)

fish guidance efficiency — The percentage of the total number of fish approaching a turbine intake that are deflected from a dam's turbine units by a fish guidance device such as a turbine intake screen.

Fish Passage Center — Part of the water budget program, the center plans and implements the annual smolt monitoring program; develops and implements flow and spill requests; and monitors and analyzes research results to assist in implementing the water budget. [See water budget.]

fish passage efficiency — The percentage of the total number of fish that pass a dam without passing through the turbine units.

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fish passage managers—Located at the Fish Passage Center, the two fish passage managers are responsible for the specific planning, implementation and monitoring activities of the Center aimed at helping fish on their migratory routes in the Columbia River Basin. One manager is designated by a majority of the federal and state fish and wildlife agencies, and the other manager is designated by a majority of the Columbia River Basin Indian tribes. [See Fish Passage Center.]

fish screen—A screen across the intake of a dam, designed to divert the fish to another area.

fishway (also called a fish ladder)—A device made up of a series of stepped pools, similar to a staircase, that enables adult fish to migrate up the river past dams.

flows (also instream flows)—The rate at which water passes a given point in a stream or river, usually expressed in cubic feet per second (cfs).

forage species—Fish that serve as a food source for carnivorous fish.

forebay—The part of a dam's reservoir that is immediately upstream from the powerhouse.

forebay guidance net—A large net placed in the forebay of a dam to guide juvenile fish away from the powerhouse.

fry—The stage in the life of a fish from the hatching of the egg through the absorption of the yolk sac until it is about 1 inch long.

game fish—A fish that is regulated by law for recreational harvest.

gene—The chemical unit of hereditary information that can be passed on from generation to generation.

gene pool—The total genes in a breeding population.

genetic conservation—The preservation of genetic resources in breeding populations.

genetic diversity—The range of genetic differences among individuals or groups of organisms.

genetic integrity—The ability of a breeding population to remain adapted to its native environment without genetic changes caused by human intervention.

gpm (gallons per minute)—A unit used to measure water flow.

gravity feed system—A system that provides flow in a channel or conduit through the use of gravity.

habitat—The locality or external environment in which a plant or animal normally lives and grows.

harvest controls—Regulations established for commercial and sport fisheries to ensure that the correct proportion of the different stocks escape to spawn.

harvest management—The process of setting regulations for the commercial, recreational and tribal fish harvest to achieve a specified goal within the fishery.

headworks—A flow control structure on an irrigation canal.

headwaters—The source and upper part of a stream or river.

homing behavior—Behavior that leads mature salmon and steelhead to return to their stream or lake of origin for spawning.

husbandry—The scientific management and control of the hatchery environment for the production of fish or wildlife.

hydroelectric power or hydropower—The generation of electricity using falling water to turn turbo-electric generators.

hydropower system—The hydroelectric dams on the Columbia River and its tributaries.

imprinting—The physiological and behavioral process by which migratory fish assimilate environmental cues to aid their return to their stream of origin as adults.

incubation—The period of time from egg fertilization until hatching.

intake traveling screens—See turbine intake screens.

interim spill—The spilling of water over John Day, The Dalles, Bonneville, Lower Monumental and Ice Harbor dams to aid fish passage. This method will be used until permanent solutions to juvenile fish passage problems are developed.

intertie—A transmission line or system of lines permitting a flow of energy between major power systems. The Northwest has an intertie connection with California.

juvenile—Fish from one year of age until sexual maturity.

kcfs (thousand cubic feet per second)—See cubic feet per second.

kcfs-month—One kcfs-month is a flow of 1,000 cubic feet per second for one month or 0.0595 million acre-feet.

known-stock fishery—A harvest management technique by which specific stocks are harvested in either a mixed-stock or a single-stock fishery.

kWh (kilowatt-hour)—A basic unit of electrical energy that equals one kilowatt of power applied for one hour.

low-head dam—A dam at which the water in the reservoir is not high above the turbine units.

Maf (million acre-feet)—See af.

mainstem—The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the fish and wildlife program, mainstem refers to the Columbia and Snake rivers.

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mainstem passage—The movement of salmon and steelhead around or through the dams in the Columbia and Snake rivers.

mainstem survival—The ability of anadromous fish to survive the dams while migrating in the Columbia and Snake rivers.

mark-recapture study—A study that estimates population size by marking a segment of the population at one time and later measuring the ratio of marked animals to total animals.

mechanical bypass systems—See bypass system.

mid-Columbia—The section of the Columbia River between the junction with the Snake River and Chief Joseph Dam.

Mid-Columbia Coordinating Committee—A committee whose primary purpose is to improve fish passage at the mid-Columbia dams. It determines annual operating requirements for fish passage at the dams; schedules research projects; and implements flow and spill requirements of the Mid-Columbia Settlement Agreement. The committee is composed of eight representatives of the fish and wildlife agencies, Indian tribes, the three mid-Columbia public utility districts, and a power purchaser's representative.

mid-Columbia dams—Dams owned by the mid-Columbia public utility districts. They include Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams.

mid-Columbia public utility districts (PUDs)—Public Utility District No. 1 of Grant County, Public Utility District No. 2 of Chelan County and Public Utility District No. 1 of Douglas County.

minimum flow level—The level of streamflow sufficient to support fish and other aquatic life; to minimize pollution; or to maintain other instream uses such as recreation and navigation.

Mitchell Act—The Mitchell Act of 1938 (Public Law No. 75-502, 16 U.S.C.755), which authorizes federal funds for hatchery construction and operation within the Columbia River Basin.

mixed-stock fishery—A harvest management technique by which different species, strains, races, or stocks are harvested together.

MW (megawatt)—The electrical unit of power that equals one million watts or one thousand kilowatts.

natural production—Spawning, incubating, hatching and rearing fish in rivers, lakes and streams.

natural stocks—Fish produced normally in rivers and streams but originated in or supplemented from hatcheries.

Northwest Power Act—The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power Planning Council and directed it to develop a program to protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries.

off-site enhancement—The improvement in conditions for fish or wildlife species away from the site of a hydroelectric project that had detrimental effects on fish and/or wildlife, as part or total compensation for those effects. An example of off-site enhancement is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects caused by mainstem hydroelectric projects.

on-site — Usually refers to projects or activities designed to address harm caused to fish and wildlife by hydroelectric projects at the site where the harm occurred.

outmigration — The migration of fish down the river system to the ocean.

outplanting — Hatchery-reared fish released into streams for rearing and maturing away from the hatchery sites.

Pacific Northwest Coordination Agreement — An agreement between federal and non-federal owners of hydropower generation on the Columbia River system. It governs the seasonal release of stored water to obtain the maximum usable energy subject to other uses.

