1984

Columbia River Basin

Fish and Wildlife Program

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

NORTHWEST POWER PLANNING COUNCIL

Columbia River Basin
Fish and Wildlife Program

Adopted November 15, 1982
Amended October 10, 1984

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:

In 1982, the Northwest Power Planning Council unveiled its Columbia River Basin Fish and Wildlife Program. That program turned out to be one of the most important efforts to save a natural resource currently going on in this nation. It is designed to protect and restore the once teeming fish and wildlife populations which have been seriously depleted by hydroelectric development in the Basin.

In many ways, this innovative program is far more than the Council's program. It truly belongs to the people of the Pacific Northwest. As the program developed, the Council heard oral testimony and received written comment from people from all over the region. These included Indian tribes, fish and wildlife agencies and other resource managers, utilities and federal power agencies, environmental groups, scientists, and businesses, as well as private individuals. The Council reviewed and took into account all of this testimony as it developed the program.

Then, a year after the program was adopted, the Council reopened the program for amendment and received 140 proposals from individuals and organizations throughout the region. In addition, the Council staff proposed changes. Once again, the Council went through an intensive public review process. The result is this amended program.

The Council will continue to reopen the program in the future to the people of the Northwest to allow changes which reflect knowledge gained through study and practice and new scientific technology. Thus, the program will remain vital and effective in its efforts to preserve the Basin's resources. Throughout this process, our goal will be to recognize our debt to the past at the same time we are making an investment in our future.

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Foreword

Early settlers

When settlers first came to the Columbia River Basin in the early 1800s, the resources of the basin must have appeared inexhaustible: mountains of timber, ranges of prairie for grazing, lush valleys for farming, and rivers teeming with fish. The settlers competed for these resources with the native population, the Northwest Indians. The land and the river seemed to fulfill all the needs of the Indians, whose culture was built around the fish, particularly salmon, which migrated to and from the ocean in huge runs as reliable as the changing seasons. Salmon were more than just a food to the Indians; these fish were considered sacred, and played a prominent role in Indian religious ceremonies.

Indian culture

It was inevitable that the settlers and the Indians should clash. The settlers learned quickly that the resources of the Columbia River Basin could be exploited for substantial economic gain. The Indians, on the other hand, believed they lived in special harmony with nature, a harmony that should not be disturbed. A series of wars between the settlers and the Indians ended in the mid 1800s when peace treaties were signed. In these treaties, the federal government recognized the Native Americans' prior claim to the water and fish, reserving their right to fish in their "usual and accustomed places in common with" territorial settlers. The treaties were an acknowledgment of the Indians' special relationship to the land, the river, and the fish.

Treaties

Commercial salmon industry

New canning methods revolutionized the canning industry at the turn of the century, and the commercial salmon industry developed rapidly. Soon the river was being taxed beyond its ability to replenish itself. Once conserved by the Indians, who took only as many fish as they needed, the salmon runs became so overharvested that Indian treaty rights could not be realized.

Fishing alone, however, did not deplete the fishery of the Columbia River Basin. Poor logging, grazing, and farming practices caused the land to erode, leaving blankets of silt over natural spawning beds and rendering them useless. In addition, under the Reclamation Act of 1902, federal dams were constructed to store water for irrigation, decreasing the flows available for successful migration of salmon and steelhead, and blocking access to miles of upriver spawning habitat.

Major development

Despite these effects, the fisheries of the Columbia River Basin were still relatively strong in the early 1930s. The election of Franklin D. Roosevelt started economic recovery programs of the New Deal, and by 1933 Congress had approved both the Bonneville Dam on the lower Columbia River and the Grand Coulee Dam on the upper river. Four years later, Congress authorized the Bonneville Power Administration, then a temporary agency, to construct transmission lines and sell the power from these dams. Bonneville, spurred by the public power movement and better economic times, sold power to more and more customers, requiring the construction of more and more dams.

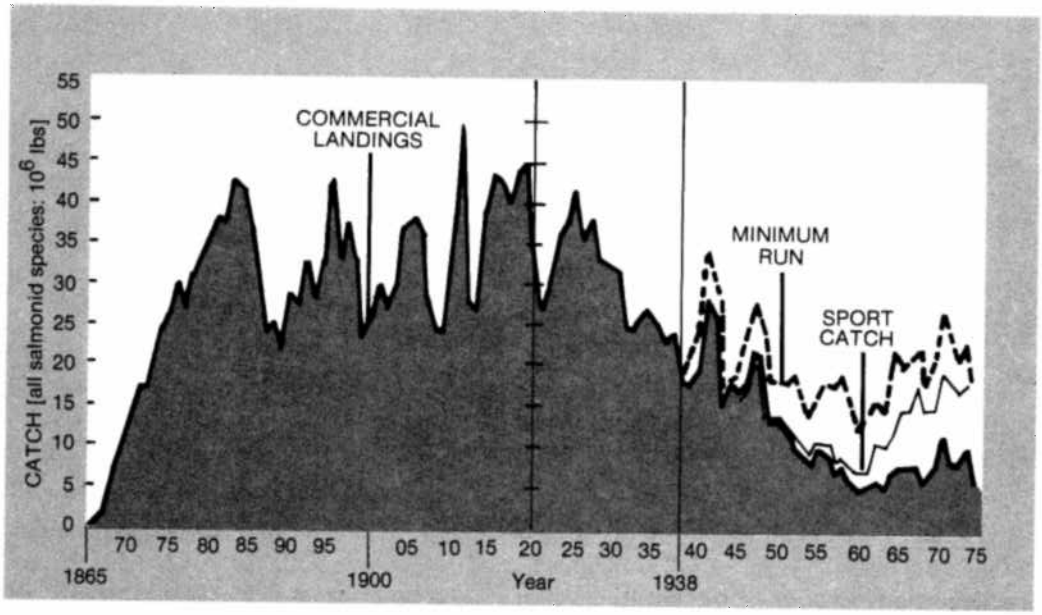
When it was finished in 1975, the Federal Columbia River Power System consisted of 28 dams that produce more than 13,000 megawatts of low-cost, renewable electricity, with a storage capacity exceeding 20 million acre-feet of water. Dams owned by public and private utilities generate even more power, and other state and federal dams hold back more water for irrigation and flood control. The result is less water for increasingly fewer fish.

Depletion of fish runs

A few numbers illustrate this unhappy result. Between the mid-1930s and the mid-1970s — as the power system fully developed — the commercial Columbia salmon catch declined by two-thirds, from approximately 21 million pounds to about 6.5 million pounds (Figure A). Simultaneously, the accessible habitat for natural spawning shrank by more than half, from approximately 163,000 square miles to about 73,000 square miles. Similar reductions occurred in the number of upriver chinook salmon re-entering the river.

Foreword

Figure A.
Impacts of Hydroelectric System on Columbia River Salmon



The culprits, however, were not the dams alone. Fish runs had begun to decline even before the completion of Bonneville Dam in 1938 as overfishing, from both the ocean and river harvest, and destruction of natural spawning beds from a variety of human activities, claimed a larger and larger share of the stocks.

Fisheries agencies concerned

By the late 1970s, the anadromous runs (migrating salmon and steelhead) were so depleted that the federal fisheries agencies initiated administrative proceedings to consider whether to designate certain upriver runs as "threatened" or "endangered," thus invoking the protection provided by the Endangered Species Act. Fisheries officials wanted redress from the power system, and focused their attention on the Northwest Power Bill which was under Congressional consideration.

Enactment of Northwest Power Act

While Northwest Congressmen urged the conflicting power and fisheries interests to develop a legislative compromise, the fish found another friend on Capitol Hill: Michigan Congressman John D. Dingell. Chairman of the key House Commerce Committee, Dingell made it clear that the bill would not leave his committee unless it contained provisions to protect fish and wildlife resources affected by hydroelectric development in the Columbia River Basin. When the Northwest Power Bill was enacted into law, it mandated the development of a program to protect, mitigate, and enhance these resources.

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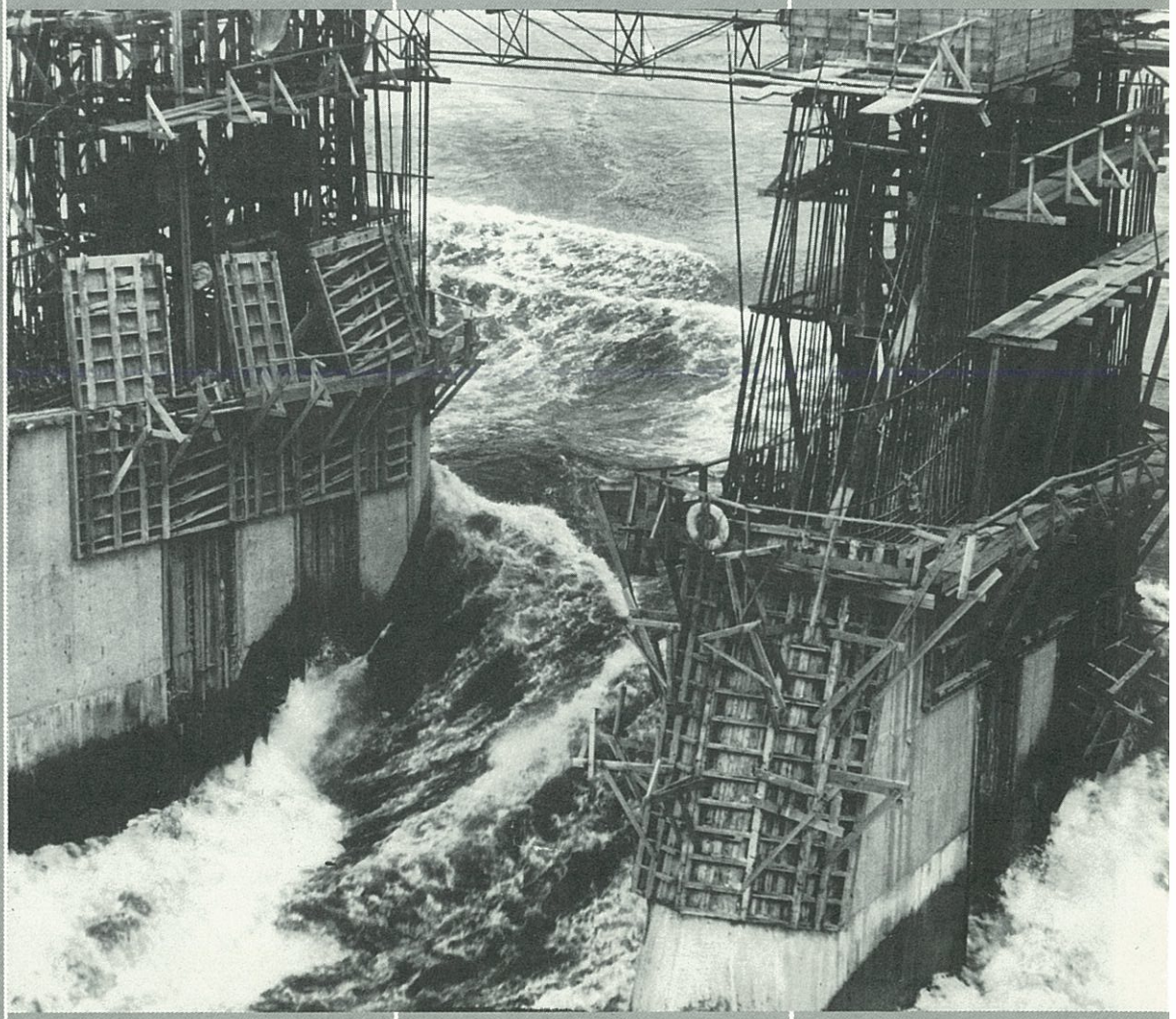
Introduction



101. Purpose

The Pacific Northwest Electric Power Planning and Conservation Act of 1980, 16 U.S.C. 839 et seq. (the "Northwest Power Act" or the "Act"), directed the Northwest Power Planning Council to "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." The Act further directed that "the program, to the greatest extent possible, shall be designed to deal with that river and its tributaries as a system." In the development of the program, the Council was required to consult with a variety of groups in the Northwest, including the Indian tribes, and was required to maintain comprehensive programs for public participation. This program reflects those requirements.

The Northwest Power Act brings three important new tools to the effort to mitigate fish and wildlife losses caused by Columbia River hydroelectric dams. First, the Act assigns responsibility for developing a fish and wildlife program to this Council, which is composed of representatives from the four states in the Columbia River Basin — Idaho, Montana, Oregon, and Washington. The people of the Northwest are given an opportunity to decide what should be done to protect their fish and wildlife resources and mitigate the harm caused by decades of hydroelectric development. Second, the Act directs that the river and its tributaries shall be treated as a system to the greatest extent possible. This allows the region to formulate solutions that go beyond the problems created by each particular dam and that address the cumulative impact of the entire hydroelectric system. Third, the Act explicitly gives the Bonneville Power Administration 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."

This program is limited by the Act to measures to protect, mitigate, and enhance fish and wildlife affected 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. It does not address harm to fish and wildlife attributable to causes other than hydroelectric development. Finally, 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 hereafter fish and wildlife interests and power interests shall cooperate as partners in the development, operation, and management of the Columbia River hydroelectric system for the benefit of all citizens of the Pacific Northwest.

102. Program Development

The Act directed the Council to develop this program by first requesting recommendations from the region's federal and state fish and wildlife agencies, appropriate Indian tribes, and other interested parties. The recommendations were to include:

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

b. Objectives for the development and operation of hydroelectric dams in a manner designated to protect, mitigate, and enhance fish and wildlife; and

c. Fish and wildlife management coordination and research and development (including funding).

The law allowed a minimum of 90 days to respond with recommendations and detailed information and data in support of their recommendations. Under the law, if the Council fails to adopt any recommendation the Council must explain, as part of the program, why the recommendation is

inconsistent with the standards of the Act or is less effective than the adopted recommendations for the protection, mitigation, and enhancement of fish and wildlife. Thus, the recommendations have provided the framework for this program.

Efforts to develop this program began immediately after enactment of the Act on December 5, 1980. By April 1981, fish and wildlife agencies and Indian tribes had established an Ad Hoc Executive Committee for the purpose of organizing and managing their recommendations. The Council was formed on April 28, 1981, and issued its request for fish and wildlife program recommendations on June 10, 1981. Responses were required by November 15, 1981.

More than 400 recommendations were received. The recommendations and supporting material were reproduced and bound in four volumes totaling 2200 pages, and were distributed throughout the region. Public involvement efforts began immediately. During March 1982, public hearings on the recommendations were held in Portland, Boise, Missoula, and on the Yakima Indian Reservation, producing 1728 pages of testimony. Council members personally attended each hearing. Additional written comments were received prior to the close of the comment period on April 1, 1982. Thereafter, the Council and its staff embarked upon a program of consultation with its Scientific and Statistical Advisory Committee (created under section 4(c)(ii) of the Act) and with individual agencies, utilities, tribes, and other interested groups to evaluate the recommendations and comments. Major components of the program were discussed at Council meetings, and detailed consultations and briefings on the proposed program were conducted during early September. All these efforts took place before adoption of the draft program on September 16, 1982. The draft program included many changes arising out of the consultations and public meetings that had occurred between September 1 and September 16.

Immediately after release of the draft program, 52 agencies, utilities, and tribes given special status under section 4(h)(4)(A) of the Act were provided with a double-spaced copy of the program and were encouraged to provide comments in as much detail as possible. Over 2300 copies of the draft program were distributed without charge to major federal and state agencies, interested organizations, and private citizens. Consultation efforts began again. The Council sponsored meetings on the goals of the program, the Water Budget, and on the problems of downstream passage through the mid-Columbia dams. Council members were personally present and deeply involved throughout these consultations.

Public hearings on the draft program were held in Portland, Boise, Missoula, and Yakima, with each hearing drawing a full calendar from early in the morning until late at night. Again, Council members attended each hearing. The four days of hearings produced 1481 pages of testimony. The period for submitting written comments closed on October 25, 1982.

The written comments far exceeded the Council's expectations. Comments totaling approximately 5000 pages came from 600 agencies, tribes, utilities, and members of the public. The comments were as impressive in their content as they were in their volume. Those commenting took literally the Council's request for specific, detailed suggestions for improvements in the draft program. The quantity and quality of the comments should convince anyone who has participated in this process that the Council, the fish and wildlife agencies, Indian tribes, federal project operators and regulators, utilities, and the public are committed to solving the region'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.

The program was adopted on November 15, 1982. It included provisions for amendment so that it would be flexible and responsive to new information. November 15, 1983, was set as the deadline for receipt of the first set of applications for amendment of the program. The Council received more than 140 amendment applications by the November 15, 1983, deadline. The Council staff divided these into 14 categories and developed an issue paper on each category. In June, 1984, the Council released a draft amendment document for public review and comment. After lengthy review, the Council made its final decision on the proposed amendments at its October 10-11, 1984, meeting. This program incorporates the amendments adopted by the Council.

103. Alternatives

In the process of developing this program, the Council has considered a number of alternatives to the measures it has adopted. The recommendations themselves, of course, were given great weight because of the expertise of the fish and wildlife agencies and tribes. The public hearings and written comments on the recommendations and on the draft program produced alternatives to many program measures, all of which were considered by the Council. The Fish and Wildlife Subcommittee of the Council's Scientific and Statistical Advisory Committee met seven times to discuss various aspects of the program. Particularly significant elements of the program, such as program goals, flows for downstream migration, fish passage around dams, and interim spills pending solutions to downstream passage problems, were examined carefully in consultation with experts from throughout the region.

The many alternatives considered by the Council are explained in the main sections of this program and in appendices. Appendix A explains the Council's disposition of applications for amendment. Appendix B describes the comments submitted on the draft amendment document, many of which suggested alternatives to the measures in the draft, and the Council's response to those comments.

104. Role of The Council

Throughout development of this program, and particularly in comments on the draft program and draft amendment document, federal operating and regulating agencies have emphasized their independent responsibilities for carrying out this program and for fish and wildlife mitigation and enhancement generally. The Northwest Power Act is explicit on this subject. Under section 4(h)(10)(A), Bonneville is directed by Congress to use the Bonneville fund and all of its 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." Under section 4(h)(11)(A), Bonneville and the federal operating and regulating agencies are directed by Congress to exercise their responsibilities consistent with the purposes of the Act and other applicable laws, to provide equitable treatment for fish and wildlife, and to take this program "into account at each relevant stage of decision-making processes to the fullest extent practicable."

The Council understands this language. Implementation and funding of this program will be carried out by or through federal agencies. (See Costs subsection.) The Council recognizes that implementation must be accomplished in accordance with the substantive and procedural requirements of the Act and other statutes under which each federal agency operates. For example, it may be necessary for an agency 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 directed at non-federal projects, the processes of the Federal Energy Regulatory Commission must be respected. Under the Northwest Power Act, the Council has developed its program measures in "informal rulemaking" proceedings and based them on the best available scientific knowledge, as required by section 4(h)(6)(B) of the Act. However, under the Federal Power Act, the FERC must review the program measure, the license, and the hydroelectric project to determine whether the project license can and should be amended. Formal adjudicatory proceedings may be necessary if the parties cannot agree on the amendment. Adjudicatory proceedings are not required, however, if parties settle their differences among themselves. The Council strongly encourages the non-federal project operators to implement program measures voluntarily. Their cooperation can greatly speed fish and wildlife enhancement by avoiding lengthy, and often unnecessary, administrative proceedings.

The Council, of course, is not a federal implementing agency. Congress expected the Council to plan the fish and wildlife program, and expected the federal agencies to carry it out. But in the end, Congress expected action. Something must be done to overcome the harm to fish and wildlife caused by Columbia River hydroelectric dams. The Northwest Power Act anticipates that the Council and the federal implementing agencies will cooperate to achieve the goals set by Congress, and will respect the role each has to play. Fish and wildlife protection, mitigation, and enhancement will never take place if each agency tries to substitute its judgment for the scientific knowledge, expertise, and judgment of those who went before.

The Council has been committed throughout this process to the development of a fish and wildlife program that is readable, understandable, and direct. The success of that endeavor can be measured by the amount of public interest and constructive participation generated by the draft program and draft amendment document. The 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 many 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 has concluded 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 restoration of the Columbia River's depleted salmon and steelhead runs. Specifically, the word "shall" is used throughout this program (i) 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 (ii) 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. Costs

Program measures will be implemented 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 Act, Bonneville and the federal project operators will fund program measures at federal dams. Non-federal hydroelectric project owners generally will pay for program measures implemented at their dams. However, Bonneville is required to bear any monetary costs and power losses which result from implementing a program measure at a non-federal dam to the extent that such measure addresses fish and wildlife problems that are not attributable to that project.

The most significant element of this program is a Water Budget to improve streamflows for downstream migration. Implementation of the Water Budget is expected to result in a reduction in the firm energy load carrying capability of the region's power system of approximately 550 megawatts (MW). This projected loss is based on computer simulation studies conducted primarily by the Instream Flow Work Group. Although these simulation studies are based on the best available data and simulation of the Columbia River system, the Council recognizes that the actual execution of the Water Budget may result in some variance from this projection.

The Council will consult with Bonneville and the federal operating agencies about the following possible actions which could reduce the cost of providing adequate flows for fish:

a. Conservation;
b. Power exchange agreements with California;
c. Changes in thermal plant maintenance scheduling;
d. Use of Canadian storage to achieve Water Budget flows;
e. Changes in operations for flood control; and
f. Use or development of additional water storage.

Through an aggressive program to determine more precisely the flows needed for downstream migration of juveniles, the Council expects to have much better data to make Water Budget modifications, if they are appropriate.

Current load forecasts for the Northwest project a power surplus through the 1980s and possibly beyond the year 2000, even including power losses attributable to the Water Budget. Although power revenue losses also will occur due to fish flows, it is clear that adequate power exists in the region to meet the forecasted energy loads and at the same time establish a Water Budget for fish.

While initial studies indicate that the Water Budget will reduce firm energy load carrying capability by approximately 550 Mw, the Council itself has not determined the cost of this power loss. The Pacific Northwest Utilities Conference Committee, however, has estimated the cost of replacing 525 Mw of energy loss by various actions. Using conservation and renewable energy resources, the estimated cost would be $160 million per year.

It is even more difficult to estimate accurately the cost of the capital construction projects, interim water spills, operation and maintenance, and research in this program. Many of these measures are subject to further approval by the Council based on additional information, including design, cost, identification of alternatives, and the number of fish to be produced. Also, some measures would be paid for by individual project operators, while others would be funded by Bonneville as power system costs. However, based on proposed implementation plans submitted by the fish and wildlife agencies and tribes, and on an analysis of the cost of program measures (excluding the Water Budget) conducted for the Council by Kramer, Chin, and Mayo, Inc., the Council estimates that if all measures were implemented, the costs would be in the range of approximately $650-$740 million over the next twenty years. This estimate is in 1982 dollars and would result in costs of approximately 0.05 cents per kilowatt hour of energy sold by Bonneville.

The Council has determined that the estimated hydroelectric system costs, which include the cost of implementing the Water Budget and costs associated with capital, operation, and maintenance for other program measures, are consistent with section 4(h)(5) of the Act. This section directs the Council to develop a program to protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of the Columbia River Basin hydroelectric facilities while ensuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.

The Council is taking the following steps in this program to ensure that costs are reasonable and that the desired results are achieved:

a. In Section 200, the Council establishes a process for setting program goals to ensure that program measures achieve desired results.

b. In Section 304(a)(6), the Council encourages the Corps of Engineers to reexamine its flood control requirements in light of other water needs, including fish and power flow requirements.

c. In Section 504, the Council commits to taking all steps within its authority to ensure that harvest management practices do not diminish the value of the ratepayers' investment in protection, mitigation, and enhancement of Columbia River Basin fisheries. These steps include developing enhancement objectives which are coordinated with efforts undertaken pursuant to the Salmon and Steelhead Conservation and Enhancement Act.

d. In Section 904, the Council commits to promoting more efficient water use in the Yakima River Basin through improved irrigation practices and other methods. The Council also makes a commitment to identify additional water storage opportunities in the Yakima River Basin, without taking a position at this time on any particular site or on whether ratepayers should pay any share of the costs of providing the additional storage.

e. In Section 1004, the Council calls for a full review of all past and continuing wildlife mitigation programs in the basin prior to funding new mitigation and enhancement efforts.

f. In Section 1104, the Council establishes a process for ensuring that program measures are supported by adequate information prior to funding, that the effectiveness of program measures is carefully monitored, and that research is coordinated with the Council's program.

g. In Section 1404, the Council provides a process for program amendment that could be used to substitute less costly, but equally effective means for achieving the biological objectives of the program.

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) 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 remain unclear and, in some cases, 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 hydroelectric system on fish and wildlife. It may not address activities such as irrigation, logging, or other practices which also have degraded fish habitat. In addition, the Council cannot create a program which 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, hunting, 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 Columbia River Basin tribes and the Columbia River Inter-Tribal Fish Commission 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 throughout to restore fish runs by improving fishery habitat so that Indian tribes will be able to realize the rights secured by their treaties. Improvement of flows and passage to increase fish survival play a major role in the program. Many measures calling for habitat restoration to improve natural fish propagation and hatchery management to complement natural propagation respond directly to tribal emphasis on reestablishing upriver runs. The offsite 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, then, the Council believes 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 1600 of this program, nothing in this program authorizes appropriation of water, affects rights to water or jurisdictions over water, or establishes the respective rights of the United States, states, Indian tribes, or individuals to water. The Council assumes that the federal implementing agencies will work hard to develop cooperative and creative ways to implement program flow measures with those requirements in mind. The Council has made a commitment in Section 1104(d) to 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 develop their individual water resource management programs in full consideration of those effects and this program.

108. Council Findings

The Council finds that this program is 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, and 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, in that they:

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

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

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

d. are 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.

The Council has been particularly mindful of its responsibility to base this program on the best available scientific knowledge. This has been a difficult task. The purpose of this program is to restore fish and wildlife resources, and program measures are only desirable if they achieve that goal. The Council found that the scientific information was inadequate to support some recommendations, and thus rejected those measures. Improving the level and usefulness of the scientific knowledge in this area will be one of the Council's most significant objectives.

The Council also spent considerable time seeking and examining less costly alternatives that would achieve the same biological objectives. The Water Budget, for example, is less costly than the tribes' flow recommendations, but should be equally effective in achieving juvenile salmon and steelhead survival. Also, the studies, interim spill requirements, and testing of both bypass and transportation at the mid-Columbia dams should lead to the most effective and least costly solutions to downstream passage problems at those sites. Other protections against unwarranted costs are described under the Costs subsection.

This program embodies a comprehensive, systemwide approach to the protection, mitigation, and enhancement of fish and wildlife in the Columbia River Basin. 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, 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 represents a clear statement that the region views this program as an historical work. The final measure of the success of this program, and of its implementation by federal agencies, will be the restoration of abundant fish and wildlife resources throughout the Columbia River Basin.

The Council has made it clear that it expects action on this program from all the appropriate federal agencies. The Council also expects the cooperation of state agencies and Indian tribes, which have maintained substantial fish and wildlife programs. This program is not intended to replace those activities. In the words of the Act, it is intended to "complement" them.

In addition to its special use of the word "shall," the Council also has used the following shorthand terms throughout 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, National Park Service, 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; and FERC
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; and Washington Department of Game

Abbreviations	Full Name
State water management agencies	Idaho Department of Water Resources; Montana Department of Natural Resources and Conservation; Oregon Department of Water Resources; and Washington Department of Ecology
Tribes	Burns-Paiute Indian Colony; Coeur d'Alene Tribes; Confederated Tribes of the Colville Reservation; Confederated Salish and 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; and Spokane Tribe of Indians

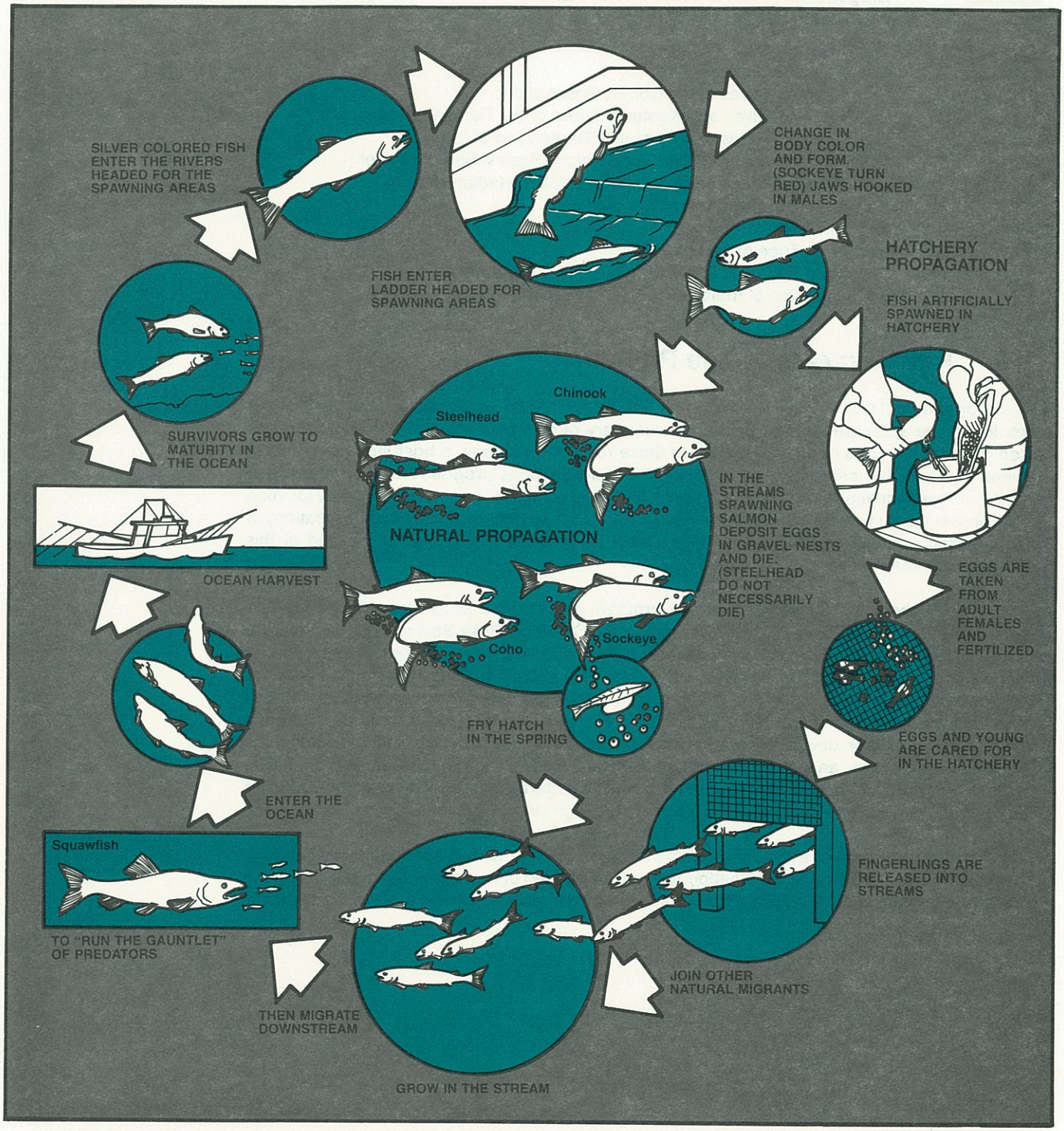
109. Key Elements of The Program

This program contains 17 sections. Sections 300 through 1500 begin with a statement of the problem to be addressed in that Section, a summary of the recommendations related to that problem, the Council's general response to those recommendations, a brief summary of 1984 amendments, and specific program measures. Within the Sections, program measures are divided into a number of categories related to the objective to be achieved, and are arranged by location (dam or river basin) within each category. A large fold-out map (Figure 1) showing the locations of hydroelectric projects and rivers in the Columbia River Basin is included at the end of this document for easy reference.

Sections 300 through 700 and 900 of the program address the protection, mitigation, and enhancement of the anadromous fish resources of the Columbia River Basin. These sections are based on the life cycle of salmon and steelhead (Figure 2) and therefore include measures to improve downstream migration, ocean survival, upstream migration, and propagation. Following the sections on anadromous fish, the program addresses the protection, mitigation, and enhancement of resident fish and wildlife. Finally, the program addresses the Council's involvement in further development and implementation of the program, ensuring adequate protection, mitigation, and enhancement of fish and wildlife in the development of future hydroelectric projects, the coordination of river operations, the Council's procedures for amending the program, and the five-year action plan scheduling high-priority implementation.

This program also contains a glossary and, in a separate volume, the two appendices. Appendix A contains the Council's written explanation for how it disposed of recommendations for program amendment. Appendix B is an evaluation of the comments received on the draft amendments.

Figure 2.
Life Cycle of Anadromous Fish



This program is expected to provide a comprehensive, interrelated systemwide plan for the protection, mitigation, and enhancement of anadromous fish, resident fish, and wildlife on the Columbia River and its tributaries. The program only includes measures that address the adverse effects on fish and wildlife of the Columbia River hydroelectric system. The vast majority of measures will be funded by Northwest electric ratepayers. The Council has a duty to those ratepayers to ensure that program expenditures are related to the hydroelectric system, that the program produces results, and that the Northwest electricity consumers are assured of an adequate, efficient, economical, and reliable power supply.

Reasonable program goals will greatly improve the Council's ability to achieve the fish and wildlife and power purposes of the Act. Having goals allows a regular and consistent evaluation of the progress of the program and an early identification of any problems that are developing. When unexpectedly slow progress is observed, investigations can be conducted to identify whether the problems are created by the hydroelectric system or by other factors. Moreover, having goals makes those charged with implementing the program responsible for producing specific results. The Council understands that it does not have authority to cure all of the problems of fish and wildlife on the Columbia River and its tributaries; nevertheless, clearly identifying the results that are expected will substantially increase the likelihood of success.

In 1984 the Council amended this section to reflect the schedule of the goals study and limit the scope of this section to goals for mitigating losses of anadromous fish.

201. Anadromous Fish

The fish and wildlife agencies and tribes included proposed anadromous fish goals with the recommendations they filed for the development of this program. Proposed goals were included for the six major stocks of salmon and steelhead as follows:

	Pre-McNary Goals (Base run size)	**Current Run Levels** (5-yr. avg.: 1975-79)
Spring chinook	300,000	101,000
Summer chinook	200,000	41,000
Fall chinook	400,000	294,000
Sockeye	200,000	55,000
Coho	164,000	45,600
Summer steelhead	400,000	124,000

These goals were represented as the run sizes of the various stocks which could have been maintained prior to the construction of McNary Dam in 1953. In the case of coho, the goal was based on the size of the run in 1967.

The Pacific Northwest Utilities Conference Committee (PNUCC) and others objected to these goals. PNUCC proposed its own set of goals, based upon the same pre-McNary period and data used by the fish and wildlife agencies and tribes. The PNUCC goals, however, were set at the average run sizes for each of the listed stocks during the pre-McNary period. The fish and wildlife agencies and tribes responded that averages do not reflect the fish production potential of the Columbia River system. The Council has examined these positions carefully and does not believe that the information now available is adequate to support a final decision on goals.

Through consultation with the fish and wildlife agencies, tribes, federal project operators and regulators, and utilities, the Council has learned that the pre-McNary goals proposed by the fish and wildlife agencies and tribes do not actually represent goals, as the Council understands that term. The proposed run sizes are more accurately described as a basis for calculating anadromous fish losses. These numbers represent what the fish and wildlife agencies and tribes regard as the production potential of the river. Anadromous fish losses can be calculated by deducting current run levels from these pre-McNary run sizes. The fish and wildlife agencies and tribes contend that the difference in run sizes is entirely attributable to the hydroelectric power system. The position of the tribes goes further. They contend that the pre-McNary goals are only interim and that the long-term goal should be to restore anadromous fish runs to the sizes that existed before any hydroelectric development on the Columbia River and its tributaries.

The Council believes that the approaches to setting goals used by the fish and wildlife agencies, tribes, and utilities are not appropriate under the Northwest Power Act. The fact is that the Columbia is not a pre-McNary river, and the Act did not authorize or direct the Council to return the river to its previous condition. Nor did the Act direct the Council to restrict its efforts to hydroelectric impacts since McNary Dam. The law directs the Council to address losses caused "by the development and operation of *any* hydroelectric project on the Columbia River and its tributaries." (Emphasis added.)

No amount of effort can restore the environmental conditions for anadromous fish that existed prior to the construction of hydroelectric projects. Spawning areas have been permanently inundated by dams, and fish migration past Grand Coulee Dam on the Columbia River, Dworshak Dam on the Clearwater River, and Hells Canyon Dam on the Snake River is now impossible. Over 1000 miles of salmon and steelhead habitat is lost. Certain upriver stocks, such as the well-known 'June hogs,' are now extinct. The environmental conditions they required cannot be restored.

Despite these facts, which are self-evident, salmon and steelhead mitigation efforts have continued to focus on what is referred to as "in place and in kind" compensation for all fish losses due to hydroelectric development. Solutions have been provided only on a site-specific basis. The Northwest Power Act recognizes that such an approach has been unsatisfactory and specifically directs that this program, "to the greatest extent possible, shall be designed to deal with (the Columbia River) and its tributaries as a system."

In establishing goals, it is imperative to understand that losses and goals are not identical. Losses indicate what the river was capable of producing before hydroelectric development. Goals identify the mitigation that will be provided to compensate for those losses. The mitigation must take the system as it exists and provide a reasonable equivalent for what was lost.

In calculating both losses and goals the Council is limited to the effects caused by the hydroelectric system. Despite the significance of those effects, there is no scientific evidence, or intuitive good sense, to support the position that the hydroelectric system is responsible for all salmon and steelhead losses in the Columbia and its tributaries. Can one seriously contend that irrigation, forestry, commercial and sport fishing, and cycles of nature (especially in the ocean) have had no effect on salmon and steelhead? The mixed-stock ocean harvest, for example, has had profound effects on salmon. Until harvest management is coordinated with enhancement efforts, the task of developing realistic goals will be very difficult.

Despite the difficulty of the task, the Council is committed to identifying with reasonable confidence the losses suffered by salmon and steelhead as a result of hydroelectric development on the Columbia River and its tributaries, and to establishing goals for this program which can be achieved. Until that task is completed, the Council will recognize the pre-McNary fish run levels proposed by the fish and wildlife agencies and tribes as a reasonable statement of the salmon and steelhead losses that have occurred since the construction of McNary Dam, due to all causes. For

Program Goals: Anadromous Fish

the reasons explained above, the Council does not have adequate information to identify the share of those losses attributable to the hydroelectric system, nor does the Council have adequate information to establish the area-by-area and stock-by-stock goals which are necessary to implement this program.

The following measures are designed to lead to the establishment of program goals for anadromous fish:

(1) Bonneville shall fund a study by the fish and wildlife agencies and tribes to identify the salmon and steelhead losses that have occurred as a result of the development and operation of the Columbia River hydroelectric system and to develop proposals for anadromous fish goals for this program. Specific losses and goals will be provided for each stock and each significant river basin.

(2) In designing and conducting this study, the fish and wildlife agencies and tribes will consult with the federal project operators and regulators, any utility that owns or operates hydroelectric facilities on the Columbia River or its tributaries, appropriate water management agencies, and the Salmon and Steelhead Advisory Commission created under the Salmon and Steelhead Conservation and Enhancement Act of 1980 (16 U.S.C. 3301 et seq.).

(3) The study will determine:

(A) Past, present, and potential production;

(B) The separate potential for wild, naturally spawning, and hatchery propagation;

(C) Limiting factors, such as disease and genetics;

(D) Harvest and escapement management implications;

(E) Areas of emphasis;

(F) Stocks of emphasis;

(G) Capital costs and operation and maintenance costs;

(H) A sequence and priority of action;

(I) The extent and success of past mitigation and enhancement efforts; and

(J) The credit to be given to ratepayers for offsite enhancement activities undertaken pursuant to this program.

(4) The fish and wildlife agencies and tribes will report on their progress to the Council and to the agencies and organizations entitled to consult under measure (2). The Council will determine frequency of reporting after reviewing the study design.

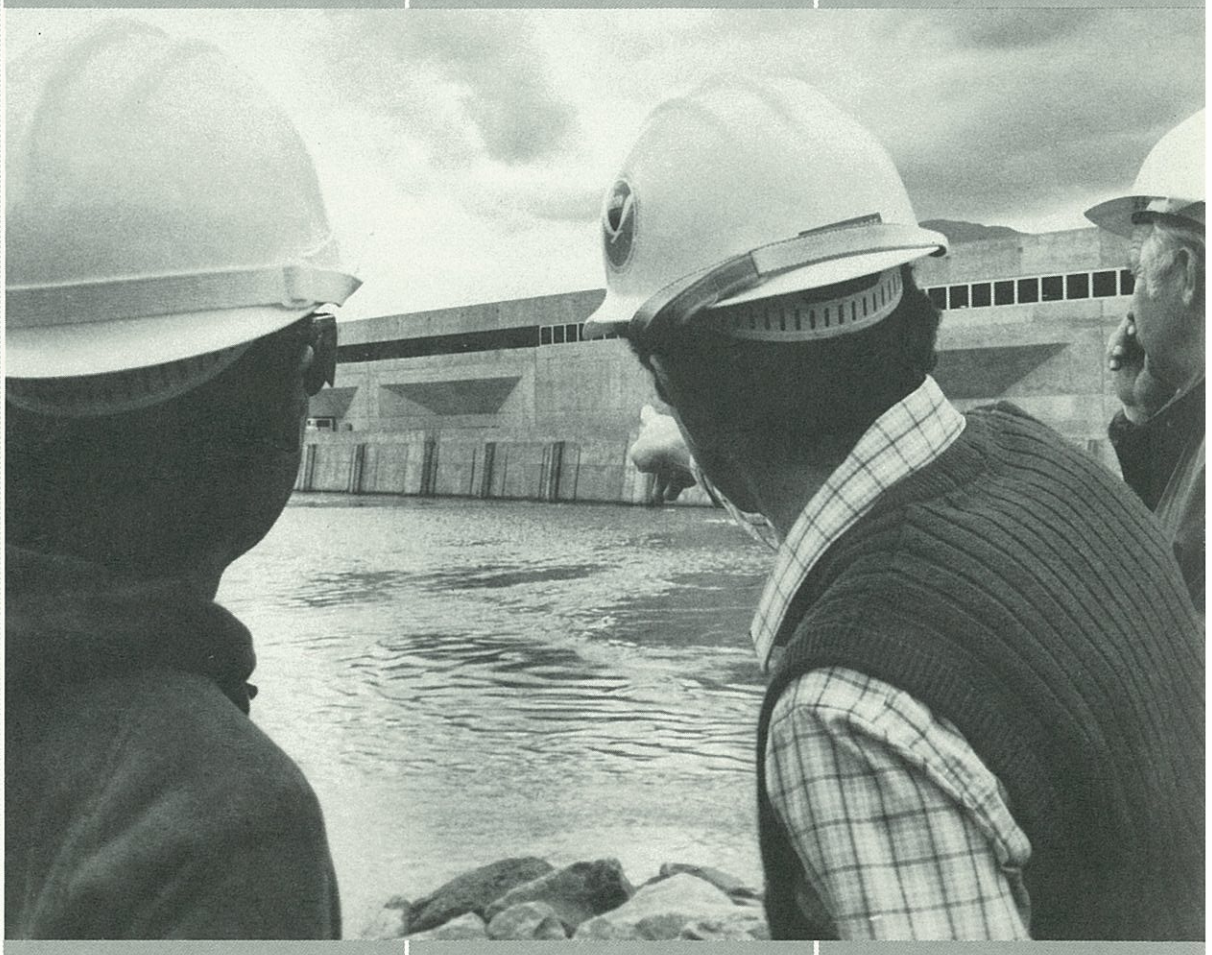
(5) The fish and wildlife agencies and tribes will complete their study and will submit proposals to the Council by a time to be determined by the Council after reviewing the study design. The proposals must be accompanied by all supporting data and must include a description of the consultation undertaken under measure (2), the positions taken by the consulting agencies and organizations, and the responses of the fish and wildlife agencies and tribes.

(6) Following receipt of the proposals and supporting materials of the fish and wildlife agencies and tribes, the Council will take appropriate action to establish goals for the protection, mitigation, and enhancement of salmon and steelhead under this program.

(7) If satisfactory proposals and supporting material are not provided by the fish and wildlife agencies and tribes by April 15, 1984, the Council will propose appropriate amendments to this program.

Until satisfactory goals have been established under this program, the Council will take special care not to endorse any projects that would overcompensate for fish and wildlife losses caused by the Columbia River hydroelectric system.

Downstream Migration: Water Budget



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 drainage. Runoff during the spring is stored in reservoirs for use during periods of naturally low flows. While regulating the river in this fashion increases the firm energy load carrying capability, it reduces river flows, especially during the spring when juvenile salmon and steelhead are migrating downstream to the ocean (Figure 3). The combination of reduced flows and the greater cross-sectional area of the river due to reservoir storage has increased the time required for juveniles to migrate from their area of origin to the ocean. This increase in travel time affects the ability of the juvenile salmon to make the transition from freshwater to saltwater, and results in increased exposure to predatory fish and birds. As a result of reduced flows, juvenile salmon also experience higher water temperatures, different water chemistry, and greater susceptibility to disease.