Pacific Northwest Utilities Conference Committee (PNUCC) — A group formed by Pacific Northwest utilities officials in order to coordinate policy on Pacific Northwest power supply issues and activities. PNUCC lacks contractual authority, but it plays a major role in regional power planning through its Policy, Steering, Fish and Wildlife, and Lawyers committees and the Technical Coordination Group. PNUCC publishes the Northwest Regional Forecast, containing information on regional loads and resources.

passage — The movement of migratory fish through, around, or over dams and other obstructions in a stream or river.

pathogens — Any agent that causes disease, such as a virus, protozoan, bacterium or fungus.

peaking generation — See power peaking.

peaking operations — See power peaking.

plume area/ocean plume — Where a river meets an ocean, the freshwater extrusion that extends from the river mouth into the ocean and along the coast. The Columbia River plume extends south along the coast of Oregon.

powerhouse — A primary part of a hydroelectric dam where the turbines and generators are housed and where power is produced by falling water rotating turbine blades.

power peaking — The generation of electricity to meet maximum instantaneous power requirements. The term usually refers to daily peaks.

predator — An animal that lives by preying upon others.

public utility district (PUD) — A government unit established by voters of a district to supply electric or other utility service.

raceway — A rectangular tank used for rearing fish in hatcheries.

rearing — The juvenile life stage of anadromous fish spent in freshwater rivers, lakes and streams before they migrate to the ocean.

redd — A spawning nest made in the gravel bed of a river by salmon or steelhead.

reprogramming — The development of a new plan for the time and location of the release of hatchery-produced fish into rivers and streams, especially in the upper river areas.

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reregulating dam — A dam and reservoir, located downstream from a hydroelectric peaking plant, with sufficient storage capacity to store the widely fluctuating discharges from the peaking plant and to release them in a relatively uniform manner downstream.

reservoir — A body of water collected and stored in an artificial lake behind a dam.

resident fish — Fish that spend their entire life cycle in freshwater. For program purposes, resident fish includes landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

resident fish substitutions — The enhancement of resident fish to address losses of salmon and steelhead in those areas permanently blocked to anadromous (ocean-migrating) fish as a result of hydroelectric dams.

riparian habitat — Habitat along the banks of streams, lakes or rivers.

riprap — A streambank protection method using large rocks, boulders or debris to reduce erosion.

river miles — Miles from the mouth of a river to a specific destination or, for upstream tributaries, from the confluence with the main river to a specific destination.

rule curves — Graphic guides to the use of storage water. They are developed to define certain operating rights, entitlements, obligations and limitations for each reservoir.

run — A population of fish of the same species consisting of one or more stocks migrating at a distinct time.

runoff — The portion of rain or snowmelt that runs across the land surface or infiltrates the soil and flows through the surface soil to ultimately reach stream channels.

Salmon and Steelhead Conservation and Enhancement Act — The Salmon and Steelhead Conservation and Enhancement Act of 1980 (Public Law 96-561, 16 U.S.C. 3301 et seq.), which authorized the establishment of a cooperative program to conserve and enhance the Pacific Northwest's salmon and steelhead stocks. The law called for the creation of the Salmon and Steelhead Advisory Commission; the development of a comprehensive salmon and steelhead enhancement plan; and a "buy-back" program for commercial fishing vessels, licenses and gear.

salmonid — A fish of the Salmonidae family, which includes soft-finned fish such as salmon, trout and whitefish.

sluiceway — An open channel inside a dam designed to collect and divert ice and trash in the river (e.g., logs) before they get into the turbine units and cause damage. On several of the Columbia River dams, ice and trash sluiceways are being used as, or converted into, fish bypass systems.

smolt — A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence.

spawn — The act of fish releasing and fertilizing eggs.

species — A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring.

spill — Releasing water through the spillway rather than through the turbine units.

spillway — The channel or passageway around or over a dam through which excess water is released or "spilled" past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam, while maintaining the reservoir level below some predetermined maximum level.

stock — A population of fish spawning in a particular stream during a particular season. Such fish generally do not interbreed with fish spawning in a different stream or at a different time.

state water management agencies — State government agencies regulate water resources. They include the Idaho Department of Water Resources; the Montana Department of Natural Resources and Conservation; the Oregon Water Resources Department; and the Washington Department of Ecology.

storage — The volume of water in a reservoir at a given time.

subbasin — Major tributaries to and segments of the Columbia and Snake rivers.

subbasin planning — See system planning.

subimpoundment — An isolated body of water created by a dike within a reservoir or lake.

supplementation (also called outplanting) — The release of hatchery fry and juvenile fish in the natural environment to quickly increase or establish naturally spawning fish populations.

system planning — A coordinated systemwide approach to planning in which each subbasin in the Columbia system will be evaluated for its potential to produce fish in order to contribute to the goal of the overall system. The planning will emphasize the integration of fish passage, harvest management and production.

tail water — Water below a dam or hydropower development.

terrestrial furbearers — Furbearing animals that dwell primarily on land.

test fish — Fish used for research purposes.

thermal plants — A power plant that generates electricity by burning coal, oil or other fuel, or by nuclear fission.

transportation — Collecting migrating juvenile fish and transporting them around the dams using barges or trucks.

travel corridors — Paths animals use during their migrations.

tribes — In this program, these include the Burns-Paiute Indian Colony; the Coeur d'Alene Tribes; the Confederated Tribes of the Colville Reservation; the Confederated Salish-Kootenai Tribes of the Flathead Reservation; the Confederated Tribes of the Umatilla Reservation of Oregon; the Confederated Tribes of the Warm Springs Reservation of Oregon; the Confederated Tribes and Bands of the Yakima Indian Nation; the Kalispel Indian Community; the Kootenai Tribe of Idaho; the Nez Perce Tribe of Idaho; the Shoshone-Paiutes of the Duck Valley Reservation; the Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Spokane Tribe of Indians.

turbine intake screens — Large screens, which may have moving or non-moving parts, designed to be placed in a dam's turbine intake at an angle to deflect juvenile fish from the intakes into a bypass system.

uncontracted water — A volume of water in a storage reservoir that is not assigned for other purposes, such as irrigation.

upriver stocks — Salmon and steelhead stocks that spawn in the Columbia River or its tributaries above Bonneville Dam.

upwelling — Near the continental shelf, the movement of nutrient-rich ocean bottom waters to the ocean's surface.