Travel time

Predation

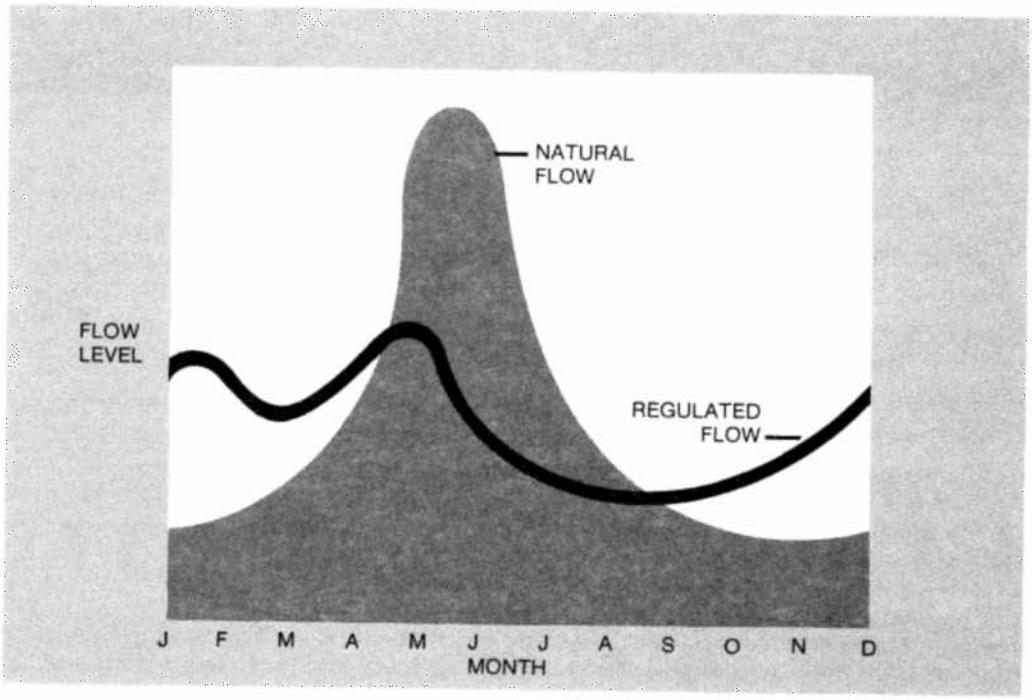


Figure 3.
Natural vs. Regulated Flows

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 complain 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 acknowledge the need for fishery 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.

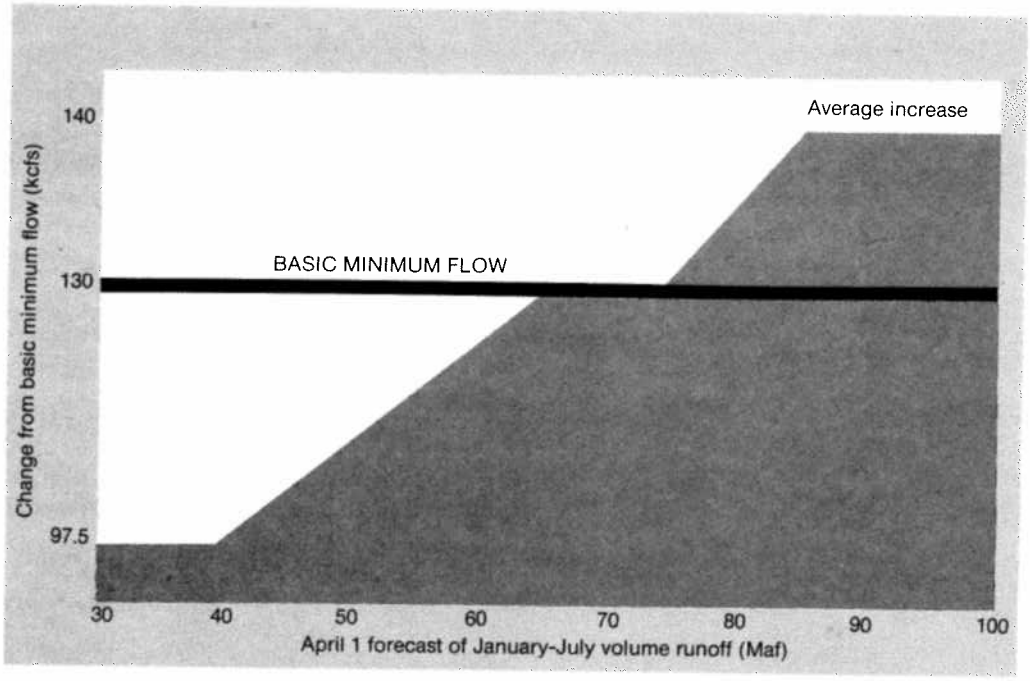
Coordination

302. Summary of Recommendations

Minimum flows

Fish and wildlife agencies recommended monthly "sliding scale" minimum flow requirements throughout the year at The Dalles and Priest Rapids dams on the Columbia River and at Lower Granite Dam on the Snake River. Rather than remaining at a certain fixed amount from year to year, the minimum flow requirements would depend on the April 1 forecast of the anticipated runoff for the period January through July. Figure 4 illustrates this sliding scale concept for Priest Rapids Dam during May. (Although minimum recommended flow levels are different at the other dams, the sliding scale concept remains the same.)

Figure 4.
Sliding Scale Minimum Flow Recommendations for Priest Rapids Dam, during May



The basic minimum flow of 130,000 cubic feet per second (cfs) at Priest Rapids Dam, which would apply when the forecast of volume runoff is from 65 to 75 million acre-feet (Maf), is represented by the horizontal line at the center of Figure 4. When the volume runoff is forecast to be 85 Maf, the minimum flow requirement would be increased to 140,000 cfs. This would allow migrating juveniles to share with the power system the benefits of increased flows. On the other hand, if the forecast of volume runoff is less than 65 Maf, the minimum flow requirement would be decreased in accordance with Figure 4 to reduce impacts on reservoir refill, power production, and future fish flows. For years when the forecast of volume runoff is less than 40 Maf, the minimum flow would be 97.5 kcfs for the month of May.

The recommendations submitted by the tribes called for optimum flows in order to achieve maximum smolt survival at each project. According to the tribes, the sliding scale neither represented equitable treatment required by the Act nor was consistent with treaty rights.

Coordination

The fish and wildlife agencies and tribes also asked the Council to fund positions for three individuals to coordinate fishery activities with power system operations and to assess implementation of fishery measures by the power entities. The purpose of establishing these positions would

be to help the fish and wildlife agencies and tribes acquire the skills they need to participate in power system decision-making affecting fish.

303. Council Response

After considering the sliding scale minimum flows recommended by the fish and wildlife agencies as well as the optimum flows recommended by the tribes, the Council has determined that increased spring flows are needed at Priest Rapids and Lower Granite dams to improve juvenile salmon migration. Power flows during the remainder of the year are generally sufficient to allow safe migration. In addressing the impact of water storage for hydroelectric generation upon migrating juveniles, the Council considers it most important to provide adequate flows during that portion of the spring when smolts are actually migrating downstream. For this reason, the Council proposes a "Water Budget" approach to improving spring flows. Under this approach, the fish and wildlife agencies and tribes would have the ability to shape flows during the period April 15 through June 15 by using a volume of water specified by the Council and called the Water Budget. Separate Water Budgets would be established for Priest Rapids and Lower Granite dams. No Water Budget would be established for The Dalles, since flows at Priest Rapids and Lower Granite determine the flow at The Dalles.

Water Budget

The size of the proposed Water Budget is derived from the flow recommendations submitted by the fish and wildlife agencies and tribes. First, the Council added the positive differences between the average monthly flows achieved under the fish and wildlife agency recommendations and the average monthly flows achieved during the 42-1/2 month critical period used for power requirements only. This calculation results in a total Water Budget of 67.8 kcfs-months (4.03 million acre-feet [Maf]), comprised of 40.2 kcfs-months (2.39 Maf) at Priest Rapids Dam and 27.6 kcfs-months (1.64 Maf) at Lower Granite Dam. (One kcfs-month is a flow of 1000 cubic feet per second for one month, or 0.0595 Maf.)

Computer simulations by the Instream Flow Work Group indicate that there is not enough water in the Snake River Basin during the critical period both to meet the recommended flows and to ensure that the system's reservoirs refill frequently enough to be of use for future power and fish flow purposes. To reflect these physical limitations, the Council has set the Water Budget for Lower Granite Dam in the Snake River Basin below that derived from the recommendations. Conversely, the Council has set the Water Budget for Priest Rapids Dam in the mid-Columbia above that derived from the fish and wildlife agency recommendations because the Council believes greater flows can be provided without significant adverse effects on the hydroelectric system. 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 shaping, improves the ability to meet optimum flows below the confluence of the Snake and the Columbia as requested by the tribes.

Through the use of the Water Budget, the fish and wildlife agencies and tribes will be able to increase spring flows for the downstream migration of juveniles. The Council has established a schedule of firm power flows for the period April 15 through June 15 to provide a base from which to measure Water Budget usage. The Water Budget may be used by the fish and wildlife agencies and tribes to implement any flow schedule which would assure juvenile salmon survival, provided the flows allow existing firm non-power commitments to be met. The Water Budget would not be used to achieve flows which are greater than the optimum flows (140 kcfs for both Priest Rapids and Lower Granite dams) recommended by the tribes. Water used for the Water Budget will create a reduction in firm energy load carrying capability throughout the year, with the concomitant benefit of improving juvenile migrant survival.

Use of Water Budget

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. Once the concept of the Water Budget was developed, the Council consulted extensively on how to incorporate it into river operations. These consultations produced numerous refinements in the Water Budget, as well as several alternatives. In fact, alternatives were being offered up until the close of the comment period.

The Water Budget has undergone a great deal of study concerning its biological effects and its impacts on the coordinated operation of the power system. Many of the alternatives received similar attention. The most noteworthy proposals were presented by Bonneville during the summer of 1982, by the Columbia River Inter-Tribal Fish Commission on September 30, 1982, and by the Inter-Company Pool on October 25, 1982. While many Bonneville suggestions were included in the Water Budget, its alternative proposal was not accepted because it was administratively more complex and less certain than the Water Budget. The proposals offered by the Columbia River Inter-Tribal Fish Commission and the Inter-Company Pool each appeared to have many worthwhile features. However, they were not accompanied by enough supporting information on flows and biological effects to demonstrate that they were superior overall to the Water Budget. The Council remains interested in these proposals, and will consider them further in future Water Budget deliberations.

Monitoring

The Council will study the effectiveness of the Water Budget in terms of improved salmon survival and travel time. The Council believes that a Water Budget approach at Priest Rapids and Lower Granite dams will increase markedly the number of Columbia Basin fish without seriously affecting the provision of an adequate, efficient, economical, and reliable power supply. However, since this is the first effort to establish a Water Budget for fisheries enhancement, the Council anticipates that the currently specified Water Budgets may be modified through the program amendment process based on study results and on whether increases in scheduled firm power flows occur in the spring months. The Council's objective is to increase flows for juvenile migration during the spring months. To provide incentive for Bonneville and the region's utilities to increase scheduled firm power flows during the April 15 through June 15 period, the Council will consider modifying the size of the Water Budget based on the extent to which scheduled firm power flows have been increased during this period.

Coordination

The Council agrees with the fish and wildlife agencies and tribes that creating fish/power coordinating positions would allow those entities to develop power system skills and to participate in power system decision-making affecting fish. In keeping with the Water Budget concept, the Council proposes to call these coordinators "Water Budget managers" and to assign one position each to an entity designated by the majority of the fish and wildlife agencies and an entity designated by the majority of Columbia River Basin tribes. The Council will provide a Water Budget 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.

In 1984 the Council changed the date for submission of the annual report on the Water Budget. In response to a request for broader participation by Indian tribes, the Council added a provision for funding of coordination of Water Budget activities with all Columbia River Basin Indian tribes.

304. Measures

(a) Establishment and Use of the Water Budget

Priest Rapids Dam
Lower Granite Dam

(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 which 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 usage, the Council has established the "firm power flows" listed in Table 1. Water Budget managers will request flows for Priest Rapids and Lower Granite dams and dates on which these flows are desired. The flow requests must be greater than the firm power flows and less than 140 kcfs. Water Budget usage will be measured as the difference between the actual average weekly flows, which result from the Water Budget managers' requests, and the firm power flows.

Water Budget usage

	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

Table 1.
Firm Power Flows (average weekly kcfs)

(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, thermal plant maintenance will be moved into the April 15 to June 15 period. The fish and wildlife agencies and tribes must give the Corps of Engineers three days' written notice of changes in the planned flow schedule under the Water Budget.

Firm requirement

(4) The Water Budget is expected to result in an average annual loss of 550 megawatts (MW) of firm energy load carrying capability, which will be taken into account in the Council's energy plan as provided in the Act. The actual amount of power loss is dependent on actions taken by power managers to accommodate the Water Budget. Such actions may include extra-regional firm power exchanges and shifting of thermal plant maintenance schedules.

Power loss

(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 Idaho Power Company's Hells Canyon Complex, Bonneville shall replace the loss in kind [see Section 1304(a)(4)].

(6) The Water Budget will not be used so as to 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, it 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 Water Budget managers. Even in this event, the federal project operators and regulators shall make every attempt, using the flexibilities of the system, to implement

Conflict with flood control

the Water Budgets at Priest Rapids and Lower Granite dams according to the flow schedules requested by the fish and wildlife agencies and tribes. The Corps shall reexamine its flood control requirements to ensure a proper balance among the multiple-purpose uses of the projects, including the Water Budget.

(7) In designing and scheduling flows through use of the Water Budget, the fish and wildlife agencies and tribes 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 many operating decisions will be made that could influence the effectiveness of the Water Budget, the Council recommends the following priority for competing uses of the hydroelectric 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 1600).

(b) Water Budget Manager

(1) Bonneville shall provide funds to establish two "Water Budget manager" positions. One Water Budget 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 Water Budget 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 river system planning and operations. They will be selected on the basis of their knowledge of the regional hydroelectric power 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 Water Budget 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 in resolving Water Budget disputes.

Selection criteria

(2) The Water Budget managers will be the primary points of contact between the power system and the fish and wildlife agencies and tribes on matters concerning the Water Budget. 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 the request to the extent necessary.

Duties and functions

(c) Coordination of the Water Budget

(1) By January 15 of each year, the federal project operators and regulators shall meet with a committee composed of the Water Budget managers, the Council's Water Budget advisor, and representatives of the power system operators to review the official January volume-of-runoff forecast and to coordinate the system operation for the current year. A similar meeting shall be conducted in mid-February and mid-March of each year.

(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 Water Budget 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.

(3) By November 1 of each year, the Water Budget managers will submit a single report to the Council which 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 which 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 (3) meetings per year for the purpose of coordinating tribal Water Budget activities.

(d) Research and Monitoring

(1) Bonneville shall fund a study to gather additional evidence on the relationships among flows, spills, travel time, and smolt survival. This study will include an analysis of the relationship between flows and survival of the late-summer migrating chinook stocks, which migrate during earlier life stages than the smolts which migrate in the spring. Based on the results of the study, the Council will determine whether the Water Budget is successful in achieving smolt survival and to what degree. Annually, it will review the operation of the Water Budget. Pursuant to Section 1400, the Council will consider proposed alternatives to the Water Budget designed to be more effective in improving downstream migration or in reducing power system effects.

Effectiveness

Alternatives

(2) 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 and survival 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 usage 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 usage if actual runoff conditions are inconsistent with runoff forecasts;

(D) Correlation of data on flows, smolt survival, and subsequent adult returns as a basis for adjusting Water Budget usage;

(E) Mark and recapture studies to evaluate flow, spill, and structural bypasses as means of improving downstream migrant survival; and

(F) Coordination of hatchery releases with Water Budget usage.

(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 Water Budget 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 carrying out the Water Budget, the Council will meet with the representatives of those entities to help in resolving the dispute. The Council will consult with the fish and wildlife agencies, tribes, Public Utility Districts (PUDs), the Federal Energy Regulatory Commission (the FERC), and other interested parties throughout implementation of the program (see Section 1300).

Section 400

Downstream Migration: Passage

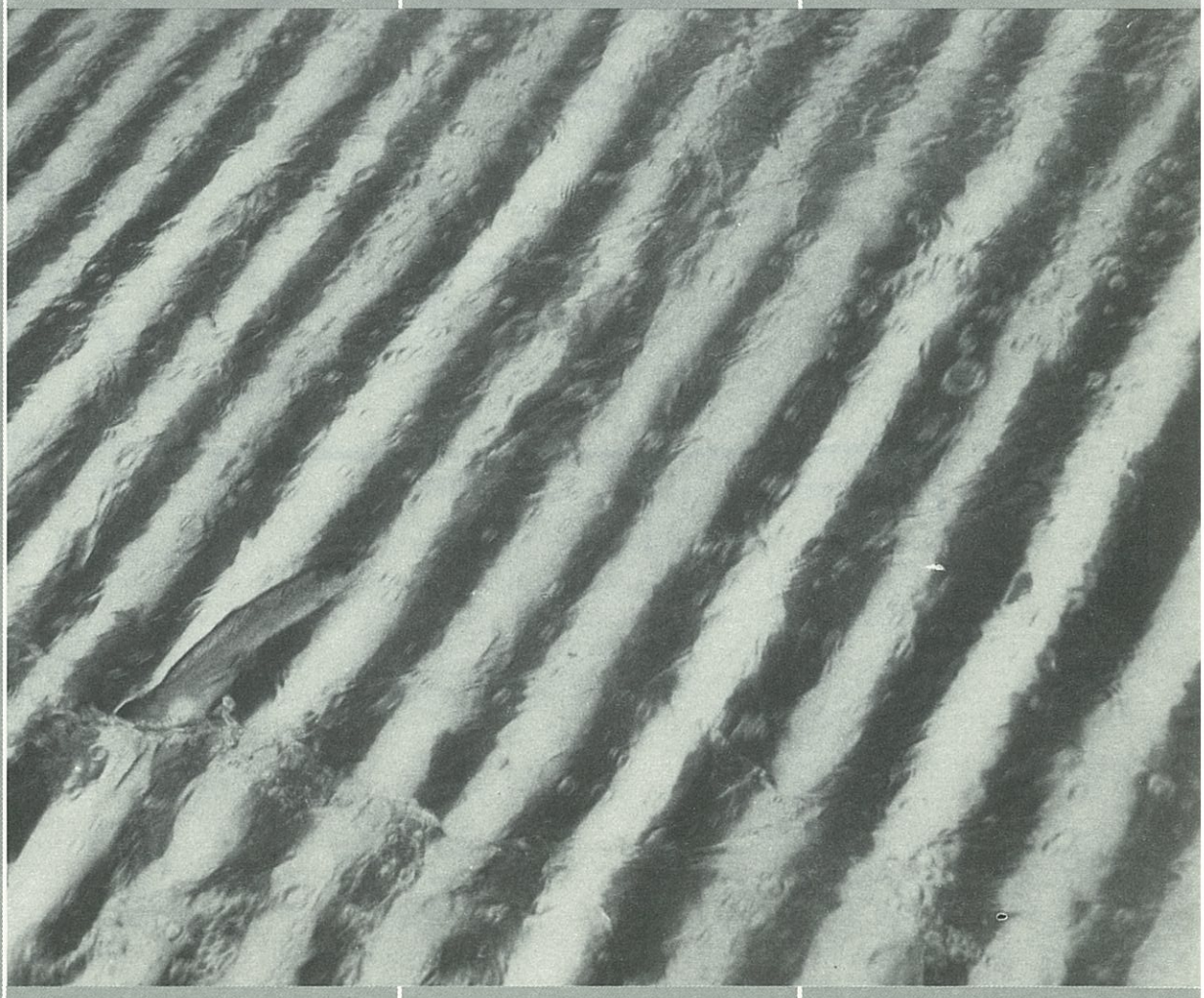
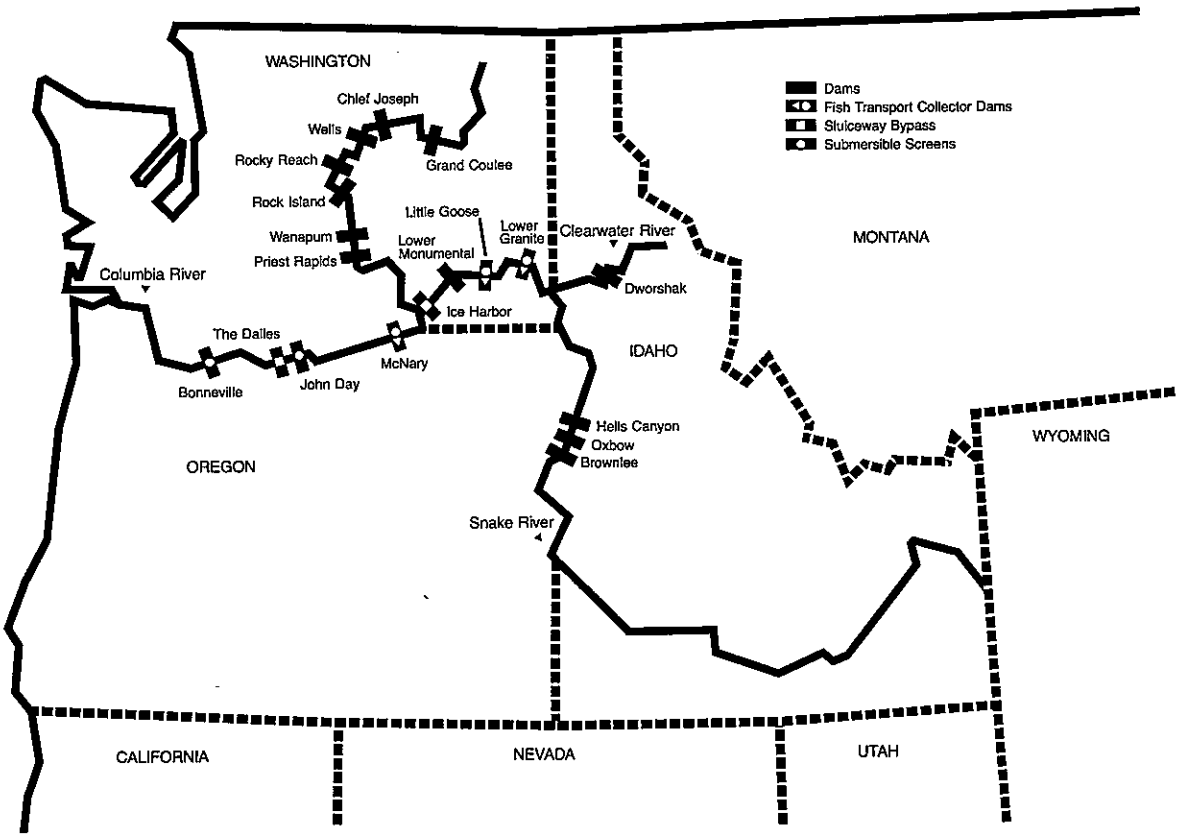


Figure B.
Columbia and Snake River Hydroelectric Projects



401. The Problem

When hydroelectric dams originally were constructed in the Northwest, it was believed that providing adequate upstream passage over the dam was sufficient to sustain salmon and steelhead runs. Since that time, research has shown that as juvenile salmon and steelhead are drawn through power turbines, they are exposed to conditions which 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.

Passage around turbines

Predation

402. Summary of Recommendations

The fish and wildlife agencies and tribes recommended that the Council adopt measures to study prototype bypass systems and install efficient, complete bypass systems using the best available technology at the five mid-Columbia PUD dams: Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids. (Figure 5 shows one type of bypass system currently in use at other projects.) The recommendations further state that until such time as complete bypass systems are operational at these dams, "sufficient spill shall be provided to minimize juvenile salmonid losses during spring and summer migration."

Mid-Columbia passage

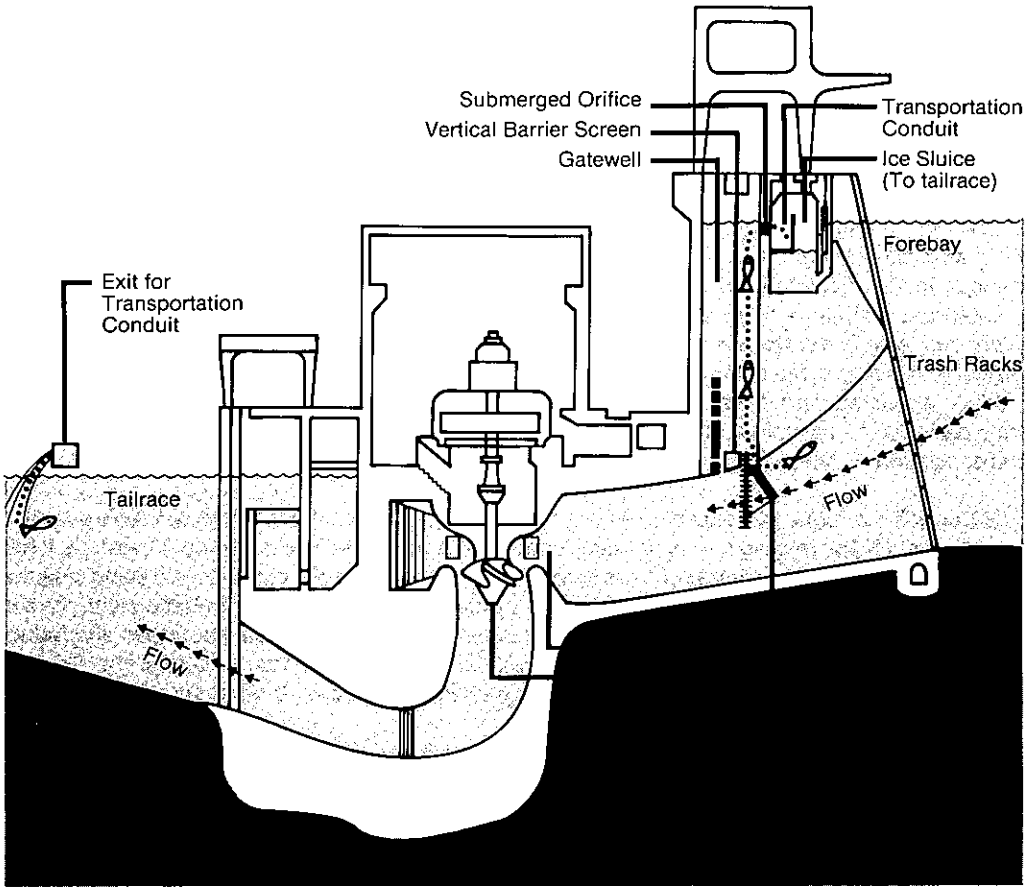


Figure 5.
Typical Traveling Screen Bypass System

Lower Columbia and tributary passage

The fish and wildlife agencies and tribes also recommended that the Corps of Engineers continue to install an intake screen deflection bypass system at John Day Dam and develop permanent solutions to downstream migration problems associated with Ice Harbor and Lower Monumental dams. Interim spills were recommended at these three dams until effective bypass systems become operational. Completion of bypass facilities at Bonneville Dam and improvements to facilities at other mainstem dams were also recommended. At other tributary projects, recommendations asked for specific measures to solve juvenile passage problems, for further study, or for the continuation of existing studies.

403. Council Response

Mid-Columbia passage

The Council has adopted recommendations that the mid-Columbia PUDs take immediate action to provide safe passage for migrating juvenile salmon and steelhead at Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams. Program measures would require the PUDs (through the FERC) to initiate an interim spill program over their respective dams to achieve survival of migrating juvenile salmon and steelhead at a level comparable to that achieved by collection and bypass systems but at a level not less than 20 percent of the average daily flow in the April 15 through June 15 period. Seasonal shaping of spills will be coordinated with the fish and wildlife agencies and tribes. In addition, each PUD must begin a program to do research on design and to test prototype bypass systems for all of its dams, followed by installation of bypass systems at Wells, Rock Island, Rocky Reach, and Wanapum dams.

It is important to distinguish between interim spills for bypass and the flows provided in the Water Budget. Spills are provided at certain projects to avoid turbine-related mortalities. The Water Budget is provided so that the fish and wildlife agencies and tribes can increase flows to improve smolt travel time to the ocean, thus improving smolt survival.

Transportation vs. bypass at Priest Rapids Dam

The fish and wildlife agencies and tribes recommended installation of a bypass system at Priest Rapids Dam. However, Grant County PUD provided information indicating that a short-haul transportation system around Priest Rapids Dam could be at least as effective as a bypass system in improving the survival of juvenile salmon and steelhead, and would cost substantially less. The PUD also maintained that a short-haul program should have fewer problems than the long-haul transportation that has been tested from the Snake River to below Bonneville Dam. The PUD pointed out that since there are no major salmon and steelhead spawning tributaries between Wanapum and Priest Rapids dams, it is possible that no problem would occur with the homing instincts of transported salmon, and that this hypothesis should at least be tested. The fish and wildlife agencies and tribes expressed concern about allowing the testing of short-haul transportation in the mid-Columbia because of problems experienced thus far with long-haul transportation of Snake River chinook stocks.

The Council has found that experts disagree vehemently about what is the "best available scientific knowledge" on the relative merits of transportation and bypass at Priest Rapids. Therefore, it has concluded that transportation should be studied while a prototype bypass system is being tested at the project. The Council's program requires that Grant County PUD, in consultation with the fish and wildlife agencies and tribes, begin to study the effectiveness of the transportation alternative. Before transportation is actually tested, the PUD would provide further details to the Council, including existing laboratory results on stress from handling as well as other smolt survival data.

If the Council determines after consultation with the fish and wildlife agencies, tribes, and PUDs that the short-haul transportation alternative would not be as effective as a collection and bypass system, Grant County PUD would promptly install such a system at Priest Rapids Dam. On the

other hand, if the Council determines that short-haul transportation is likely to be as effective as a bypass system, short-haul transportation may continue. It shall continue to be subject to observation and testing.

Lower Columbia and tributary passage

The Council has adopted recommendations that the Corps of Engineers resolve bypass problems at John Day, Ice Harbor, and Lower Monumental dams, and begin a spill plan at each dam until bypass systems are in operation. Some specific measures recommended at tributary locations also would be adopted by the Council. However, in cases where data is insufficient or time does not permit verification of conflicting claims, the Council is requiring studies to provide further information, with specified completion dates. The Council has adopted many of the recommendations for studies or for continuation of studies already underway at tributary projects, and will propose specific actions based on the results of these studies.

In 1984 the Council considered a number of proposals for improvement of passage efficiencies and smolt survival at Columbia and Snake river dams with the goal of improving smolt survival systemwide. Some proposed to continue studies on fish passage problems at mainstem dams and await the results of those studies prior to taking action to improve bypass efficiencies. The Council, however, found that certain problems on the Columbia and Snake rivers require prompt action instead of continued delay and study. As a result, the Council changed this section in several areas with respect to fish passage efficiencies and smolt survival. As a result of the amendments, the Corps is expected to develop coordinated interim juvenile 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. The Council has called on the Corps to complete a comprehensive evaluation of smolt transportation. It also calls 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 turbine intake deflection devices. In the interim, the Council set survival standards of at least 90 percent at specified projects.

404. Measures

(a) Mid-Columbia River Passage

Wells Dam

(1) The FERC shall require Douglas County PUD to:

Collection and bypass systems

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

(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 of a collection and bypass system which has been approved by the Council at Wells Dam.

Rocky Reach Dam
Rock Island Dam

(2) The FERC shall require Chelan County PUD to:

Collection and bypass systems

(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, the FERC shall require the PUD to evaluate alternative collection and bypass systems.

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

Wanapum Dam
Priest Rapids Dam

(3) The FERC shall require Grant County PUD to:

Collection and bypass systems

(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, the FERC shall require the PUD to evaluate alternative collection and bypass systems.

Installation at Wanapum Dam

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

Transportation vs. bypass at Priest Rapids Dam

(4) Upon approval by the Council of a detailed study plan, the 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 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 and 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, the 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 the FERC, will provide adequate numbers of fish for test purposes for the study.

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

(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, the 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, the FERC shall require Grant County PUD to report the data on returning adults to the Council to permit the Phase II evaluation. If the Council determines, based upon this data, that short-haul transportation would be as effective as a collection and bypass system, the 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, the 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. The FERC shall require the PUD to fund this continuing assessment of the program's effectiveness and any necessary documentation.

(10) The 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. The FERC shall require the PUDs to use their best efforts to provide spills which will achieve smolt survival comparable to that achievable by the best available collection and bypass systems. The 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 such spills 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 by such reduced spills. In the case of Wells, Rocky Reach, Rock Island, and Wanapum dams, the 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, the 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) The 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 Section 404(a)(1) to (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 River and Tributary Passage

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

McNary Dam

Background. Since 1968, a number of structural modifications have been made at McNary Dam to improve juvenile passage. Studies are needed to evaluate the success of these modifications and to determine if further modifications are necessary.

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

John Day Dam

(3) In consultation with the fish and wildlife agencies and tribes, the Corps of Engineers shall develop and implement a plan for spills which will achieve a level of smolt survival comparable to or better than that achievable by the best available bypass and screening systems. This shall be done by April 1 of each year. The Corps shall implement such plans until the bypass and screening systems at John Day Dam are operating.

The Dalles Dam

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

(A) A coordinated interim juvenile passage plan which will result in at least a 90 percent level of smolt survival at this project. This plan shall be developed in consultation with the fish and wildlife agencies and tribes and shall include project operating criteria for fish passage. The fish and wildlife agencies and tribes will prescribe the method for determining smolt survival at this project.

(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 deflection device, unless it can be demonstrated to the Council's satisfaction, on the basis of hydraulic model studies or 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 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 deflection screens. The latter bypass method is required since spill may not be available always to pass juvenile fish. The requirement for an interim passage plan is the first step in a sequence leading to a permanent passage plan that will, within the first five-year action plan, demonstrate that positive action can be taken to improve juvenile fish survival. The reference to 90 percent fish guidance efficiency criterion, in this measure and in Sections 404(b)(8) and 404(b)(9), is used as a standard for the purpose of engineering design of turbine intake deflection devices 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 the type of criteria to be developed by all parties can be found in the Detailed Fishery Operating Plan, a 1984 operations manual prepared 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

(5) (A) The Corps of Engineers shall complete the installation of submersible traveling 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 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 impact on adult and juvenile fish in the vicinity of the second powerhouse.

(B) The Corps shall develop and implement an interim juvenile passage plan, in consultation with the fish and wildlife agencies and tribes, which includes 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 which cannot be met elsewhere in the regional power system.

Background. The Corps has completed installation of submersible traveling screens at the first and second (new) powerhouses at Bonneville Dam. Modifications which have been made to the downstream migrant system at the first powerhouse in 1983-1984 require evaluation. Guidance efficiency for juvenile fish has ranged from 14 to 35 percent (depending on species) at the new 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 made to solve the problem to achieve turbine bypass levels comparable to those achieved at McNary Dam, which is considered the best available ("state-of-the-art") 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 offsite enhancement measures.

(6) 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. **Lower Granite Dam**

Background. Lower Granite Dam is equipped with traveling 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 which may require further modification.

(7) 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. **Little Goose Dam**

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

(8) The Corps of Engineers shall implement at Lower Monumental Dam: **Lower Monumental Dam**

(A) A coordinated interim juvenile passage plan which will result in at least a 90 percent level of smolt survival at this project. This plan shall be prepared in consultation with the fish and wildlife agencies and tribes and shall include project operating criteria for fish passage. The fish and wildlife agencies and tribes will prescribe the method for determining smolt survival at this project.

(B) 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 deflection device, unless it can be 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. The problems at Lower Monumental Dam are similar to those at Ice Harbor Dam with regard to juvenile migration [see Section 404(b)(9)]. However, at Lower Monumental Dam there is no sluiceway system that can be modified to provide effective bypass. 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, feels 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 404(b)(17). 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.

Ice Harbor Dam

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

(A) A coordinated interim juvenile passage plan which will result in at least a 90 percent level of smolt survival at this project. This plan shall be developed in consultation with the fish and wildlife agencies and tribes and shall include project operating criteria for fish passage. The fish and wildlife agencies and tribes will prescribe the method for determining smolt survival at this project.

(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 deflection device, unless it can be 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 deflection devices. The latter bypass method is required since spill may not always be available to protect the millions of wild and hatchery outmigrants that pass this project each year. The requirement for an interim passage plan is the first step in a sequence leading to a permanent passage plan that will demonstrate within the first five-year action plan that positive actions can be taken to improve juvenile fish survival.

Marmot Dam

(10) The 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 is currently 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.

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

Background. PGE owns and operates a powerhouse, the Sullivan Plant, at Willamette Falls on the Willamette River. The plant diverts 5000 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.

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

Background. Foster Dam is a low-head dam on the South Santiam River. When it was constructed, it was expected that downstream migrants would 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 1900 adults to fewer than 500.

(13) The FERC shall require Pacific Power and Light Company (PP&L) to operate its Albany Hydroelectric Project on Lebanon Canal in accordance with the existing agreement between PP&L and the Oregon Department of Fish and Wildlife. If changes to existing operations are proposed, the FERC shall require PP&L to conduct studies that evaluate the need for additional measures to protect migrating juveniles and to determine the most effective alternatives available. **Lebanon Dam**

Background. Water is diverted at Lebanon Dam on the South Fork-Santiam River into Lebanon Canal for municipal and power uses. Flows in the canal are approximately 100 cfs. PP&L operates a small turbine on the canal. No fish protection screens exist at the entrance to Lebanon Canal. However, the existing agreement between PP&L and the Oregon Department of Fish and Wildlife requires the powerhouse on the canal to be shut down from November 1 to December 31 and from February 16 to June 15 to protect migrating juvenile salmon and steelhead. Power operations from January 1 to February 15 are subject to modification or shutdown if necessary to improve fish passage on the South Santiam River.

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

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. The EWEB already has agreed to provide a bypass system.

(15) The 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 the 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.

(16) 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 greater 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 trucks. **Lower Granite Dam**
Little Goose Dam
McNary Dam
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.

(17) The Corps of Engineers shall conduct studies to improve the success of juvenile transport operations at Lower Granite, Little Goose, and McNary dams. These studies shall consist of testing and analysis of various portions of the collection, bypass, and transportation systems, including a study of fish densities in the holding and loading facilities and barges. The Corps shall prepare a comprehensive report to the Council containing a complete evaluation of all past transportation activities and including proposals for future actions. Proposals shall be developed in consultation with the fish and wildlife agencies and tribes and shall include a detailed schedule and recommendations for future actions.

(18) 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.

(c) Additional Research

Predation

(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.

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 which act as predators 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.

Causes of mortality in mainstem reservoirs

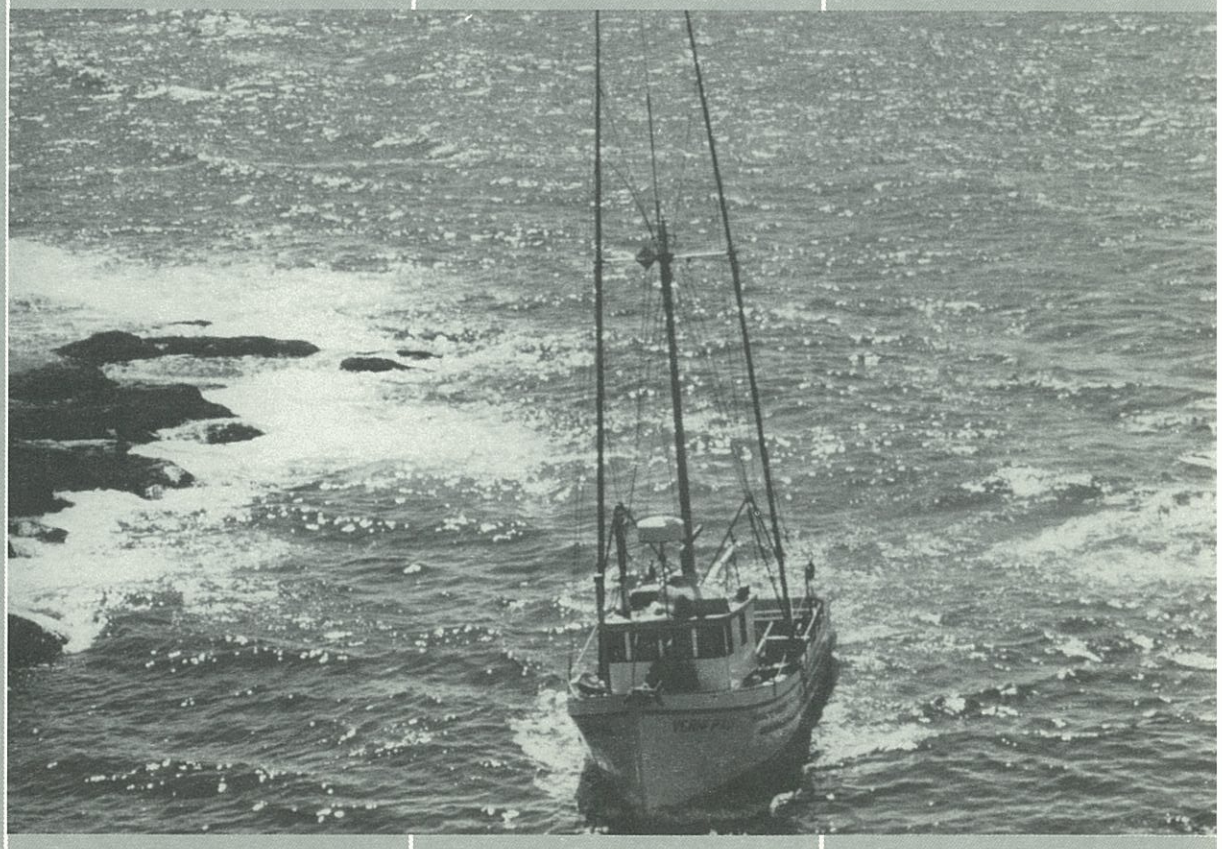
(2) Bonneville shall fund studies to determine the causes of juvenile salmon mortality in mainstem reservoirs, as well as the potential for rearing anadromous fish and improving the survival of hatchery-produced fish in these reservoirs.

Background. Migrating juvenile salmon reside in reservoirs for various lengths of times depending on the species involved, the size of the reservoir, the life history stage, and physiological conditions. Some fish use the reservoir for maturing, others may hold over, and others may become residuals, completing their life history without migrating to the ocean. Studies are needed to determine to what extent the reservoir experience is a factor in juvenile mortality, and to what extent rearing anadromous fish in reservoirs can be used as a method of increasing the number of fish.

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

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

Ocean Survival and Harvest Management



501. The Problem

(a) Measures of Effectiveness

Implementation of the Council's fish and wildlife program will lead to a substantial investment on the part of the ratepayers to protect, mitigate, and enhance the salmon resources of the Columbia River Basin. The effectiveness of the program will be measured by the number of juvenile fish migrating through the hydroelectric system to the ocean, by the health of the ocean and river fisheries, and by the number of adults which survive their residence in the ocean and migrate back to their areas of origin. Therefore, it is not enough for the hydroelectric system to improve downstream migration, upstream migration, and natural and artificial propagation of salmon and steelhead. The fisheries management entities must improve survival of these stocks through effective regulation of harvests. The Council realizes that Congress did not give it authority to manage fish harvests. That authority is held by a variety of management entities from Alaska to California (Figure 6).

(b) Mixed-Stock Ocean Fishery

Declining natural stocks

Fisheries management agencies have had limited success thus far in targeting ocean fishing efforts on particular stocks of salmon through closures of certain fishing areas for specified periods of time. Therefore, the commercial and recreational ocean fishery is a mixed-stock fishery consisting of both hatchery-reared and natural stocks from a number of different areas of origin. Because the fishing fleet currently is unable to harvest more abundant stocks, selective naturally spawning salmon are harvested at rates based on the release of large numbers of hatchery-reared fish. Part of the problem associated with mixed-stock ocean fisheries results from operations of hatcheries constructed to mitigate the effects of hydroelectric developments on the Columbia River. This problem cannot be resolved without implementing a hatchery and natural propagation program that complements the management of stocks of concern.