U.S./Canada Pacific Salmon Treaty — Signed in 1984 and ratified by Congress in 1985 as the Salmon Treaty Act, this treaty governs the harvesting of certain salmon stocks in the commercial fisheries of Alaska, Canada and the western continental United States.

wasteway — An open ditch or canal that discharges excess irrigation water or power plant effluent into the river channel.

water banking — An administrative system for renting surplus water.

water budget — A means of increasing survival of downstream migrating juvenile fish by increasing Columbia and Snake river flows during the spring migration period. The water budget was developed by the Council, which oversees its use in conjunction with the fish and wildlife agencies and Indian tribes, the U.S. Army Corps of Engineers, the Bonneville Power Administration, and the Bureau of Reclamation.

wild stocks — Genetically unique populations of fish that have maintained reproduction successfully without supplementation from hatcheries.

Appendix A
Tools, Assumptions and Tasks for System Planning

"System planning" means planning at the subbasin level (Figure 10), to identify local opportunities and constraints; and at the system level, to ensure integration and consistency with the program goal and policies. The following tools, assumptions and tasks will be used in conjunction with Section 203: Salmon and Steelhead Goal and Section 204: System Policies for Doubling Runs. The work plan identified in Section 1403: Five-Year Action Plan (action item 1.1) will incorporate the contents of this appendix as appropriate.

(a) Tools and Assumptions

In planning for the achievement of the program's salmon and steelhead doubling goal, a consistent set of parameters and assumptions will be needed. To that end, planners will be expected to use the Council's anadromous fish data base and system planning model and rely on available information, rather than collecting new information. They also will use the following planning assumptions.

(1) Harvest: Focus primarily on current harvest rates and harvest patterns established by the fishery management entities.

(2) Passage: Focus primarily on mainstem survival conditions expected to occur when this program's measures on mainstem passage and flows are fully implemented.

(3) Production: All policies contained in Section 204: System Policies for Doubling Runs will apply. If such policies are not applicable or feasible in a given subbasin, the subbasin plan should explain why they are not.

(b) Tasks

(1) System level

At the system level, planners will be expected to:

(A) Submit to the Council an integrated system plan containing subbasin plans that are consistent with program policies and with each other. If such consistency is not possible, explain why and identify alternative means for resolving the inconsistencies.

(B) Identify computer modeling parameters and alternatives for use in system integration. Model production actions consistent with the passage and harvest policies in Section 204: System Policies for Doubling Runs, using the Council's system planning model. In addition, explore the sensitivity of the model results to alternative harvest and passage scenarios.

(C) Identify generally the types, number, sizes and approximate locations of new artificial production facilities needed to achieve subbasin objectives. Where feasible, new artificial production should emphasize improvement of existing hatcheries or development and testing of small-scale artificial propagation, rather than construction of new hatcheries. Include a description of harvest plans related to the new artificial production.

(D) Quantify production increases to be achieved by the proposed system plan and estimate the time needed to realize those increases.

Appendix A
Tools, Assumptions and Tasks for System Planning

(2) Subbasin level

(A) Production plans should be developed for the following subbasins:

(i) *Above Bonneville Dam:*

Columbia River Mainstem from Bonneville Dam to the Snake River including minor tributaries
Hood River
Fifteenmile Creek
Deschutes River
John Day River
Umatilla River
Walla Walla River
Wind River
Big White Salmon River
Klickitat River
Columbia River Mainstem from the Snake River to Chief Joseph Dam including minor tributaries
Yakima River
Wenatchee River
Entiat River
Methow River
Okanogan River
Snake River Mainstem from the mouth to Hells Canyon Dam, including minor tributaries
Tucannon River
Clearwater River
Grande Ronde River
Salmon River
Imnaha River

(ii) *Below Bonneville Dam:*

Columbia River Mainstem including minor tributaries
Willamette River
Sandy River
Grays River
Elochoman River
Kalama River
Washougal River
Lewis River
Cowlitz River

(B) Each subbasin plan should:

(i) Contain a short summary of current conditions and related plans.

(ii) Provide a detailed plan for salmon and steelhead production during the period 1989-1998 and a general plan for the longer term.

(iii) State biologically sound objectives that reflect the system goal and policies.

(iv) Propose major production scenarios and state the preferred production scenario for achieving subbasin objectives.

(v) For each subbasin objective:

a) Compare the estimated effectiveness of each production scenario.

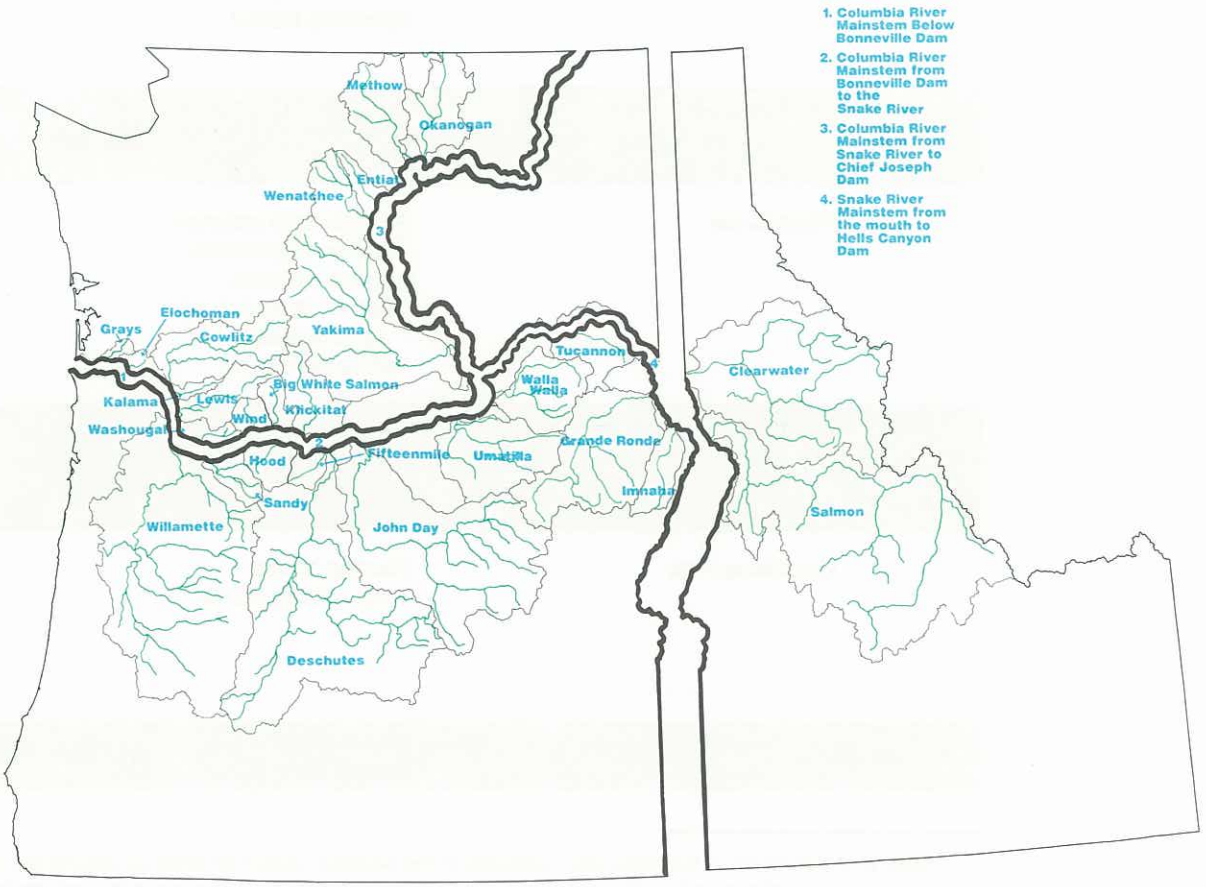
b) Estimate the costs of each production scenario.

c) State the hypotheses that may be tested in implementing each production scenario.

d) Compare the genetic risks of each production scenario and explain any need to accept relatively high risks.

(vi) Include an inventory of measures, in order of priority within that subbasin, for achieving the preferred alternative. Consider the projects listed in the Appendix A Table: Planning Inventory of Enhancement Projects in developing the inventory.

Figure 10.
Subbasins in the Columbia River Basin



Appendix A Table[1]
Planning Inventory of Enhancement Projects

Subbasin and Project Site	Problem
COLUMBIA RIVER BASIN BELOW BONNEVILLE DAM:	
KLASKANINE RIVER	
Klaskanine River Falls	Adult/juvenile passage
LEWIS RIVER	Rearing habitat Adult holding habitat Spawning habitat
WILLAMETTE RIVER	
Collowash Falls	Adult/juvenile passage
Little Falls Creek Falls	Adult/juvenile passage
Willamette River	Adult passage
Clackamas River	Rearing habitat Adult holding habitat Spawning habitat
Fish Creek	Adult/juvenile passage Channel degradation/ bank instability
Wash Creek	Adult/juvenile passage Riparian degradation Logging activities Channel degradation/ bank instability Road construction
Upper Clackamas River	Rearing habitat Adult holding habitat Spawning habitat
Oak Grove Fork	Rearing habitat Adult holding habitat
Mag Creek	Rearing habitat Adult holding habitat

1. Most of the contents of this table were originally in the program section on artificial, natural and wild propagation of salmon and steelhead, as amended in 1984. Implementation of some of the projects listed is under way. See the Five-Year Action Plan in Section 1403, action item 4.2.

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Provide passage	Coho, steelhead
Riparian revegetation Improve rearing habitat/construct pools Gravel restoration	Steelhead
Provide passage	Chinook, coho, steelhead
Provide passage	Chinook, steelhead
Adult trap facility	Chinook
Feasibility study Riparian revegetation Improve rearing habitat/construct pools Gravel restoration	Chinook, coho, steelhead
Feasibility study Channel rehabilitation	Coho, steelhead
Feasibility study Riparian revegetation Provide passage	Steelhead
Feasibility study Riparian revegetation Improve rearing habitat/construct pools Gravel restoration	Chinook, coho, steelhead
Environmental assessment report Feasibility study Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead
	Coho, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Hunter Creek	Rearing habitat Adult/juvenile passage Channel degradation/ bank instability
Lowe Creek	Rearing habitat
Fall Creek	Rearing habitat
North Fork Clackamas River	Rearing habitat Spawning habitat Water temperature Adult/juvenile passage Channel degradation/ bank instability
Hot Springs Fork	Rearing habitat Adult holding Water temperature Adult/juvenile passage Channel degradation/ bank instability
Pansy Creek	Rearing habitat Spawning habitat Water temperature Adult/juvenile passage Channel degradation/ bank instability
Hugh Creek	Spawning habitat Water temperature Adult/juvenile passage
Nohorn Creek	Rearing habitat Water temperature Adult/juvenile passage Channel degradation/ bank instability
Roaring River	Adult holding habitat Spawning habitat Adult/juvenile passage

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Riparian revegetation Provide passage Improve rearing habitat/construct pools	Coho, steelhead
Riparian revegetation Improve rearing habitat/construct pools	Coho, steelhead
Gravel restoration	Coho, steelhead
Feasibility study Riparian revegetation Provide passage Improve rearing habitat/construct pools Gravel restoration	Chinook, coho, steelhead
Feasibility study Riparian revegetation Bank stabilization Provide passage Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Riparian revegetation Bank stabilization Provide passage Improve rearing habitat/construct pools Gravel restoration	Steelhead
Riparian revegetation Bank stabilization Provide passage Gravel restoration	Steelhead
Feasibility study Riparian revegetation Bank stabilization Provide passage Improve rearing habitat/construct pools	Steelhead
Feasibility study Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Collowash River	Rearing habitat Adult holding habitat Water temperature Channel degradation/ bank instability
East Fork Collowash River	Adult/juvenile passage
South Fork Clackamas River	Rearing habitat Adult/juvenile passage
Lower Clackamas River	Spawning habitat
Cub Creek	Spawning habitat Adult/juvenile passage
Pinhead Creek	Rearing habitat
Buckeye Creek	Adult/juvenile passage
Squirrel Creek	Adult/juvenile passage
Tag/Tar Creeks	Adult/juvenile passage
Blister Creek	Adult/juvenile passage
Calico Creek	Adult/juvenile passage
Elk Lake Creek	Adult/juvenile passage
Dickey Creek	Adult/juvenile passage
Memaloose Creek	Adult/juvenile passage
Pick Creek	Adult/juvenile passage
Skin Creek	Adult/juvenile passage
Thunder Creek	Adult/juvenile passage
Trout Creek	Adult/juvenile passage
Whale Creek	Adult/juvenile passage
Whetstone Creek	Adult/juvenile passage

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Riparian revegetation Bank stabilization Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study	Coho, steelhead
Feasibility study Gravel restoration	Chinook, coho, steelhead
Gravel restoration	Chinook, coho, steelhead
Provide passage Gravel restoration	Steelhead
Improve rearing habitat/construct pools	Coho, steelhead
Provide passage	Coho, steelhead
Feasibility study Provide passage	Steelhead
Provide passage	Coho, steelhead
Feasibility study	Steelhead
Feasibility study	Steelhead
Feasibility study Provide passage	Coho, steelhead
Feasibility study	Coho, steelhead
Feasibility study Provide passage	Coho, steelhead
Provide passage	Coho, steelhead
Provide passage	Steelhead
Provide passage	Steelhead
Feasibility study Provide passage	Steelhead
Provide passage	Steelhead
Feasibility study Provide passage	Steelhead