Numerous jurisdictions

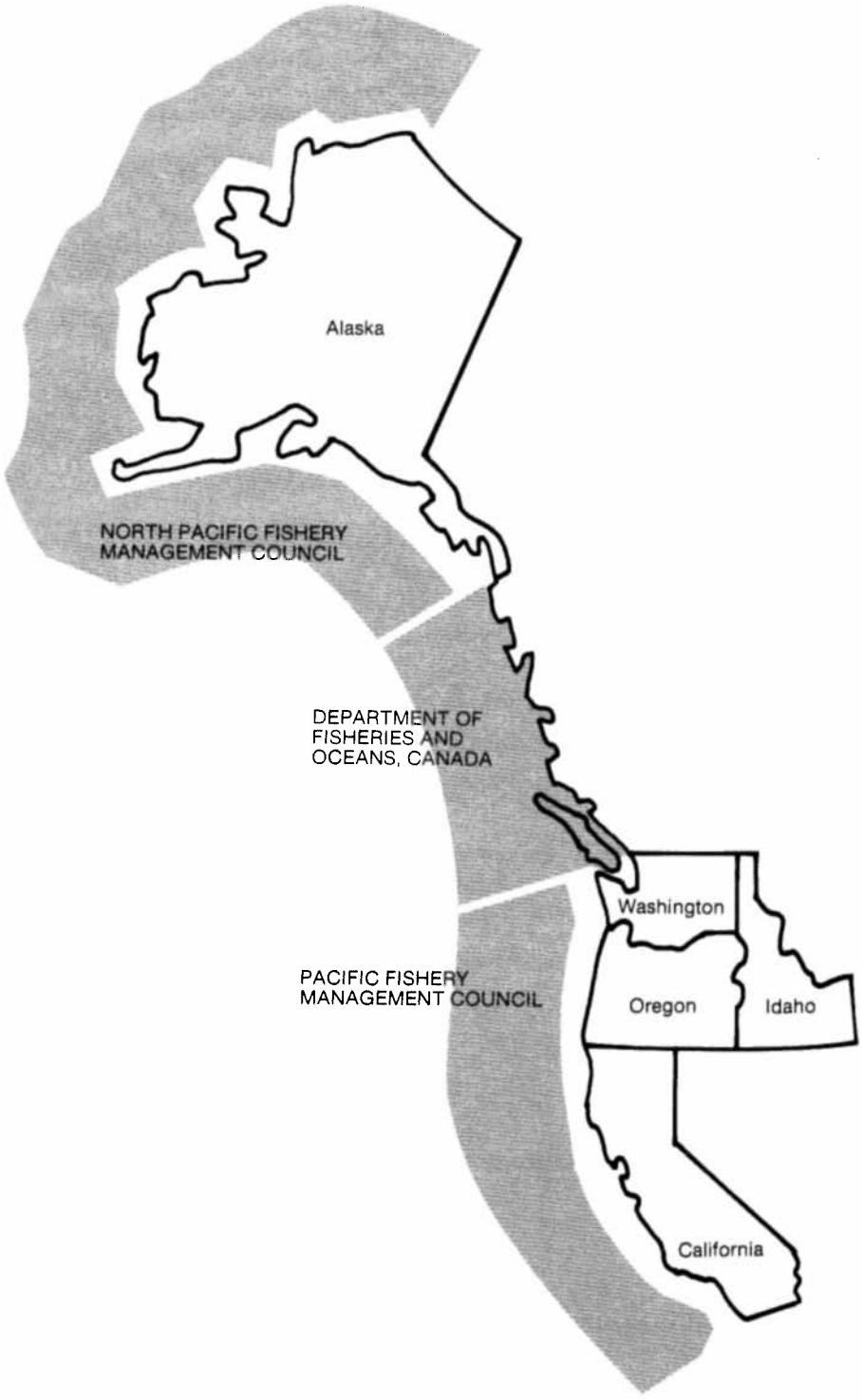
The mixed-stock ocean harvest of the Columbia River Basin stocks occurs primarily off the coasts of Alaska, British Columbia, Washington, Oregon, and California. Ocean harvest in United States waters is regulated by the Pacific Coast states, and by the Pacific Fishery Management Council and the North Pacific Fishery Management Council, which were established under the Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801 et seq.). A primary objective of this Act was to establish a regional basis for the management of all fisheries within 200 miles of the U.S. coastline, except for the area within 0 to 3 miles where management authority resides with each state, subject to federal preemption by the Secretary of Commerce. Although this new management structure provides improved control over the harvest of salmon stocks, these stocks still migrate through numerous political jurisdictions, all of which find it difficult to reduce the mixed-stock fishing effort. The mixed-stock fishery makes it essential to enhance naturally spawning stocks to prevent their continual decline, but at the same time reduces the effectiveness of enhancement efforts.

(c) Excessive Fishing Effort

Increase in fishing vessels

Since World War II there has been a significant increase in the number and effectiveness of commercial trolling vessels and, more recently, in the number of recreational vessels (both private and charter). Many of the license holders for these vessels currently are not full-time fishermen. However, if the Council's program results in improved fish runs, fishing seasons may be increased. This increase in fishing effort could again result in reduced natural stocks due to the mixed-stock fishery. To reduce the existing and potential fishing effort, Alaska, British Columbia, and Washington have initiated programs to reduce the number of vessel licenses available. Although Oregon and California currently have a moratorium on new licenses, they have not initiated a

Figure 6.
Harvest Management Jurisdiction Map



license reduction program. Ocean harvest regulations off Washington and Oregon have been increasingly restrictive in recent years in an effort to reduce harvest rates on the natural stocks in the mixed-stock fisheries; however, due to constant political pressure there are no guarantees that these regulations will not be changed.

502. Summary of Recommendations

No recommendations to address ocean harvest problems were submitted.

503. Council Response

The Council recognizes that an excessive mixed-stock ocean and river fishery could reduce the effectiveness of program measures designed to restore naturally spawning salmon stocks, and believes that the fisheries management entities should ensure adequate levels of escapement (returning adults) to strengthen and improve the upriver stocks of the Columbia River Basin. Therefore, the Council has developed program measures that provide for identification of escapement objectives, consultation and coordination with management entities, and development of known-stock fisheries, as well as measures that require adequate ocean harvest regulations to be imposed before the Council will approve funding of certain mitigation and enhancement efforts.

In 1984 the Council made several changes in this section. The Council removed harvest-control conditions on building of the Yakima River hatchery and temporary John Day acclimation ponds. The Council also adopted measures providing for Bonneville funding of an electrophoresis testing program, a known-stock fishery demonstration program, and ocean plume research. The Council also supported establishment of escapement objectives consistent with goals to be set in Section 201.

504. Measures

(a) Establishment of Escapement Objectives

(1) The Council will identify spawning escapement objectives and rebuilding schedules that will achieve the production goals adopted by the Council upon establishment of goals pursuant to Section 201. The Council will support adoption by the fisheries management entities of these escapement objectives and rebuilding schedules.

(b) Consultation and Coordination

(1) To ensure that harvest management objectives are consistent with the objectives of the fish and wildlife program, the Council will consult on a regular basis with the following ocean and river harvest management entities:

(A) Pacific Fishery Management Council;

(B) North Pacific Fishery Management Council;

(C) 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; and

(D) Tribes.

The consultations will determine whether:

- Annual management plans, including those developed pursuant to the Magnuson Fishery Conservation and Management Act of 1976 (16 U.S.C. §1801 et seq.), specify harvest regulations for ocean and inriver fisheries that will achieve the escapement objectives for the upriver stocks.

- Regulation of tributary fisheries for trout fishing adequately protects rearing and migrating juvenile wild salmon and steelhead.

  Background. Angling for trout in streams and tributaries can adversely impact migrating and rearing juvenile wild steelhead and salmon. Regulations should protect these nursery areas.

- 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.

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

(3) To ensure the rapid adoption and implementation of a United States/Canada treaty to conserve Columbia River chinook, the Council will consult regularly with the U.S. Department of State.

(c) Known-Stock Fisheries

(1) Electrophoresis Demonstration Program

The Council supports inseason 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) Research

Bonneville shall fund research to improve stock identification methods. Proposals for further action will be reviewed on completion of the research.

Background. The need for known-stock fisheries is based on the "stock concept" and 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 mixed-stock composition in ocean and river fisheries and adjustment of fishery regulations. Although electrophoresis is the state-of-the-art technique, continued research can develop new procedures to provide fishery managers with improved stock detection techniques.

(3) Known-Stock Fishery Demonstration Programs

Bonnevillle shall fund known-stock fishery demonstration programs where it can be shown these programs will help achieve the goals of the Fish and Wildlife Program, including protection of wild stocks of salmon and steelhead.

Background. The development of known-stock fisheries has the potential for allowing the Fish and Wildlife Program 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.

(d) Funding

(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 the Salmon and Steelhead Advisory Commission, Bonneville, and other appropriate entities for the funding and administration of measures which would help accomplish objectives common to the Northwest Power Act and the Salmon and Steelhead Conservation and Enhancement Act of 1980 (16 U.S.C. 3311).

Salmon and Steelhead Conservation and Enhancement Act

Background. The Northwest Power Act and the Salmon and Steelhead Conservation Act were adopted within 17 days of each other 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, among the appropriate parties, on administration and funding.

(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 704(i)(3).

Propagation facilities

Background. It is known that certain upriver salmon and steelhead stocks do not contribute significantly to ocean fisheries. Others contribute primarily to the North Pacific fishery or to the Pacific fishery. The hatchery will be designed so that it can be operated in such a way that fish produced do not contribute to inadequately controlled fisheries.

(3) To the extent practical, the Council supports enhancement activities that are 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.

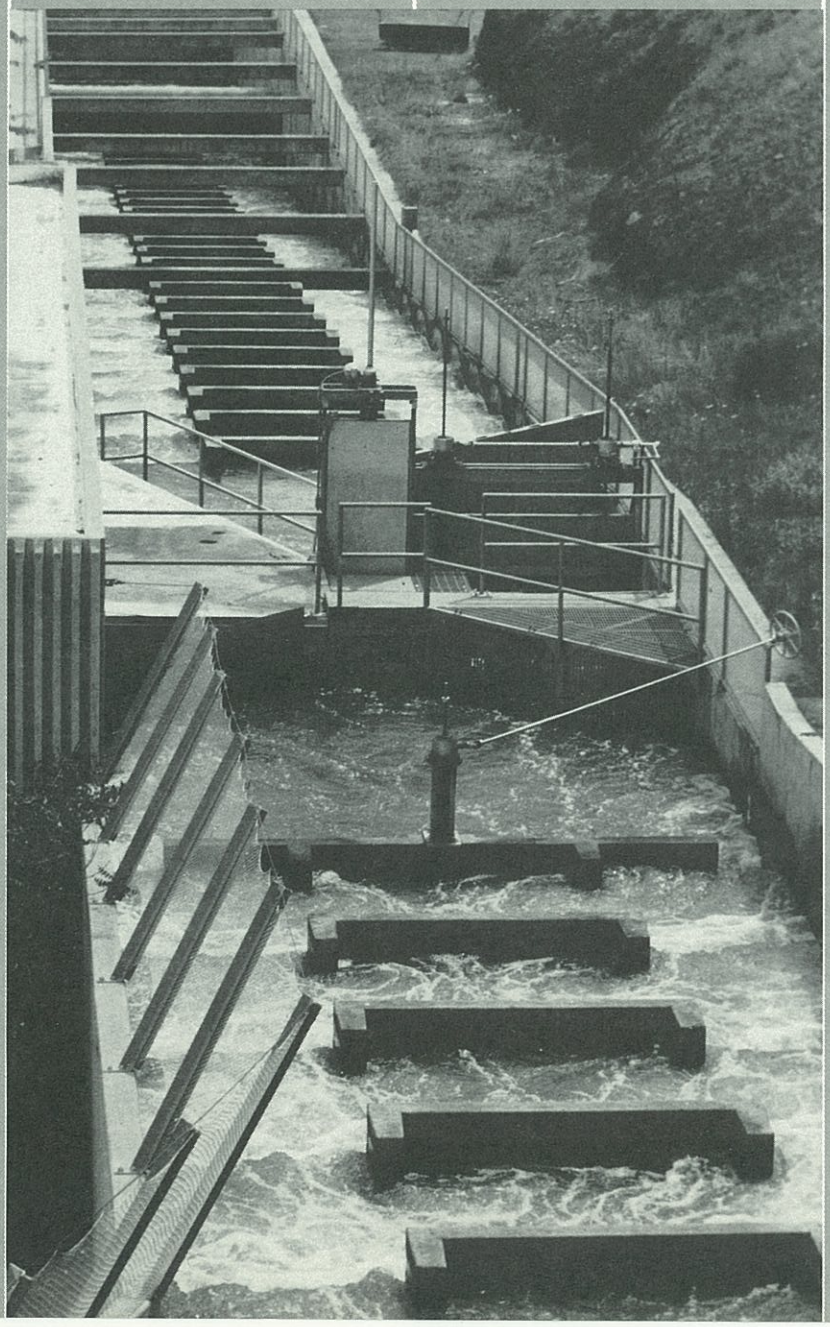
(4) The Council does not take a position on funding for the construction of any other hatcheries or the operation and maintenance of existing hatcheries which are currently funded by the state or federal government. This program will not include such funding unless adequate controls are imposed on the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

(e) Ocean Plume Research

(1) Bonneville will 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 juvenile Columbia River salmon. Proposals will be in accord with the research objectives established pursuant to Section 1104(c)(1).

Background. Early ocean growth and survival play a vital role in the ultimate abundance of adult Columbia River salmonids. 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.

Upstream Migration

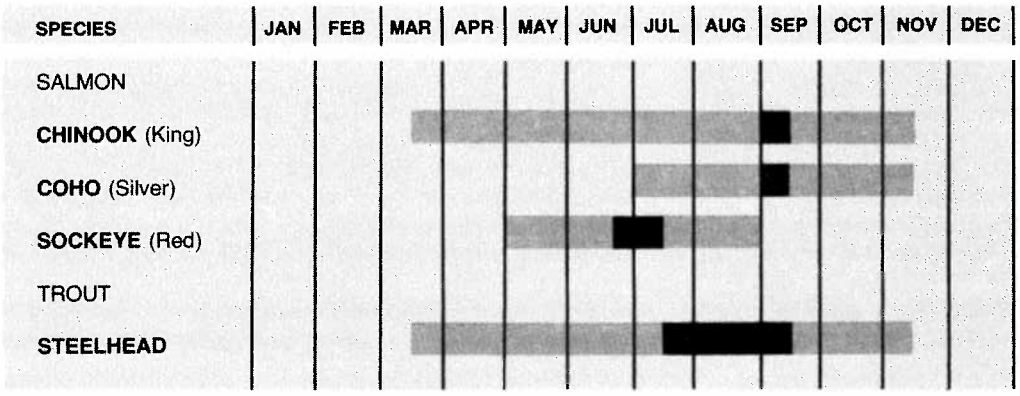


601. The Problem

Hydroelectric projects present a physical barrier to adult anadromous fish migrating from the ocean to spawning areas upstream at various times of the year depending on the species (see Figure 7). To solve this problem, "fishways" (fish passage facilities) have been constructed at many of the dams in the Columbia River Basin. Also flows and spills have been adopted to provide maximum attraction and unimpeded passage. 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 fishway attraction flows. In addition, some inadequacies in certain fishway facilities and in the operation and maintenance of these facilities reduce the success of adult 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 counting facilities to permit effective management of adult runs.

Flow and spill conditions

Fishway operation and maintenance



Solid black indicates peak of fish run.

Figure 7.
Timing of Upstream Migration at Bonneville Dam

602. Summary of Recommendations

Based on experience and the results of recent studies, the fish and wildlife agencies and tribes recommended a number of measures to improve adult migrant survival. Recommendations included adoption of flow and spill criteria at Columbia and Snake river dams, improved operation and maintenance of adult fishways at these dams, and improved adult passage conditions at numerous hydroelectric projects on tributary streams. Many of the recommendations called for studies and further documentation to provide a base for changes in structures and operating procedures.

603. Council Response

The Council has adopted most of the recommended measures to improve adult migrant survival. In cases where studies were recommended, program measures specify dates by which the studies must be completed. In consultations on the issue of adult migrant survival, the fish and wildlife agencies and tribes pointed out that some disease problems of migrating salmon and steelhead may be attributed to their concentration at fish ladders. No recommendations were made to investigate disease problems associated with fish passage facilities. However, the Council believes that these problems warrant further research, and proposes to adopt a measure calling for such research.

Studies

Disease problems

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.

604. Measures

(a) Flow and Spill Criteria

All Columbia and Snake River Dams

Flows

(1) The Corps of Engineers and the mid-Columbia PUDs, as required by the FERC, 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.

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

Spill configuration

(2) The Corps of Engineers and the mid-Columbia PUDs, as required by the FERC, 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 shall also 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 reevaluated at these facilities. There have been no detailed studies 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.

Post-construction 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 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 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 have occurred which affect spawning and rearing.

Background. Since the completion of the Green Peter Dam/Foster Dam complex on the South and Middle Santiam rivers in 1969, there has been a decrease in the number of native winter steelhead 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 to the Middle Santiam River.

(5) The Corps of Engineers shall continue to fund studies to investigate the causes of adult fish passage delays at John Day Dam.

John Day Dam

Background. The fish and wildlife agencies and the Corps of Engineers have indicated that studies need to be performed to determine if (a) structural modifications of fishway entrances are necessary, (b) present flows for attracting fish might be used more effectively, (c) water quality or flow condition problems exist within the fishway, and (d) the unaccounted losses of adult fall chinook between The Dalles and John Day dams are due to passage conditions at John Day Dam.

(b) Operation and Maintenance of Adult Fishways

(1) The Corps of Engineers shall implement existing fishway operating criteria for all Corps projects on the Columbia River. The FERC shall require Grant, Chelan, and Douglas County PUDs each to conduct studies and develop fishway operating criteria for optimum fish passage for the mid-Columbia project(s) under its control.

Corps of Engineers and Mid-Columbia Dams
Fishway operating guidelines

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

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

Pump problems

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

(3) The Corps of Engineers shall install a new vertical slot counter at the existing east fishway and then proceed to design and install a vertical slot counter at the north shore fishway at The Dalles Dam to count adult runs accurately and to improve adult fish passage.

The Dalles Dam

Background. The Dalles Dam is the only federal project that has horizontal rather than vertical counting boards in the counting stations. Accurate identification and counting of fish is necessary for management. The existing counting facility is inadequate. Preliminary design of new counting boards by the Corps of Engineers has been approved by the fish and wildlife agencies.

Counting boards

(c) Adult Passage Improvements at Tributary Projects

Willamette Falls

(1) Bonneville and the Portland General Electric Company (PGE), as required by the 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

(2) The Columbia Basin Fish and Wildlife Council (fish and wildlife agencies) and Portland General Electric Company shall work cooperatively to investigate and resolve adult fish passage problems associated with Portland General Electric Company's (PGE) 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 believes 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. PGE believes that homing to the release location mimics a delay in returning adults.

(d) Additional Areas of Investigation

Fish losses between dams

(1) The 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.

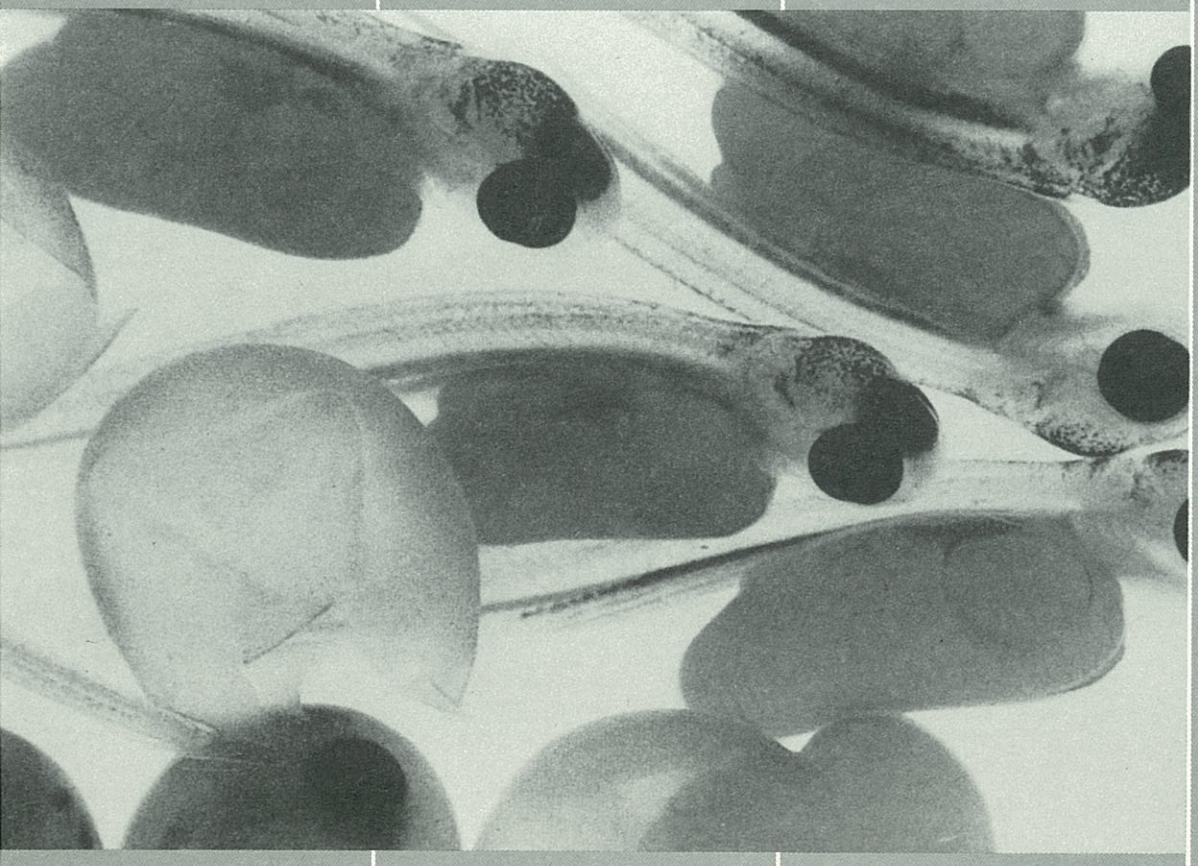
Disease studies

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

Background. A number of diseases that affect adult fish have been identified as 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.

(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.

Wild, Natural and Artificial Propagation



701. The Problem

Genetic diversity

Maintenance of genetic diversity of stocks is essential to the vigor and survival of a species. Persistence of the fishery resource at maximum levels of productivity depends on stock diversity sufficient to ensure continual adaptation to changing environments, including natural and manmade changes. The ability of Columbia Basin fish populations to adapt to environmental change depends on their genetic diversity. Continued erosion of that diversity will diminish the future capacity of the stocks to adapt and survive. The objectives of harvest management and wild, natural, and hatchery production must provide for the conservation and wise use of basin gene resources. The Council recognizes the need to develop a better inventory and characterization of existing stocks and the need for imaginative combination of that information with genetic concepts to develop realistic methods of gene conservation. A primary goal of the Council's program is to restore wild and natural propagation of salmon and steelhead in the Columbia River system. Fish that spawn naturally are subjected to constant selective pressures, resulting in an evolution toward strong, resilient, and diverse stocks. Since each stream or drainage offers a different environment which influences the natural selection process, the fish stocks originating there will be genetically unique to that drainage.

Habitat loss

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 freeflowing, water level fluctuations caused by power peaking operations adversely affect the use of these areas for spawning. Fortunately, the Columbia River has a number of tributary streams with good spawning and rearing habitat. Many of these streams can be brought to their full propagation potential through habitat improvement. Other streams offer good habitat, but currently are under-used by fish, mostly because of passage problems (Figure 8).