Appendix A Table

Subbasin and Project Site	Problem
Whiskey Creek	Adult/juvenile passage
McKenzie River	
Cougar Dam	Adult/juvenile passage
Blue River Dam	Adult/juvenile passage
Mohawk River	Logging activities
SANDY RIVER	
Boulder Creek	Spawning habitat
Clear Creek	Spawning habitat Adult/juvenile passage
Lost Creek	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage
Lower Bull Run	Adult holding habitat Spawning habitat
Little Sandy River	Spawning habitat
Alder Creek	Rearing habitat Spawning habitat
Clear Fork	Rearing habitat Adult holding habitat
Zigzag River	Rearing habitat Adult holding habitat Spawning habitat
Little Zigzag River	

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Provide passage	Steelhead
Construct adult collector Reservoir rearing	Chinook, sockeye
Construct adult collector Reservoir rearing	Chinook
Improve rearing habitat/construct pools Provide passage Off-channel development	Steelhead
Feasibility study	
Gravel restoration	Coho, steelhead
Feasibility study Provide passage Gravel restoration	Coho, steelhead
Feasibility study Provide passage Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead
Feasibility study Gravel restoration	Chinook, coho, steelhead
Feasibility study Gravel restoration	Chinook, coho, steelhead
Feasibility study Improve rearing habitat/construct pools Gravel restoration	Coho, steelhead
Improve rearing habitat/construct pools Off-channel development	Coho, steelhead
Feasibility study Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead
Feasibility study	

Appendix A Table

Subbasin and Project Site	Problem
Still Creek	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage
Camp Creek	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage
Salmon River	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage
South Fork Salmon River	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage
Cheeney Creek	Rearing habitat
Horseshoe Creek	Adult/juvenile passage
Lady Creek	Adult/juvenile passage
COLUMBIA RIVER BASIN ABOVE BONNEVILLE DAM:	
WIND RIVER	Rearing habitat Spawning habitat
HOOD RIVER	
Lake Branch	Rearing habitat Spawning habitat Adult/juvenile passage Riparian degradation Channel degradation/ bank instability
Clear Branch	Spawning habitat Adult/juvenile passage Irrigation diversions
East Fork Hood River	Rearing habitat Spawning habitat
West Fork Hood River	Rearing habitat Spawning habitat

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Provide passage	Chinook, coho, steelhead
Feasibility study Provide passage	Chinook, coho, steelhead
Feasibility study Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead
Feasibility study Provide passage	Chinook, coho, steelhead
Feasibility study	Coho, steelhead
Feasibility study Provide passage	Coho, steelhead
Provide passage	Coho, steelhead
Improve rearing habitat/construct pools Gravel restoration Feasibility study	Steelhead, chinook
Riparian revegetation Bank stabilization Channel rehabilitation Provide passage Improve rearing habitat/construct pools Gravel restoration	Steelhead
Feasibility study Gravel restoration	Chinook, steelhead
Improve rearing habitat/construct pools Gravel restoration	Steelhead
Feasibility study Improve rearing habitat/construct pools Gravel restoration	Chinook, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Middle Fork Hood River	Rearing habitat Adult holding habitat Spawning habitat
Neal Creek	Rearing habitat Adult holding habitat Channel degradation/ bank instability
Odell Creek	Rearing habitat Adult holding habitat Channel degradation/ bank instability
Cold Springs Creek	Adult/juvenile passage
Elk Creek	Adult/juvenile passage
Green Point Creek	Adult/juvenile passage
Hood River Falls	Adult/juvenile passage
Laurel Creek	Adult/juvenile passage
Meadows Creek	Adult/juvenile passage
North Fork Green Point Creek	Adult/juvenile passage
Tony Creek	Adult/juvenile passage
Powerdale Dam	Adult/juvenile passage
KLICKITAT RIVER	Adult/juvenile passage
FIFTEENMILE CREEK	Rearing habitat Water temperature Adult/juvenile passage Channel degradation/ bank instability
Ramsey Creek	Rearing habitat Water temperature Channel degradation/ bank instability

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Improve rearing habitat/construct pools Gravel restoration	Chinook, steelhead,
Protective fencing Bank stabilization Improve rearing habitat/construct pools	Chinook, steelhead
Protective fencing Bank stabilization Improve rearing habitat/construct pools	Steelhead
Feasibility study	Steelhead
Provide passage	Steelhead
Feasibility study Provide passage	Steelhead
Provide passage	Steelhead, coho, sockeye
Provide passage	Steelhead
Provide passage	Steelhead, coho
Provide passage	Steelhead
Feasibility study Provide passage	Steelhead
Construct adult collector	Chinook, steelhead, sockeye
Provide passage	Chinook, coho, steelhead
Feasibility study Protective fencing Riparian revegetation Bank stabilization Provide passage Off-channel development	Steelhead
Feasibility study Protective fencing Riparian revegetation Bank stabilization	Steelhead

Appendix A Table

Subbasin and Project Site	Problem
Eightmile Creek	Rearing habitat Water temperature Channel degradation/ bank instability
Fivemile Creek	Rearing habitat Water temperature Channel degradation/ bank instability
Dry Creek	Rearing habitat Adult holding habitat Spawning habitat Water temperature Channel degradation/ bank instability
COLUMBIA GORGE TRIBUTARIES	
Moffett Creek	
Horsetail Creek	Rearing habitat Spawning habitat
Multnomah Creek	Spawning habitat
Lindsey Creek	
Viento Creek	
Herman Creek	
DESCHUTES RIVER	Gravel degradation
Deschutes River, mainstem and tributaries above Pelton Dam	Adult/juvenile passage Habitat study
Bakeoven Creek	Low flows Riparian degradation
Buck Hollow Creek	Low flows Riparian degradation
Trout Creek	Low flows Riparian degradation

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Protective fencing Riparian revegetation Bank stabilization Off-channel development	Steelhead
Feasibility study Protective fencing Riparian revegetation Bank stabilization	Steelhead
Feasibility study Protective fencing Riparian revegetation Bank stabilization	Steelhead
Feasibility study	Chinook, coho, steelhead
Protective fencing Improve rearing habitat/construct pools Gravel restoration Off-channel development	Chinook, coho, steelhead
Gravel restoration	Chinook, coho, steelhead
Feasibility study	Coho, steelhead
Feasibility study	Coho, steelhead
Feasibility study	Coho, steelhead
Gravel restoration	Chinook, steelhead
Feasibility study Provide passage Habitat study	Chinook, sockeye, steelhead
Improve flows Riparian revegetation	Steelhead
Improve flows Riparian revegetation	Steelhead
Improve flows Riparian revegetation	Steelhead

Appendix A Table

Subbasin and Project Site	Problem
Shitike Creek	Habitat study
Beaver Creek	Habitat study
Mill Creek	Habitat study
Badger Creek	Habitat study
Warm Springs River	Habitat study
White River Falls[2]	Adult/juvenile passage
JOHN DAY RIVER	Rearing habitat
John Day (upper mainstem and tributaries)	Adult holding habitat Riparian degradation
John Day (lower mainstem and tributaries)	Adult holding habitat Riparian degradation
Fields Creek	Rearing habitat
Clear Creek	Rearing habitat
Squaw Creek	Rearing habitat Adult/juvenile passage
Middle Fork John Day and tributaries	Rearing habitat Adult holding habitat Riparian degradation
Big Boulder Creek	Rearing habitat
North Fork John Day and tributaries	Rearing habitat Adult holding habitat Mining/dredging Adult/juvenile passage Riparian degradation
South Fork John Day and tributaries	Adult holding habitat Adult/juvenile passage Riparian degradation

2. Subject to approval by the Oregon Fish and Wildlife Commission.

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Habitat study	
Habitat study	
Habitat study	
Habitat study	
Habitat study	
Adult/juvenile passage	Chinook, steelhead
Improve rearing habitat/construct pools	Chinook, steelhead
Riparian revegetation Improve rearing habitat/construct pools	Chinook, steelhead
Riparian revegetation Improve rearing habitat/construct pools	Steelhead
Environmental assessment report Improve rearing habitat/construct pools	Steelhead
Environmental assessment report Improve rearing habitat/construct pools	Chinook, steelhead
Environmental assessment report Provide passage Improve rearing habitat/construct pools	Chinook, steelhead
Environmental assessment report Riparian revegetation Improve rearing habitat/construct pools	Chinook, steelhead
Environmental assessment report Improve rearing habitat/construct pools	Chinook, steelhead
Environmental assessment report Riparian revegetation Provide passage Improve rearing habitat/construct pools	Chinook, steelhead
Riparian revegetation Provide passage Improve rearing habitat/construct pools	Steelhead

Appendix A Table

Subbasin and Project Site	Problem
Fivemile Creek	Adult/juvenile passage
UMATILLA RIVER	Rearing habitat Adult holding habitat Spawning habitat Adult/juvenile passage Irrigation diversions
WALLA WALLA RIVER	
Walla Walla River[3]	Low flows
Walla Walla River	Adult holding habitat Low flows Channel degradation/ bank instability
Mill Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Henry Canyon Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Tiger Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Couse Creek	Adult holding habitat Low flows Channel degradation/ bank instability

3. To be funded by the Bureau of Reclamation, in consultation with the fish and wildlife agencies and tribes and the Corps of Engineers.

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Provide passage	Steelhead
Riparian revegetation Provide passage Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Storage dam and reservoir	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead

Appendix A Table

Subbasin and Project Site	Problem
North Fork Walla Walla River and tributaries	Adult holding habitat Low flows Channel degradation/ bank instability
South Fork Touchet River	Adult holding habitat Low flows Channel degradation/ bank instability
North Fork Touchet River	Adult holding habitat Low flows Channel degradation/ bank instability
Burnt Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Griffin Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Robinson Fork Touchet River	Adult holding habitat Low flows Channel degradation/ bank instability
Lewis Creek	Adult holding habitat Low flows Channel degradation/ bank instability

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Spangler Creek	Adult holding habitat Low flows Channel degradation/ bank instability
Touchet River	Adult/juvenile passage Irrigation diversions
SNAKE RIVER	
Tucannon River	Rearing habitat Adult holding habitat Water temperature Riparian degradation Channel degradation/ bank instability
Clearwater River	
Lolo Creek	Riparian degradation Channel degradation/ bank instability Irrigation diversions Rearing habitat
Lapwai Creek	Low flows Water temperature Sedimentation/pollution Riparian degradation
Potlatch River	Low flows Water temperature Sedimentation/pollution Riparian degradation Logging activities
Clear Creek	Low flows Sedimentation/pollution Adult/juvenile passage Logging activities
Red River	Riparian degradation Channel degradation/ bank instability

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Feasibility study Improve flows Control water temperature Bank stabilization Storage dam and reservoir Improve rearing habitat/construct pools	Chinook, coho, steelhead
Provide passage	Steelhead
Protective fencing Control water temperature Riparian revegetation Bank stabilization Improve rearing habitat/construct pools	Chinook, steelhead
Protective fencing Riparian revegetation Bank stabilization Improve rearing habitat/construct pools	Chinook, steelhead
Improve flows Control water temperature Riparian revegetation	Steelhead
Protective fencing Improve flows Control water temperature Riparian revegetation Bank stabilization	Steelhead
Improve flows Control water temperature Bank stabilization Channel rehabilitation Storage dam and reservoir	Chinook, steelhead
Protective fencing Riparian revegetation Bank stabilization	Chinook

Appendix A Table

Subbasin and Project Site	Problem
Meadow Creek	Rearing habitat
Crooked River	Mining/dredging Adult/juvenile passage Riparian degradation
Orofino Creek	Adult/juvenile passage
American River	Rearing habitat
South Fork Clearwater tributaries	Adult/juvenile passage
Selway River tributaries	Adult/juvenile passage
South Fork White Bird Creek	Adult/juvenile passage
Little Slate Creek	Adult/juvenile passage
Lochsa River	
Colt Creek	Adult/juvenile passage
Badger Creek	Adult/juvenile passage
Wendover Creek	Adult/juvenile passage
Cabin Creek	Adult/juvenile passage
Grande Ronde River	
Phillips Creek	Rearing habitat Riparian degradation
Joseph Creek tributaries	Rearing habitat Adult holding habitat Spawning habitat Water temperature