Hatchery technology

Hatchery propagation of anadromous fish has proven successful as a means of supplementing the dwindling runs of naturally spawning fish in the Columbia River system. Although hatcheries produce large numbers of fish, important questions remain concerning selection of stock, disease, quality of smolt, genetics, integration of hatchery propagation with natural propagation, and, most important, where and when smolt should be released. All of these problems must be considered in a comprehensive program dealing with harvesting of the fish. Rearing large numbers of fish from egg to smolt and releasing them into the river system does not solve the problem of a declining fishery, particularly in the Columbia River where most hatchery-reared fish are released below Bonneville Dam. In fact, releasing large numbers of fish actually can be harmful because hatchery fish compete with natural fish for a limited food supply and habitat.

Because hatcheries are a crucial link in the restoration of the Columbia River fish, additional research is necessary to improve hatchery propagation. Even if other elements of the Council's fish and wildlife program are extraordinarily successful in achieving increased levels of natural propagation, releases of selected hatchery-reared stocks in suitable upriver habitat will continue to be a necessary element for the improved propagation of salmon and steelhead runs. Hatchery propagation objectives must be integrated fully with natural propagation objectives.

Coordination with harvest management

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 naturally spawning stocks and to maintain existing wild stocks in the Columbia River Basin will not be as effective as they could be.

Figure 8.
Anadromous Salmon and Steelhead Habitat. Columbia River Basin

702. Summary of Recommendations

The fish and wildlife agencies and tribes recommended improvements both in the habitat available for natural propagation of anadromous fish and in the facilities and techniques used for hatchery propagation. The primary objectives of the recommendations to improve natural propagation were:

(A) Provision of suitable flows for spawning, incubation, emergence, and rearing in the Columbia River and its tributaries;

(B) Improvement of anadromous fish spawning, incubation, rearing, and migration habitat which were affected by hydroelectric development, and enhancement of habitat at other locations to compensate for direct effects; and

(C) Provision of and restoration of passage to habitats which became unavailable to migratory fish primarily as a result of hydroelectric development.

The primary objectives of the recommendations to improve hatchery propagation were:

(A) Determination of feasible locations for hatcheries;

(B) Construction of hatcheries at selected sites;

(C) Determination of release strategies compatible with natural propagation and harvest management considerations;

(D) Improvement of operating effectiveness of hatcheries and of the quality of their fish;

(E) Investigation of low-capital hatchery propagation facilities and implementation of those found to be feasible;

(F) Development of techniques to supplement natural propagation through tributary releases of selected hatchery-reared stocks and prompt application of these techniques to appropriate stocks and areas; and

(G) Transfer of selected stocks from lower river hatcheries to upriver areas suitable for natural propagation of those stocks.

703. Council Response

The Council has adopted the primary objectives of the recommendations to improve natural propagation in the Columbia River system. However, recommendations for specific measures displayed a wide range of complexity, anticipated costs, and supporting information. When the intent of a recommendation appears meritorious but supporting information is inadequate, the Council requests further information, including scope of work, schedules, alternatives, and costs before reaching a final decision to fund the proposed measure. Other recommendations will be implemented promptly subject to agreements in scheduling.

Further information needed

Hatchery propagation measures adopted by the Council reflect recommendations which recognize the contribution hatchery propagation will make in compensation and mitigation under the Northwest Power Act. These measures also reflect the need for a logical, systematic approach to developing the full potential of hatchery technology. In addition, the Council's approach incorporates (1) recommendations for low-capital salmon and steelhead propagation, and (2) the release of selected hatchery-reared stocks to supplement natural propagation in certain tributaries.

Low-capital salmon and steelhead propagation

The Council intends to take advantage of the potential for community involvement in the basinwide development of low-capital salmon and steelhead propagation.

Integration of natural and hatchery propagation

The controlled environment of hatcheries results in a greater survival of fish to the adult stage than occurs with natural propagation. The Council recognizes that this has serious implications in managing the propagation and harvest of mixed stocks. The greater survival of hatchery fish makes it extremely difficult to manage the mixed-stock fishery. If the ocean harvest is based upon the number of hatchery fish, the wild and natural fish are over-harvested. If the ocean harvest is based upon the number of wild and natural fish, the hatchery fish are under-harvested. Therefore, the Council will explore various means for obtaining knowledgeable advice to determine the extent of hatchery propagation necessary and how it can be integrated most effectively with efforts to improve natural propagation.

Although no specific recommendations were received regarding the maintenance of wild stocks, many comments on the draft program emphasized the importance of the remaining wild stocks in the Columbia Basin. The Council recognizes the importance of these gene pools.

Consistency with PL 96-561

The Council also recognizes that the program should be consistent with the Salmon and Steelhead Conservation and Enhancement Act of 1980 (PL 96-561). The following standards from section 120(d) of that Act were considered in developing these program measures:

(1) "assure that all commercial and recreational fishermen and the treaty tribes shall have a reasonable opportunity to participate in the benefits, considered as a whole, of the salmon and steelhead resources development;

(2) minimize, to the extent practicable, significant adverse interaction between naturally spawning and artificially propagated stocks;

(3) ensure that all projects included within the plan are designed to complement the contribution of sound state, federal, and tribal enhancement activities;

(4) ensure that all projects included within the plan are economically and biologically sound and supported by adequate scientific research;

(5) assure that all projects included within the plan achieve significant benefits relative to the overall cost of each such project;

(6) consider the effect of enhancement activities as they relate to existing and future international commitments; and

(7) notwithstanding any of the above measures, provide for the harvest of fish by treaty tribes in accordance with treaty rights, unless agreed otherwise by the affected treaty tribes."

Priority

The Council intends to promote the effective use of facilities that are already available, and to develop the best method for integrating natural and hatchery propagation. Therefore, the Council has set its priorities as follows:

(A) Improved hatchery operation through assessment and appropriate selection of stocks, policies to control disease, conservation of gene pools, and improvement of quality of smolts; and

(B) The construction of new hatcheries requiring major capital investment only as necessary.

In 1984 the Council made several changes in this section. Pursuant to specific criteria established for evaluation of offsite enhancement proposals, approximately 27 sets of projects were added to the tables in Section 704(d). The Council adopted a proposal for Bonneville development of an annual work plan using specific criteria to coordinate offsite enhancement work. Habitat improvement and passage restoration projects were combined into the same measure, to coordinate activities in geographical areas. Specific detail was added on plans for John Day acclimation ponds. The Council removed the provision for Bonneville funding of temperature control activities at various Corps dams. The Council also adopted recommendations concerning the Yakima River Basin hatchery, including the development of a master plan. It also clarified several research measures.

704. Measures

(a) Coordination of Propagation Measures

(1) The Council will explore alternative means, including consultation with the fish and wildlife agencies, tribes and utilities, for obtaining the best available scientific knowledge in the following areas:

(A) Salmon and steelhead biology, specifically reproduction;

(B) Propagation of wild, natural, and hatchery fish;

(C) Techniques for improvement of habitat;

(D) Columbia Basin geography, hydrology, and meteorology;

(E) Hatchery biology;

(F) Genetics, diagnosis, and control of disease and parasites;

(G) Engineering necessary to support (A) through (F);

(H) Current status of Columbia Basin fish stocks;

(I) Management of commercial and recreational harvest of anadromous fish; and

(J) Indian treaty rights.

The Council will rely on a broad base of scientific information to determine the most effective and impartial means of achieving protection, mitigation and enhancement of Columbia River Basin fish and wildlife.

(b) Providing Suitable Flows

Priest Rapids Dam

(1) In accordance with the mid-Columbia FERC Settlement Agreement of March 20, 1980, the FERC shall require Grant County PUD to continue studies to determine the effect of varying flows on the spawning, incubation, and rearing of fall chinook salmon from Priest Rapids Dam through the Hanford Reach. Results shall be reported to the Council and to the 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 in the Hanford Reach.

(3) Upon approval by the FERC and the Council, the flow plan developed in (2) above 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 the FERC.

Background. The 54-mile section of the Columbia River from Priest Rapids Dam through the Hanford Reach is extremely valuable to natural production of chinook salmon and steelhead. Significant declines in production have occurred since the 1970s. Under the March 20, 1980, mid-Columbia Settlement Agreement, Grant County PUD agreed to study the effect of varying flows on spawning, incubation, and rearing in this section of the river. The studies were begun in the fall of 1978 and were continued through the spring of 1983. In an initial study, Grant County PUD scarified areas of gravel bottom in an attempt to improve the suitability of these areas for chinook spawning. However, there was no significant increase in use of the scarified areas by salmon. The fish and wildlife agencies have shown that increasing flows above the present 36,000 cfs minimum flow level would provide increased spawning habitat. No action will be taken by the Council to establish minimum flows at Priest Rapids Dam until studies required under the settlement agreement are completed.

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 shall also include estimates of power losses associated with improved flows.

Background. The last remaining freeflowing 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 of Engineers shall propose to the Council flow guidelines to be incorporated into the operation of dams in the Willamette Basin.

(8) Upon approval of flow guidelines by the Council, 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 of Engineers has coordinated most reservoir operations in the Willamette Basin with state and federal fisheries agencies. The Corps has, for the most part, accepted agency proposals for flow guidelines, but believes that certain agency proposals are unacceptable because they require more storage than is available. The Corps also believes 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.

(9) The 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, the 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.

Mayfield Dam

Background. In 1977 a formal agreement was reached between the Washington Departments of Fisheries and Game and Tacoma City Light that provides flows to improve anadromous fish production below Mayfield Dam. Tacoma City Light is currently implementing the flow agreement. The Washington Departments of Fisheries and Game have requested that the agreement be included in the FERC license. This is pending.

(10) The FERC shall require Pacific Power & Light Company (PP&L) 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 the FERC, the flow plan will become a part of this program.

Merwin Dam

Background. PP&L and the Washington Departments of Fisheries and Game presently are developing a flow plan for the lower Lewis River below Merwin Dam. The Council will review this plan when it becomes available.

(11) Upon approval by the Council, the 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.

McKenzie River

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. Two sections of the river, between the intakes and return canals, receive significantly reduced flows during certain periods. Studies to date by the fish and wildlife agencies indicate that greater flows are required to maintain natural propagation of anadromous fish.

(12) The 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.

Pelton Dam
Round Butte Dam

(13) The 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 fish flows throughout the Columbia River Basin. These studies shall explore:

- **(A)** Modification of existing federal project requirements for flood control;
- **(B)** Feasibility of constructing new reservoirs for additional storage capability, specifically the Weiser River Galloway Site in Idaho; and
- **(C)** Feasibility of using uncontracted water stored in existing reservoirs.

Background. The use of water stored in new impoundments, such as could be provided by the projects under study in the Yakima River Basin and by the Weiser project in the Snake River Basin, has the potential for alleviating flow problems. However, there are a number of issues which need to be considered before such an action can be taken. Among these are costs and conflicting demands for storage water for anadromous and resident fish, irrigation, flood control, recreation, power, and navigation.

Use of storage water

(15) The Bureau of Reclamation shall use the 6000 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.

(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.

(c) Temperature Control

Detroit Dam

(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.

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 Dam
Blue River Dam

(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 temperature 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 near Vida. The lower water temperatures in the spring can affect natural propagation of anadromous fish.

(d) Habitat Improvement and Passage Restoration

(1) Upon approval by the Council, Bonneville shall provide funds for habitat improvement and passage restoration or improvement measures in the Columbia River Basin, as specified in Table 2. Until program goals are established through Section 201, Bonneville shall develop an annual work plan for funding projects from the table. Bonneville shall present its plan for project selection and funding for the following fiscal year to the Council. The plan shall be developed in consultation with the fish, wildlife and land management agencies and tribes. Bonneville's plan shall include:

(A) An explanation of the sound biological basis for project selection, taking into account these factors:

- **(i)** Existing smolt production, existing potential for smolt production and potential with habitat or passage improvement.
- **(ii)** Existing escapement and potential escapement.
- **(iii)** Existing wild and naturally spawning stock trends and conditions.
- **(iv)** Benefits to multiple anadromous species and runs.
- **(v)** Extent and condition of habitat available through passage restoration.
- **(vi)** Requirements for hatchery supplementation, including genetic and disease considerations.
- **(vii)** Ocean and river harvest management considerations.

(viii) Status of diversion screening and requirements for improvement.

(ix) Effects of project on resident fish stocks.

(x) Analysis of all factors limiting existing and potential production.

(xi) Emphasis on protection, mitigation and enhancement of upriver stocks of anadromous fish.

(xii) The extent of coordinated tributary subbasin planning for habitat management, improvement and passage restoration.

(xiii) Plans for protection of the enhancement investment from land use and other activities in the tributary subbasin.

(xiv) A means to evaluate the effectiveness of the projects.

(B) Cost estimates.

(C) Time schedules.

(D) A description of coordination and consultation efforts, including:

(i) History of cooperative efforts by fish and wildlife agencies, tribes, utilities, and private landowners regarding offsite enhancement in the tributary subbasin.

(ii) Information on whether the fish and wildlife agencies, tribes, and land management agencies concur in the annual work plan.

To the greatest extent feasible, Bonneville shall focus its annual work plans in a limited number of tributary subbasins. It also shall select projects which will provide information which can be applied elsewhere in the Columbia River Basin. The work plan shall provide for evaluation of effectiveness which shall be in terms of specific subbasin production enhancement and applicability to other subbasins. The Council also encourages the development of agreements providing for cost-sharing between Bonneville and appropriate entities for the implementation of those measures which are necessary to mitigate non-hydroelectric effects.

Storage projects

(2) 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.

Condit Dam

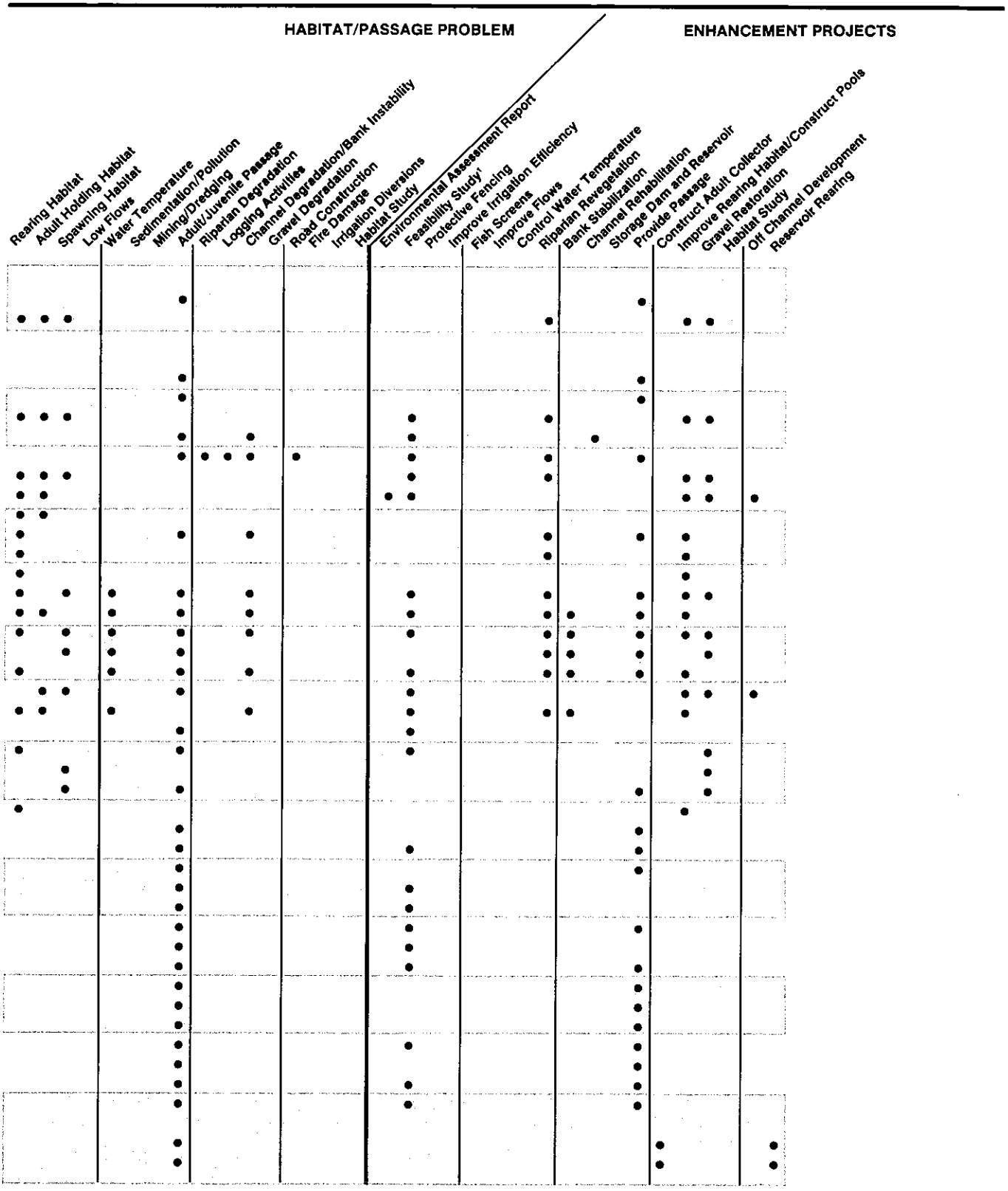
(3) The FERC shall require Pacific Power and Light Company (PP&L) to immediately design and construct facilities to allow upstream and downstream migration of anadromous fish at Condit Dam. The FERC shall require PP&L to assume full responsibility for annual operation and maintenance costs of these facilities.

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

Table 2.
Anadromous Fish Habitat Improvement and Passage Restoration or Improvement Measures in the Columbia River Basin

Key: CH — Chinook, CO — Coho, Sctt — Searun Cutthroat, St — Steelhead, SO — Sockeye

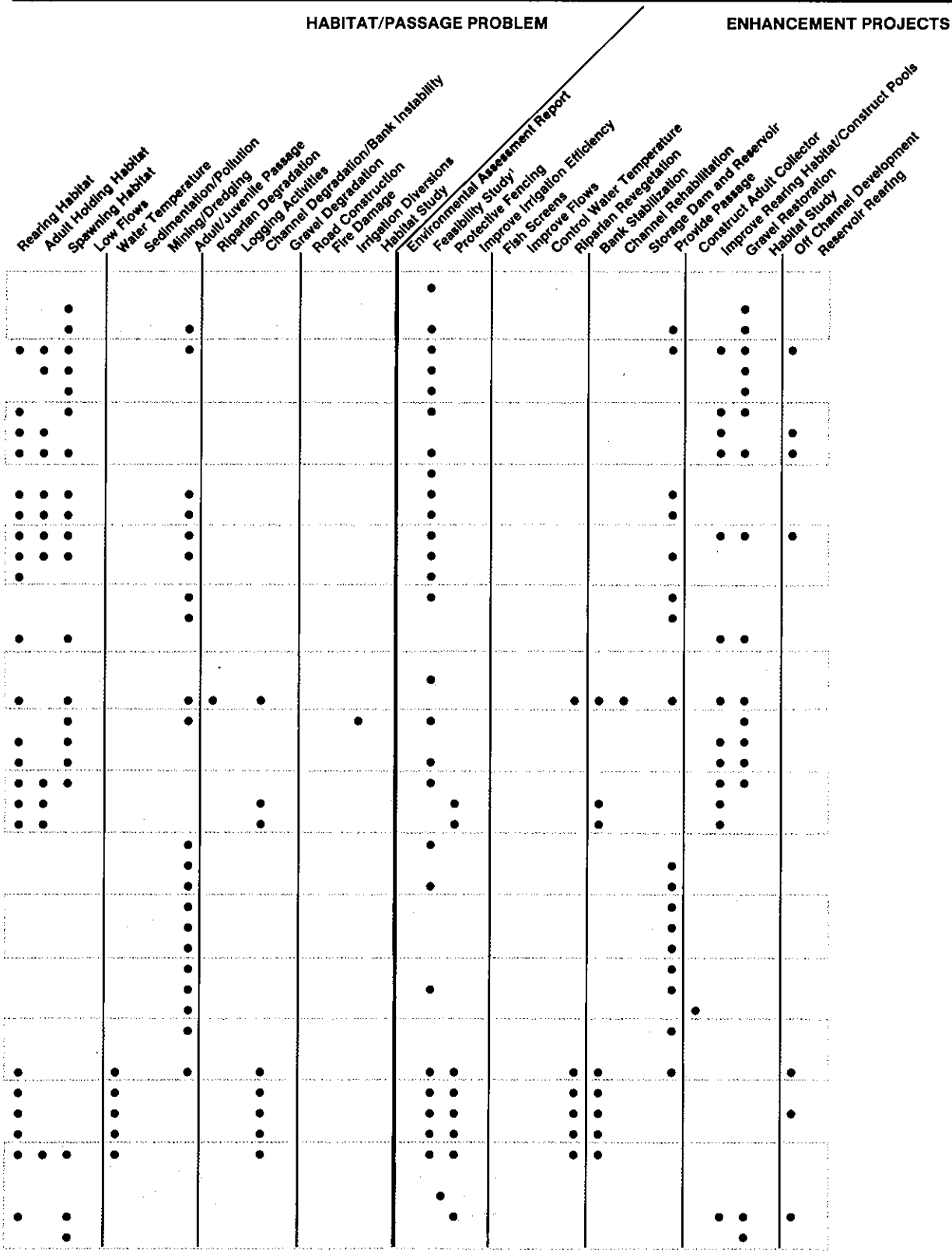
RIVER SUBBASIN	PROJECT SITE	SPECIES
Klaskanine River		
	Klaskanine River Falls	Co, Sctt, St
Lewis River	Lewis River	St
Willamette River		
	Collowash Falls	Ch, Co, St
	Little Falls Creek Falls	Ch, St
Clackamas River		Ch, Co, St
	Fish Creek	Co, St
	Wash Creek	St
	Upper Clackamas River	Ch, Co, St
	Oak Grove Fork	Ch, Co, St
	Mag Creek	Co, St
	Hunter Creek	Co, St
	Lowe Creek	Co, St
	Falls Creek	Co, St
	No. Fork Clackamas River	Ch, Co, St
	Hot Springs Fork	Ch, Co, St
	Pansy Creek	St
	Hugh Creek	St
	Nohorn Creek	St
	Roaring River	Ch, Co, St
	Collowash River	Ch, Co, St
	East Fork Collowash river	Co, St
	So. Fork Clackamas River	Ch, Co, St
	Lower Clackamas River	Ch, Co, St
	Cub Creek	St
	Pinhead Creek	Co, St
	Buckeye Creek	Co, St
	Squirrel Creek	St
	Tag/Tar Creeks	Co, St
	Blister Creek	St
	Calico Creek	St
	Elk Lake Creek	Co, St
	Dickey Creek	Co, St
	Memaloose Creek	Co, St
	Pick Creek	Co, St
	Skin Creek	St
	Thunder Creek	St
	Trout Creek	St
	Whale Creek	St
	Whetstone Creek	St
	Whiskey Creek	St
McKenzie River		
	Cougar Dam	Ch, So
	Blue River Dam	Ch



[1]Upon completion, a proposal for further action will be considered.

Table 2 (Continued)

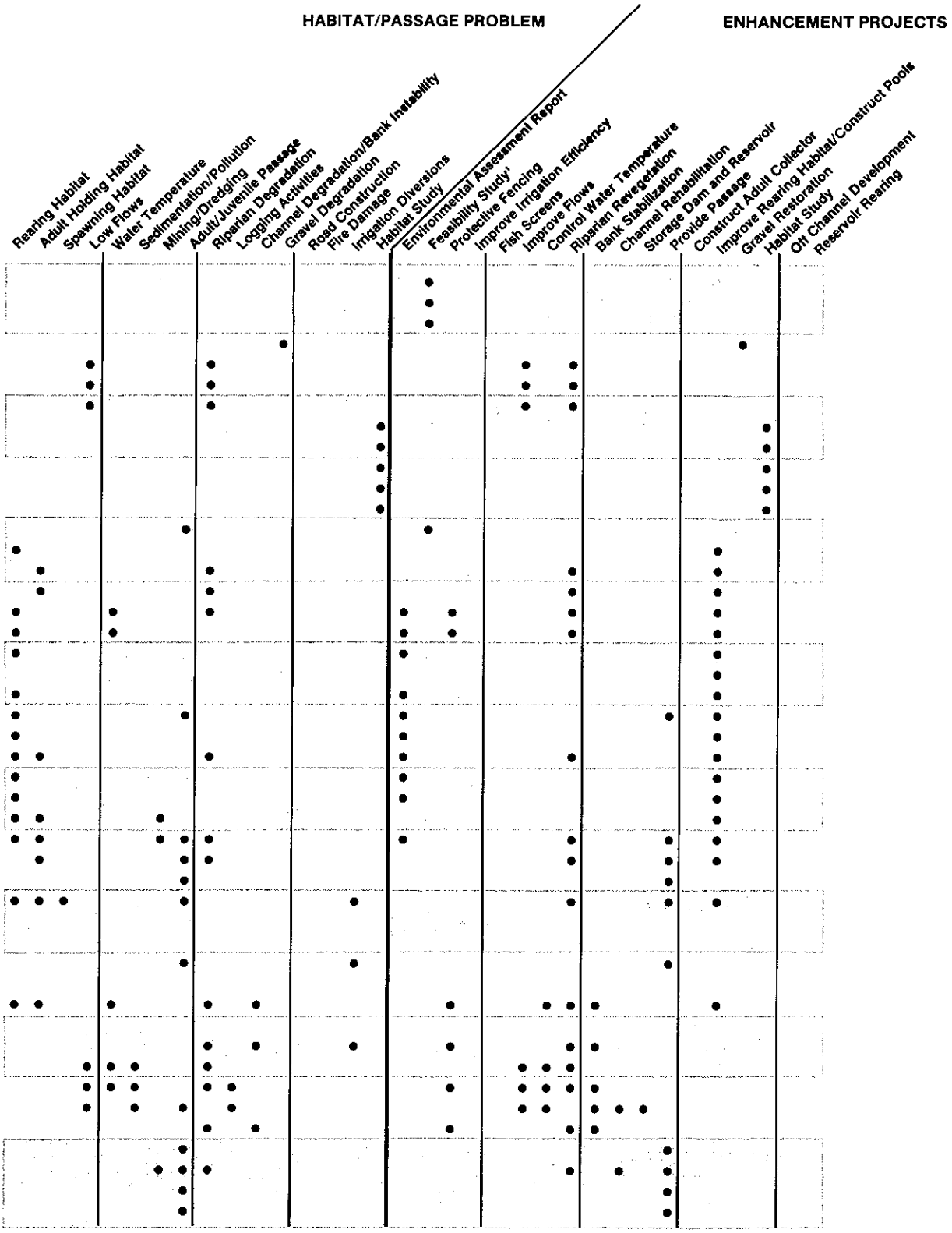
RIVER SUBBASIN	PROJECT SITE	SPECIES
Sandy River		
	Boulder Creek	Co, St
	Clear Creek	Co, St
	Lost Creek	Ch, Co, St
	Lower Bull Run	Ch, Co, St
	Little Sandy River	Ch, Co, St
	Alder Creek	Co, St
	Clear Fork	Co, St
	Zigzag River	Ch, Co, St
	Little Zigzag River	
	Still Creek	Ch, Co, St
	Camp Creek	Ch, Co, St
	Salmon River	Ch, Co, St
	S. Fork Salmon River	Ch, Co, St
	Cheeny Creek	Co, St
	Horseshoe Creek	Co, St
	Lady Creek	Co, St
Wind River	Wind River	St, Ch
Hood River		
	Lake Branch	St
	Clear Branch	Ch, St, Sctt
	East Fork Hood	St, Sctt
	West Fork Hood	Ch, St
	Middle Fork Hood	Ch, St, Sctt
	Neal Creek	Ch, St, Sctt
	Odell Creek	St, Sctt
	Cold Springs Creek	St
	Elk Creek	St
	Greenpoint Creek	St
	Hood River Falls	St, Co, So
	Laurel Creek	St
	Meadows Creek	St, Co
	No. Fork Greenpoint Creek	St
	Tony Creek	St
	Powerdale Dam	Ch, St, Sctt, So
Klickitat River		Ch, Co, St
Fifteen Mile Creek		St
	Ramsey Creek	St
	Eight Mile Creek	St
	Five Mile Creek	St
	Dry Creek	St
Columbia Gorge Tributaries		
	Moffett Creek	Ch, Co, St
	Horsetail Creek	Ch, Co, St
	Multnomah Creek	Ch, Co, St



[1]Upon completion, a proposal for further action will be considered.

Table 2 (Continued)

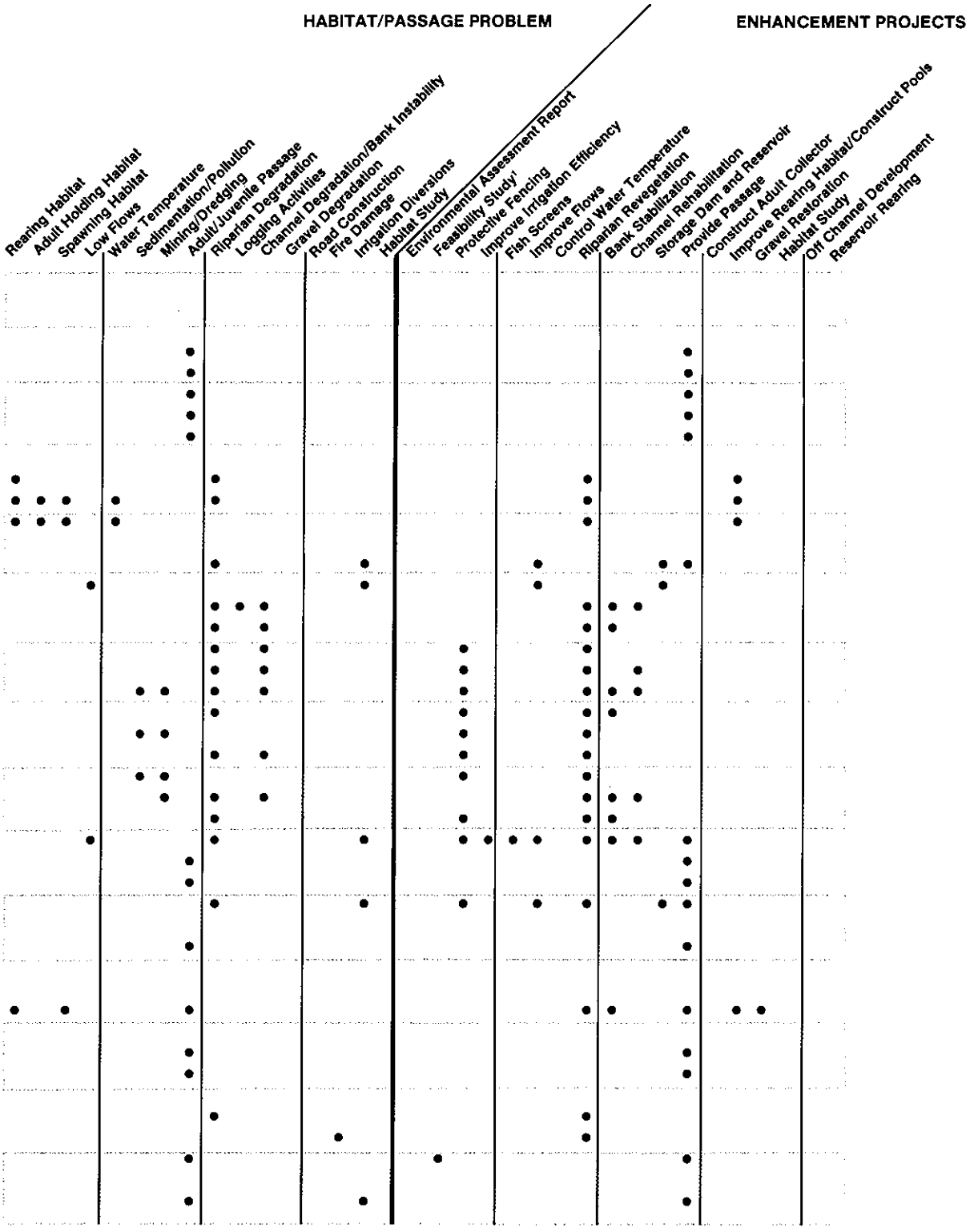
RIVER SUBBASIN	PROJECT SITE	SPECIES
Columbia Gorge Tributaries (Cont.)	Lindsey Creek	Co, St
	Viento Creek	Co, St
	Herman Creek	Co, St
Deschutes River		Ch, St
	Bakeoven Creek	St
	Buckhollow Creek	St
	Trout Creek	St
	Shitite Creek	
	Beaver Creek	
	Mill Creek	
	Badger Creek	
	Warm Springs River	
John Day River	White River Falls	Ch, St
		Ch, St
	John Day (Upper Main Stem & Trib's)	Ch, St
	John Day (Lower Main Stem & Trib's)	St
	Deer Creek	St
	Murderer's Creek	St
	Field's Creek	St
	East Fork, Beech Creek	St
	Clear Creek	Ch, St
	Squaw Creek	Ch, St
	Canyon Creek	St
	Middle Fork John Day & Trib's	Ch, St
	Big Boulder Creek	Ch, St
	Granite Boulder Creek	Ch, St
	Clear & Granite Creek	Ch, St
	North Fork John Day & Trib's	Ch, St
	South Fork John Dam & Trib's	St
	Five Mile Creek	St
Umatilla River	Umatilla River	Ch, Co, St
Walla Walla River		
	Touchet River	St
Snake River		
Tucannon River	Tucannon River	Ch, St
Clearwater River		
	Lolo Creek	Ch, St
	Lapwai Creek	St
	Potlatch River	St
	Clear Creek	Ch, St
	Red River	Ch
	Meadow Creek	St
	Crooked River	Ch
	Eldorado Creek	Ch, St
	Orofino Creek	St, Ch



[1]Upon completion, a proposal for further action will be considered.

Table 2. (Continued)

RIVER SUBBASIN	PROJECT SITE	SPECIES
Snake River (Cont)		
Clearwater River (Cont)		
Lochsa River		
	Crooked Fork Lochsa River	St
	Colt Creek	Ch
	Badger Creek	St
	Wendover Creek	St
	Cabin Creek	Ch
Grande Ronde		
	Phillips Creek	St
	Joseph's Creek Tributaries	Ch, St
	Upper Grande Ronde Tributaries	Ch, St
Salmon River		
	Alturas Lake Creek	Ch, So
	Carmen Creek	Ch, St
	Pole Creek	Ch, St
	E. Fork, S. Fork Salmon River	Ch, St
	Camas Creek	Ch, St
	Marsh Creek	Ch, St
	Bear Valley Creek	Ch, St
	Elk Creek	Ch, St
	Panther Creek	Ch, St
	East Fork Salmon River	Ch, St
	Yankee Fork Salmon River	Ch, St
	Jordan Creek	Ch, St
	Valley Creek	Ch, St
	Upper Salmon River	Ch, St
	South Fork Salmon River	Ch
	Stanley Lake	So
Lemhi River		Ch, St
Little Salmon River		
	Boulder Creek	Ch, St
Yakima River		
Naches River		
	Naches River/Little Naches	St, Ch
Wenatchee River		
	Dryden Dam	Ch, So, St
	Tumwater Falls Dam	Ch, So, St
Entiat River		
	Burns Creek	
	Fox Creek	
	Box Canyon & Entiat Falls	Ch, St
Similkameen River		
	Enloe Dam	Ch, Co, St



[1]Upon completion, a proposal for further action will be considered.

(e) Evaluation

(1) 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 [704(j)(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.

(f) Hatchery Survey

(1) Bonneville shall fund a study to compile all available information on existing and potential sites for hatcheries. The survey on existing sites shall include data on their full propagation potential, impediments to achieving full potential, and steps that must be taken to improve propagation quality and quantity. Data shall be included on hatcheries not making full use of available water. At potential sites for hatcheries, site characteristics such as water quality and quantity shall be evaluated. This study shall determine whether available data is sufficient to allow proposals to be made to the Council for improvement to existing hatcheries or for development of new hatcheries.

(g) Release Sites for Hatchery-Reared Fish

Needs of upriver stocks
Reprogramming plan

(1) Bonneville shall provide funds to evaluate sites suitable for release of hatchery fish and the levels of release compatible with natural propagation and harvest management. Initial efforts shall focus on the needs of upriver stocks. The Council will adopt a comprehensive plan for reprogramming lower river hatcheries. Where current knowledge is sufficient, certain stocks may be moved to particular upriver streams. The fish and wildlife agencies and the tribes will cooperate in this effort.

(2) Upon approval by the Council of the plan, 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.

Background. The Mitchell Act and John Day hatcheries were provided to mitigate fishery losses because of the hydroelectric development of the Columbia River. A reprogramming of hatchery operations and release strategies will rebuild upriver runs and improve tribal fisheries. The tribes already have submitted to the Council a detailed plan for reprogramming lower river hatchery releases into the upper Columbia. The Council strongly supports restoration of naturally spawning upriver stocks, but further consultation is required with the fish and wildlife agencies and tribes to determine a final release plan.

(h) Improved Propagation at Existing Facilities

Priority

(1) Priority shall be given to improving and reprogramming propagation at existing hatchery facilities over construction of new facilities. Bonneville implementation of Section 704(h)(2) is expected to be consistent with the research objectives established pursuant to Section 1104(c), when adopted, and with pertinent provisions of Section 1500.

(2) (A) Bonneville shall fund research, development and demonstration of improved husbandry practices at hatcheries which will lead to increased production and improved survival to adulthood. Bonneville also shall fund trials to test new techniques which may include using production-scale releases at Columbia Basin artificial propagation facilities.

Background. Numerous biological and environmental factors are known to affect the quality of juveniles released from hatcheries. The term "husbandry" refers to the proper control of these factors. In the hatchery, factors affecting smolt quality include nutrition, rearing density, water temperature, physiological state of smoltification, dissolved oxygen and nitrogen, and type of rearing pond or raceway. Size, location and time of release are primary factors affecting adult migrant return patterns. Better understanding of hatchery factors will lead to improved husbandry and adult contribution.

(B) Bonneville shall fund research, development and testing of hatchery rearing operations and release strategies aimed at improving operating efficiencies of hatcheries and increasing the adult contribution of artificially propagated fish. This research, development and testing shall incorporate effective husbandry practices from 704(h)(2)(A).

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

Fish stock assessment

(C) Upon approval by the Council, Bonneville shall fund an assessment of Columbia River Basin spawning stocks to ensure proper use of these stocks so that genetic integrity is maintained. Proposals for futher 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:

(i) Species, strain or stock;
(ii) Time of runs;
(iii) Disease status and tolerance;
(iv) Stock size and ability to reproduce;
(v) Migration characteristics;
(vi) Survival and fecundity of the stock;
(vii) Age and size composition, life stages;
(viii) Current rearing and release methods;
(ix) Anatomical and biochemical traits; and
(x) Genetic variability.

Background: Conservation of unique genetic stocks is fundamental to the vigor, resiliency and survival of a species. By merging the results of the stock assessment studies with genetic principles, guidelines for gene conservation can be produced for use in the implementation of several program measures, including 201(3)(C), 504(c), 704(g), 704(h)(2), 704(i), 704(j) and 704(k).

Disease control

(D) 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:

(i) Prevention of the introduction of diseases into the Columbia River Basin;
(ii) Prevention of the spread of detected fish pathogens;
(iii) Improvement of cultural policies and procedures;

(iv) Minimization of the impact of fish diseases on wild and cultured stocks; and
(v) Improvement in detection, diagnosis and control of fish diseases and parasites.

In funding these activities, Bonneville shall take into account the work of the Pacific Northwest Fish Health Protection Committee, described in 704(h)(2)(E).

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.

(E) The Pacific Northwest Fish Health Protection Committee is expected to develop a coordinated, comprehensive fish health protection policy and supporting program.

Background. The Pacific Northwest Fish Health Protection Committee was established in 1984. It is comprised of representatives from state and federal fish and wildlife agencies, Indian tribes, and private fish culturists.

Smolt survival index

(F) 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.

(i) Construction of Major Hatchery Facilities

Umatilla Reservation

(1) Bonneville shall fund the Confederated Tribes of the Umatilla Reservation to design, construct, operate, and maintain juvenile release and adult collection and holding facilities on the reservation. Upon review and approval by the Council of siting, feasibility, and preliminary design, Bonneville also shall fund the construction of a facility to increase the existing hatchery production to provide for an additional 200,000 summer steelhead smolts for release in the Umatilla juvenile release and adult collection and holding facilities.

Background. The fish and wildlife agencies and tribes have proposed to construct and operate acclimation ponds on the Umatilla Reservation. Smolts would be transported to these ponds from hatchery facilities for imprinting before release. Returning adults would provide an improved fishery for the Umatilla tribes and all other fishermen.

John Day Dam

(2) (A) The fish and wildlife agencies and tribes wil 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 that will ensure that releases: a) do not adversely affect the genetic integrity of stocks potentially impacted by the hatchery releases, b) are compatible with the fish naturally inhabiting the release locations, c) are disease-free, and d) are coordinated with the activities of other management and enhancement activities in the basin;

(iv) Monitoring and evaluation studies to assess the effectiveness of the facilities. Such studies should include 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 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, 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 Reservation

(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 904(e)(1).] 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 fisheries 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. Stocks identified will be consistent with the goals established by the Council under Program Section 201.

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

(iv) Proposed management policies and procedures that would ensure hatchery releases: a) protect genetic integrity of stocks potentially impacted 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 fishery management 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. Prior to making annual budget requests for operation and maintenance, the managing entity 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 fisheries 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 as well as elsewhere in the basin.

Background. A primary objective of the fish and wildlife program is to protect wild and naturally spawning stocks and to enhance severely depressed stocks by using hatchery-reared fish to reseed underutilized habitat. Much is still unknown, however, about the impact of hatchery produced fish on wild populations. See Program Section 704(k). The design and management of this hatchery will allow agencies and tribes to learn more about these impacts and to identify the best methods for carrying out hatchery 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 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.

Other locations

(4) Should the Council determine that additional hatchery propagation facilities are required to compensate for fish losses caused by the hydroelectric 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.

(j) Construction of Low-Capital Propagation Facilities

Columbia River Basin

(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 Section 704(h)(2)(C) and (D) and 704(k)(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 have as many of these low-cost, small-scale hatcheries used as possible.

Background. The major advantages associated with 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 704(j)(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.

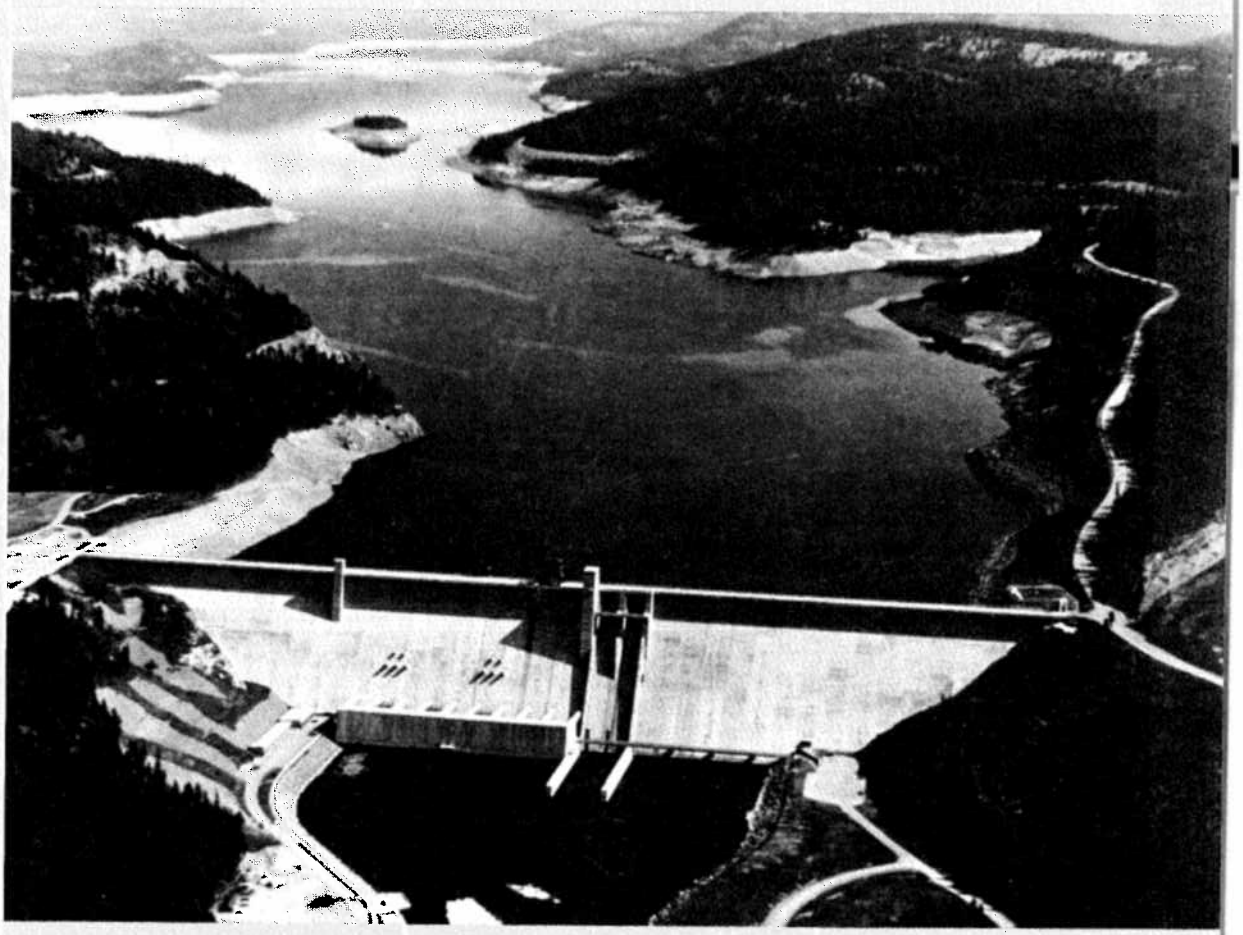
(k) Integration of Natural and Hatchery Propagation

(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 naturally spawning stocks with hatchery fish

(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.