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Protective fencing Riparian revegetation Improve rearing habitat/construct pools	Steelhead, chinook
Riparian revegetation Channel rehabilitation Provide passage	Chinook
Provide passage	Chinook, steelhead
Protective fencing Bank stabilization Improve rearing habitat/construct pools Off-channel development	Chinook, steelhead
Provide passage	Chinook, steelhead
Provide passage	Chinook, steelhead
Provide passage Unspecified habitat improvements	Chinook, steelhead
Provide passage Unspecified habitat improvements	Chinook, steelhead
Provide passage	Chinook
Provide passage	Steelhead
Provide passage	Steelhead
Provide passage	Chinook
Riparian revegetation Improve rearing habitat/construct pools	Steelhead
Riparian revegetation Improve rearing habitat/construct pools	Chinook, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Upper Grande Ronde River tributaries	Rearing habitat Adult holding habitat Spawning habitat Water temperature Riparian degradation
Salmon River	
Alturas Lake Creek	Riparian degradation Irrigation diversions
Carmen Creek	Low flows Irrigation diversions
Pole Creek	Riparian degradation Logging activities Channel degradation/ bank instability
East Fork, South Fork Salmon River	Riparian degradation Channel degradation/ bank instability Sedimentation/pollution Mining/dredging Adult/juvenile passage
Camas Creek	Riparian degradation Channel degradation/ bank instability
Marsh Creek	Riparian degradation Channel degradation/ bank instability
Bear Valley Creek	Sedimentation/pollution Mining/dredging Riparian degradation Channel degradation/ bank instability
Elk Creek	Riparian degradation
Panther Creek	Sedimentation/pollution Mining/dredging

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Riparian revegetation Improve rearing habitat/construct pools	Chinook, steelhead
Improve flows Storage dam and reservoir Provide passage	Chinook, sockeye
Improve flows Storage dam and reservoir	Chinook, steelhead
Riparian revegetation Bank stabilization Channel rehabilitation	Chinook, steelhead
Riparian revegetation Bank stabilization Channel rehabilitation Provide passage	Chinook, steelhead
Protective fencing Riparian revegetation	Chinook, steelhead
Protective fencing Riparian revegetation Channel rehabilitation	Chinook, steelhead
Protective fencing Riparian revegetation Bank stabilization Channel rehabilitation	Chinook, steelhead
Protective fencing Riparian revegetation Bank stabilization	Chinook, steelhead
Protective fencing Riparian revegetation	Chinook, steelhead

Appendix A Table

Subbasin and Project Site	Problem
East Fork Salmon River	Riparian degradation Channel degradation/ bank instability
Yankee Fork Salmon River	Sedimentation/pollution Mining/dredging
Jordan Creek	Mining/dredging Riparian degradation Channel degradation/ bank instability
Valley Creek	Riparian degradation
Upper Salmon River	Low flows Riparian degradation Irrigation diversions
South Fork Salmon River	Adult/juvenile passage Sedimentation/pollution Mining/dredging Riparian degradation Channel degradation/ bank stabilization
Stanley Lake	Adult/juvenile passage
Lemhi River	Riparian degradation Irrigation diversions
Little Salmon River and tributaries	Adult/juvenile passage

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Protective fencing Riparian revegetation	Chinook, steelhead
Protective fencing Riparian revegetation	Chinook, steelhead
Riparian revegetation Bank stabilization Channel rehabilitation	Chinook, steelhead
Protective fencing Riparian revegetation Bank stabilization	Chinook, steelhead
Protective fencing Improve irrigation efficiency Fish screens Improve flows Riparian revegetation Bank stabilization Channel rehabilitation Provide passage	Chinook, steelhead
Provide passage Riparian revegetation Bank stabilization Channel rehabilitation	Chinook, steelhead
Provide passage	Sockeye
Protective fencing Improve flows Riparian revegetation Storage dam and reservoir Provide passage	Chinook, steelhead
Provide passage	Chinook, steelhead

Appendix A Table

Subbasin and Project Site	Problem
YAKIMA RIVER	
Upper Yakima River (above Naches River)	
Selah-Moxee, Ellensburg Mill, Tjossem, Fogarty, Ventree I and II, Old Cascade, Bull, Peterson, McAusland, Broadbank, Younger, O'Conner, Teanway River-Musetti, Bussoli, Bugni, Guistetti-Bussoli, Contratto, Seaton, Ballard, Guistetti Contratto, Favro, Contratto Banchi, and Cooper Masterson diversions	Irrigation diversions Adult/juvenile passage
New Cascade Diversion	Irrigation diversions Adult/juvenile passage
Naches River	
Naches River/Little Naches	Rearing habitat Spawning habitat Adult/juvenile passage
Selah-Naches, Congdon, Old Union, Fruitvale, Naches-Cowiche, Gleed, Kelly-Lowery, Powell, LaFortune, Lindsay, Scott, Clark, Mill, Anderson, Emerick, Brewer, Foster Naches, Taylor, Ireland, Tieton River-Sinclair-Cobb, Tennant, Yakima-Tieton, Gnavaugh, Rattlesnake Creek-McDaniels, and Beck diversions	Irrigation diversions Adult/juvenile passage

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Improve fish screening facilities	Chinook, steelhead
Improve fish bypass Replace fish pump with gravity bypass Install trash rack Install gantry crane	Chinook, steelhead
Riparian revegetation Bank stabilization Provide passage Improve rearing habitat/construct pools Gravel restoration	Steelhead, chinook
Improve fish screening facilities	Chinook, steelhead

Appendix A Table

Subbasin and Project Site	Problem
Lower Yakima River (below the Naches River)	
Union Gap, Moxee-Hubbard, Kiona, Moxee, Boise Cascade, Ahtanum River-Wapato, and Satus Creek-Shattuck diversions	Irrigation diversions Adult/juvenile passage
ENTIAT RIVER	
Burns Creek	Riparian degradation
Fox Creek	Fire damage
Box Canyon and Entiat Falls	Adult/juvenile passage
SIMILKAMEEN RIVER	
Enloe Dam	Adult/juvenile passage Irrigation diversions

Appendix A Table

Solutions (Enhancement Projects)	Species Benefited
Improve fish screening facilities	Chinook, steelhead
Riparian revegetation	
Riparian revegetation	
Feasibility study Provide passage	Chinook, steelhead
Provide passage	Chinook, coho, steelhead

Appendix B
Completed Actions

The progress made in protecting and enhancing fish and wildlife in the Columbia River Basin can be measured, in part, by the actions and projects completed since the Northwest Power Planning Council adopted the first fish and wildlife program in 1982. These accomplishments represent the combined efforts of the Council, the Bonneville Power Administration, federal and state agencies and regulators, Indian tribes, public and private utilities, and other interested groups and citizens.

For construction actions, this list includes only projects on which construction is complete. Completed contracts within construction projects, such as feasibility studies, are not included unless the program only calls for a feasibility study. References are to the 1984 program unless otherwise indicated.

Major Implementing Agencies	Action	Former Program Section and Action Item Numbers
Council	Supplemental budget for salmon and steelhead planning	201, action item 36.1 (as amended in 1985)
Council	Goals work plan Compilation of losses information Salmon and steelhead productivity analysis Blocked-area identification Resident fish productivity analysis Related consultations	201, action item 36.2 (as amended in 1985)
Council	Adaptive management workshop	201, action item 39.4 (as amended in 1985)
FERC, Douglas County PUD	Spill effectiveness report: Wells Dam	404(a)(1), 404(a)(10), action item 32.13 (1st bullet)
FERC, Chelan County PUD	Spill effectiveness report: Rocky Reach and Rock Island dams	404(a)(2), 404(a)(10), action item 32.12 (3rd bullet)
FERC, Grant County PUD	Spill effectiveness report: Priest Rapids Dam	404(a)(3), 404(a)(10), action item 32.11 (2nd bullet)
FERC, Grant County PUD	Spill effectiveness report: Wanapum Dam	404(a)(3), 404(a)(10), action item 32.11 (4th bullet)
Corps	Biological and prototype screen testing report for The Dalles Dam	404(b)(4)(B), action item 32.4 (2nd bullet)
Corps	Report on evaluation of screens and bypass at both Bonneville Dam powerhouses	404(b)(5), action item 32.3 (2nd bullet)
Corps	Biological and prototype screen testing at Lower Monumental Dam	404(b)(8), action item 32.8 (2nd bullet)

Appendix B
Completed Actions

Major Implementing Agencies	Action	Former Program Section and Action Item Numbers
FERC, Eugene Water and Electric Board	Installation of juvenile bypass facility at Leaburg Canal (Willamette subbasin)	404(b)(14), action item 32.18
Corps	Transportation report and proposals	404(b)(17), action item 32.2 (3rd bullet)
Corps	Report on adult passage delays at John Day Dam	604(a)(5), action item 32.5 (4th bullet)
Corps	Installation of vertical slot counters at The Dalles Dam	604(b)(3), action item 32.4 (5th and 6th bullets)
Bonneville	Tumwater-Dryden dams adult passage feasibility study (Wenatchee subbasin)	604(c)(3), (1982 program)
Bonneville	Little Falls Creek fish passage (Willamette subbasin)	704(d)(1)
Bonneville	White River Falls passage feasibility study (Deschutes subbasin)	704(d)(1) (Table 2), action item 34.5
Bonneville	Deschutes River gravel study	704(d)(1) (Table 4), (1982 program)
Bonneville	Deer Creek habitat improvement (John Day subbasin)	704(d)(1) (Table 2), action item 34.5
Bonneville	Murderers Creek habitat improvement (John Day subbasin)	704(d)(1), action item 34.5
Bonneville	Beech Creek habitat improvement (John Day subbasin)	704(d)(1), action item 34.5
Bonneville	Canyon Creek habitat improvement (John Day subbasin)	704(d)(1), action item 34.5
Bonneville	Granite Boulder Creek habitat improvement (John Day subbasin)	704(d)(1), action item 34.5
Bonneville	Clear and Granite Creek habitat improvement (John Day subbasin)	704(d)(1), action item 34.5

Appendix B
Completed Actions

Major Implementing Agencies	Action	Former Program Section and Action Item Numbers
Bonneville	South Fork John Day River habitat improvement and passage, except Izee Falls passage (John Day subbasin)	704(d)(1), action item 34.5
Bonneville	Lower Umatilla River channel modification (Umatilla subbasin)	704(d)(1), action item 34.5
Bonneville	Meadow Creek passage (Clearwater subbasin)	704(d)(1), action item 34.5
Bonneville	Eldorado Creek passage (Clearwater subbasin)	704(d)(1), action item 34.5
Bonneville	Crooked Fork Lochsa River passage (Clearwater subbasin)	704(d)(1), action item 34.5
Bonneville	Peavine Creek habitat improvement (Grande Ronde subbasin)	704(d)(1), action item 34.5
Bonneville	South Fork Salmon River tributaries fish passage: Johnson and Boulder creeks (Salmon subbasin)	704(d)(1), action item 34.5
Bonneville	Dryden Dam passage (Wenatchee subbasin)	704(d)(1), action item 34.5
Bonneville	Tumwater Falls Dam passage (Wenatchee subbasin)	704(d)(1), action item 34.5
Pacific Northwest Fish Health Protection Committee	Fish health proposal	704(h)(2)(E)
Bonneville	Design and construction of Umatilla release, collection and holding facilities	704(i)(1), (1982 program)
Bonneville	Supplementation work plan	704(k)(1), action item 34.24
Bonneville, FERC, Council, Montana Power Company, Montana Department of Fish Wildlife and Parks	Painted Rocks Reservoir water purchase	804(e)(1), action items 41.5 and 41.14

Appendix B
Completed Actions

Major Implementing Agencies	Action	Former Program Section and Action Item Numbers
Bonneville, Washington Water Power, Idaho Department of Fish and Game	Construction of Cabinet Gorge hatchery	804(e)(4)-(5), action item 41.4
Bureau of Reclamation	Installation of barrier net at Banks Lake	804(e)(7), action item 41.17
Bonneville	Sturgeon work plan	804(e)(8), action item 41.3
Bureau of Reclamation	Juvenile screen, smolt trap, and right-bank ladder at Prosser Dam (Yakima subbasin)	904(d)(2), action item 34.2
Bonneville, Bureau of Reclamation	Fishways and screens at Horn Rapids Diversion Dam (Yakima subbasin)	904(d)(4) (Table 3-(A)), action item 34.3
Bonneville	Fishways and screens at Sunnyside Diversion Dam (Yakima subbasin)	904(d)(4) (Table 3-(B)), action item 34.3
Bonneville, Bureau of Indian Affairs	Fishways and screens at Wapato Diversion Dam (Yakima subbasin)	904(d)(4) (Table 3-(C)), action item 34.3
City of Yakima, Washington Department of Ecology	Vertical slot fishway and counting facility at Naches/Cowiche Diversion Dam (Naches River) (Yakima subbasin)	904(d)(4) (Table 3-(I)), action item 34.3
Bonneville	Vertical slot fishway at Toppenish Creek Flood Control Project (headworks of Satus Main Canal) (Yakima subbasin)	904(d)(4) (Table 3-(J)), action item 34.3
Bonneville	Vertical slot fishway and fish screening facility at Toppenish Creek Diversion Dam (Yakima subbasin)	904(d)(4) (Table 3-(K)), action item 34.3
Bonneville	Fish screening facilities Stevens Ditch (Naches River) (Yakima subbasin)	904(d)(4) (Table 3-(M)), action item 34.3

Appendix B
Completed Actions

Major Implementing Agencies	Action	Former Program Section and Action Item Numbers
Bonneville, Montana Department of Fish, Wildlife and Parks, Council and others	Mitigation plans for Hungry Horse and Libby dams	1004(b)(3),(5) and Table 4, action items 40.4 and 40.8
Council	Research study	1104(c)(1), action items 34.26 and 39.3

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