Resident Fish



801. The Problem

Resident fish are the 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 treated in Sections 300 to 700. Resident fish exist throughout the basin and are particularly important in Montana where anadromous fish runs are blocked by natural obstructions (See Figure 8).

As with anadromous fish, hydroelectric power generation interferes with the flows needed for resident fish spawning, incubation, emergence, rearing, and migration throughout the river system. In addition, reservoir operations for power purposes often detrimentally alter the environment in the reservoir where spawning, incubation, and rearing of some resident fish species take place. 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 available to the fish, crowd them into a smaller aquatic living space, and change the temperature of the remaining water. Hydroelectric project development also has created sedimentation problems for resident fish. In its 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. The hydroelectric projects slowed and decreased the flow, allowing sediment to build up over the gravel spawning beds. Sediment particles also have an affinity for chemical pollutants, creating potentially harmful concentrations in the reservoirs and other resident fish environments.

Reservoir operation

Sedimentation

A species critically affected by hydroelectric development is the white sturgeon, biologically an anadromous fish but now confined to certain stretches of the river above Bonneville because dams have blocked migration. Because of its extended life cycle (50 to 100 years), the supply of that species has been depleted and cannot be increased quickly. Other resident fish species of special interest include the kokanee, Dolly Varden (bull trout), and westslope cutthroat trout.

Species of interest

802. Summary of Recommendations

The fish and wildlife agencies proposed a wide range of methods to protect resident fish, mitigate fishery losses caused by hydroelectric projects, and compensate for past losses through enhancement measures. They recommended such provisions as minimum flow requirements, development of limitations on the drawdown of reservoirs, control of water temperature, construction of a spawning channel and a hatchery, planting of fingerlings, and related research. In some cases they asked for continuation of existing practices. In others they recommended studies designed to evaluate the effectiveness of program measures and to develop additional protection, mitigation, and enhancement methods. Many of the recommendations dealing with the resident fish were to be carried out in the State of Montana where anadromous fish runs are blocked by natural obstructions.

803. Council Response

The Council has adopted many of the recommendations for specific actions, but is calling for further review and approval by the Council of the new research projects. One of the most important measures is the initiation of a five-year program to develop new operating procedures for Hungry Horse and Libby reservoirs. These procedures will be designed to solve potential conflicts between 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 on the drawdown of reservoirs for power purposes will be developed. Such limits could be exceeded in certain instances. Until permanent limits are developed, the operating agencies are requested to make every effort to comply with the recommended drawdown limits.

New operating procedures

In 1984 the Council received several recommendations for changes in this section. The Colville Indian Tribe, recognizing that anadromous fish runs are permanently blocked by Chief Joseph Dam on the Columbia River, proposed a resident trout hatchery above the dam. The Council adopted this proposal, providing for funding of a resident trout hatchery on the Colville Indian Reservation. Responding to an amendment application submitted by the Nez Perce Tribe, the Council adopted a proposal providing for Bonneville funding of a study to analyze the impact of Dworshak Dam on resident fish. Other 1984 amendments to this section provide for Bonneville funding of a feasibility study for shoreline revegetation and interim Bonneville funding of a purchase of water from the Painted Rocks Reservoir, with FERC responsible for securing future funding and reimbursement from the responsible project operators. The Council also adopted criteria to evaluate resident fish projects for future inclusion in the Program.

804. Measures

(a) Flow Requirements

Hungry Horse Dam
Columbia Falls flows

(1) To aid reproduction of kokanee in the Flathead River, the Bureau of Reclamation shall operate Hungry Horse Dam so as to provide the following instantaneous flows at Columbia Falls:

(A) **Spawning.** Flow shall not be less than 3500 cfs or more than 4500 cfs from October 15 through December 15.

(B) **Incubation.** A minimum flow of at least 3500 cfs shall be provided 24 hours per day from December 15 through April 30.

(C) **Emergence.** Flows shall be provided during the period from March 15 through initiation of spring runoff (usually mid-April) to flush emerging fry downstream to Flathead Lake.

(D) **Other.** A minimum flow of at least 3500 cfs in the Flathead River at Columbia Falls shall be provided 24 hours per day from July 1 through October 15.

The Bureau of Reclamation shall report to the Council monthly the hourly average river flows for the period July 1 through April 30. 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 for study purposes.

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. Preliminary results of these studies shall be completed by November 15, 1985. Proposals for further action shall be made to the Council at that time.

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. These studies shall be completed by November 15, 1988. Proposals for further action shall be made to the Council at that time.

(4) The FERC shall continue to require Pacific Power and Light Company (PP&L) to maintain the present minimum flow of 40 cfs between Big Fork Dam and the powerhouse. The FERC shall require PP&L to fund a study to determine whether such flow is sufficient to ensure successful reproduction and rearing of resident species such as rainbow trout.

Big Fork Dam
Minimum flow

(5) Upon approval by the Council, the FERC shall require Pacific Power and Light Company to fund studies to:

Research

(A) Establish the effect of a minimum flow of 20 cfs on reproduction and incubation of kokanee salmon;

(B) Establish the effect of a surge flow of 150-250 cfs on migration, spawning, and incubation survival of kokanee during the hours of 2 a.m. to 6 a.m., at least two days per week; and

(C) Determine whether kokanee movement downstream out of Swan Lake is prevented by diversion through the Big Fork powerhouse, and investigate appropriate measures to reduce entrainment, if necessary.

(6) Bonneville shall continue to provide funds to the Montana Department of Fish, Wildlife and Parks for the placement of spawning-sized gravel downstream from Big Fork Dam, and shall provide funds to determine whether the reproduction success of kokanee is improved as a result. In the implementation of Section 804(a)(4), (5), and (6), Pacific Power and Light Company will be consulted in the course of all studies conducted in relation to the operation of Big Fork Dam.

Mitigation

(7) 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 Kookanusa. These procedures shall be implemented by November 15, 1987. They shall require a minimum flow of 4000 cfs except in years of extremely low runoff, when no less than 3000 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 4000-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.

Libby Dam

Minimum flow

(8) If a conflict occurs between maintaining the minimum flows required by Section 804(a)(1) and maintaining reservoir levels required by Section 804(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 804(a)(7) and maintaining the reservoir levels required by Section 804(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

(9) Upon approval by the Council, Bonneville shall fund studies to determine the flows required to ensure successful migration, spawning, and rearing of rainbow and cutthroat trout in certain tributaries to the Kootenai River (Callahan, Quartz, Libby, and O'Brien creeks, and the Fisher River) and tributaries to Lake Kookanusa (Graves, Deep, Big, Bristow, Barron, and Five-Mile creeks).

Research

(10) 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

Hungry Horse Reservoir
Libby Reservoir
Operating guidelines

(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 which will limit 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 November 15, 1987, 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 80 percent of all years;

(C) Upon approval by the Council, 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 those years in which 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) Upon approval by the Council, 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.

Related research

(3) Upon approval by the Council, 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;

(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.

These studies shall be completed by November 15, 1986. Proposals for further action shall be submitted to the Council at that time.

Mitigation

(4) Upon approval by the Council, Bonneville shall fund the design, construction, operation, and maintenance of a spawning channel along the Flathead River to supplement propagation of natural fish in the river as mitigation for habitat loss in the South Fork and Flathead rivers caused by drawdown of and discharges from Hungry Horse Reservoir. Bonneville shall fund a study to determine levels of production necessary to mitigate the effects of the hydroelectric system, and shall submit the results of the study to the Council for review prior to approval of a spawning channel. Construction of the channel shall be completed by November 15, 1987.

(5) In coordination with Section 804(a)(2), Bonneville shall continue to fund the study designed to develop measures to improve the success of the reproduction of kokanee 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:

Hungry Horse Dam
Kerr Dam

(A) The effect of operation of Kerr and Hungry Horse dams on water levels in Flathead Lake, and the effect of amount and timing of drawdown on distribution and reproductive success of kokanee spawning in the lake;

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

(C) 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, and the Bureau of Reclamation. The studies shall be completed by November 15, 1987. Proposals for further action shall be submitted to the Council at that time.

(6) Upon approval by the Council, Bonneville shall fund a study to evaluate the effects from the operation of Kerr Dam on certain game fish, including bass, Dolly Varden, and kokanee, in South Bay of Flathead Lake. These studies shall be completed by November 15, 1987. Proposals for further action shall be submitted to the Council at that time.

(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.

Flint Creek Project

(8) Upon completion of planning for Milltown Dam, the FERC shall require Montana Power Company to fund an evaluation of the proposed operating procedures to determine whether they will protect the resident fish resource downstream from the project. The study will include an analysis of suspended sediments and 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 the effect will be proposed to the Council.

Milltown Dam

(9) The FERC shall require 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, 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 resources in Lake Coeur d'Alene and the Spokane River. Proposals for further action may be made on the basis of the evaluation.

Post Falls Dam

(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 its proposed procedures for the drawdown of Banks Lake to the Council.

Banks Lake

(c) Temperature Control

(1) 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 temperature within those ranges which are best for fish habitat.

(d) Streambed Protection

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

(e) Additional Restoration Measures

Painted Rocks Reservoir

(1) Upon approval by the Council, Bonneville shall provide interim funding for the purchase of 10,000 acre-feet of water from Painted Rocks Reservoir to maintain summer and fall flows for resident fish in the Bitterroot River. This action will compensate for loss of a significant fishery in the lower Clark Fork drainage. The Council will explore whether the 10,000 acre-feet of water can be purchased in perpetuity, and whether additional stream gauging stations, a water commissioner, or water plan would be necessary to ensure that water purchased and discharged for fish is not diverted for other purposes. 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. FERC shall require the project operators to reimburse Bonneville and to provide permanent funding or other full mitigation for the impacts of the projects on resident fish.

(2) Upon approval by the Council, Bonneville shall fund an evaluation of the effectiveness of the additional water in enhancing resident fish in the Bitterroot River.

Kootenai River

(3) Upon approval by the Council, 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, and to restore sturgeon and ling (burbot) populations in that river.

Lake Pend Oreille
Research

(4) Upon approval by the Council, Bonneville shall fund an evaluation of the degree to which the Albeni Falls and Cabinet Gorge projects are responsible for the decline of the Lake Pend Oreille fishery, and the level of mitigation necessary to restore a reasonable number of fish in Lake Pend Oreille.

Hatchery construction

(5) Upon approval by the Council, Bonneville shall fund the design, construction, operation, and maintenance of a hatchery on the Clark Fork River to achieve the level of fish restoration defined in Section 804(e)(4).

Cascade Reservoir

(6) The Idaho Department of Fish and Game will provide further evidence to the Council that increased levels of stocking with hatchery fish will mitigate the effects of construction and operation of Cascade Reservoir. Upon approval by the Council, Bonneville shall fund the propagation and release of additional fingerlings in the reservoir.

Banks Lake

(7) The Bureau of Reclamation shall fund installation and maintenance of a 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 that results from reservoir fluctuations caused by hydroelectric operation of Grand Coulee Dam.

(8) Bonneville shall fund research to determine the impacts of development and operation of the hydroelectric power 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.

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

(10) The Idaho Department of Fish and Game 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, the Department will provide a plan to stock the river with rainbow trout. Upon approval by the Council, Bonneville shall fund the program for stocking.

Lower Clark Fork River

(11) Upon approval by the Council, Bonneville shall fund the following research in the lower Clark Fork drainage, which shall be completed by November 15, 1987:

(A) Assess the existing habitat suitability for species now present and those designated for possible introductions and assessment of spawning, rearing, food, and cover habitats and hydrological, limnological, and 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.

(12) 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 small mouth 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 804(e)(16), may be submitted to the Council.

(13) The Corps shall fund additional test vegetation planting at Hills Creek Reservoir and evaluation of its 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.

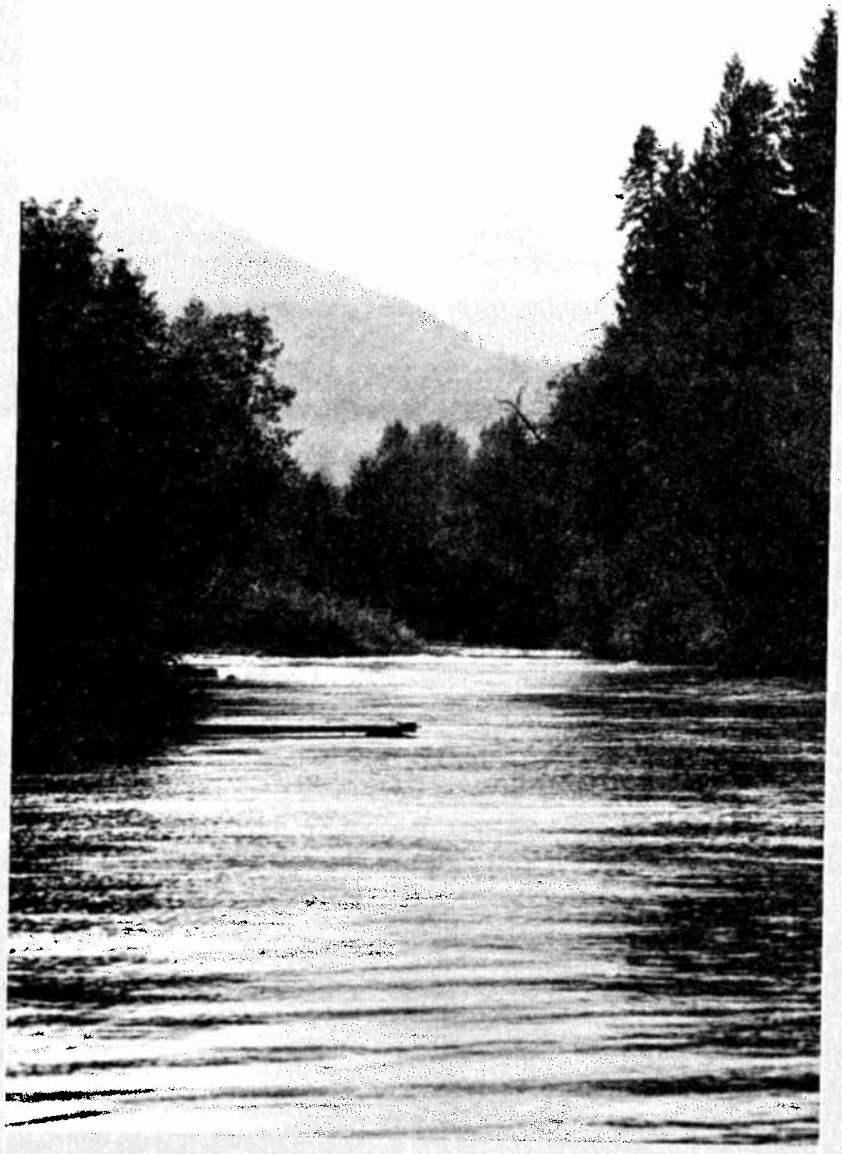
(14) The Bureau of Reclamation shall consult with the Oregon Department of Fish and Wildlife and affected irrigation districts to explore the potential for releasing surplus water, when it is available, from Owyhee, Warm Springs and Beulah reservoirs, during the nonirrigation season, to benefit downstream resident fish resources.

(15) Bonneville shall fund the design, construction, operation and maintenance of a resident trout hatchery on the Colville Indian Reservation to partially mitigate for anadromous and other fish losses resulting from the construction and operation of the Chief Joseph Dam and Grand Coulee Dam hydroelectric projects. The Council expects that state-of-the-art technologies will be used in the design of the hatchery.

(16) 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 significantly affected 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 onsite or offsite mitigation. It is even arguable that in some cases resident fish have been enhanced by hydroelectric development.

Yakima River Basin



901. The Problem

Demand for irrigation water

The Yakima River Basin (Figure 9) is located east of the Cascade Range, where annual precipitation is very low. To allow agricultural crops to be grown in the basin, it has been necessary to construct a series of irrigation diversion dams, canals, and ditches. Three irrigation diversion dams also divert water for hydroelectric generation. Irrigation has changed the Yakima River Valley from a desert environment of low agricultural productivity to one of the most productive agricultural regions in the country. However, in a low water year, the demand for irrigation water for farming and ranching applications exceeds the water supply and storage capacity. Available water must be allocated among competing uses, and provision of sufficient streamflows to support anadromous and resident fish has received a lower priority. 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 coldwater fish species. In addition, irrigation return flows carry sediment and chemicals into the Yakima River. However, water quality problems such as this are secondary to those concerning water quantity. It is clear that additional water storage, or change in existing storage operations or water management functions, is needed in the Yakima River Basin to satisfy fish requirements while meeting other competing demands, particularly irrigation uses.

Need for additional storage

Outdated passage facilities

Another problem affecting anadromous fish in the Yakima River Basin is the condition of fish screens and passage facilities at the various irrigation and hydroelectric structures which control streamflows in the basin. Most of these structures are old, and the designs of fish screens and passage facilities are outdated by current standards. In some cases, such facilities are non-existent.

Despite the major problems that must be overcome, the Yakima River Basin is considered by most fishery experts to be one of the areas in the Columbia River Basin with the greatest potential for the production of anadromous fish.

902. Summary of Recommendations

Subject areas

A variety of recommendations were received that proposed offsite enhancement measures in the Yakima River Basin to compensate for the adverse effects of hydroelectric development and operations in the Yakima Basin and elsewhere in the Columbia River Basin. Subjects included passage facilities for juvenile anadromous fish, flows and facilities required for passage of adult anadromous fish, the use of proper hatchery releases to increase and improve the number of fish in the Yakima River Basin and its tributaries, and the flows required for resident fish protection. Fundamental to the successful implementation of all other recommendations is the recommendation that additional water storage be provided in the basin.

Additional storage

The fish and wildlife agencies and tribes recommended construction of the proposed Bumping Lake Enlargement Project so that additional storage would be available to mitigate the degradation of stream habitat for fish, increase the flexibility of water management in the basin, and allow additional power generation.

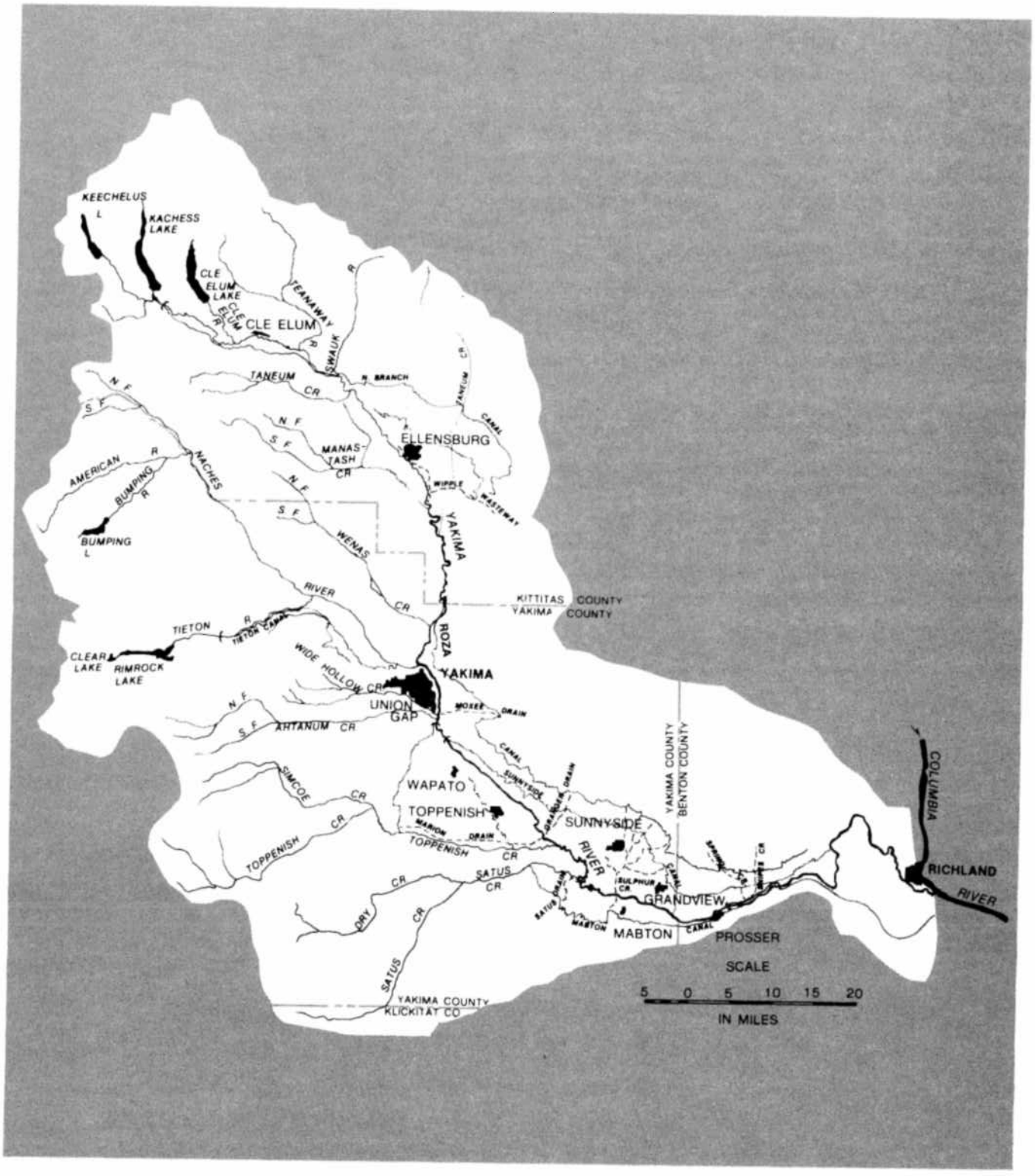
903. Council Response

The Council has adopted Yakima River Basin measures to mitigate hydroelectric impacts in the basin and to provide offsite enhancement to compensate for fish and wildlife losses caused by hydroelectric project development and operations throughout the Columbia River Basin.

Current 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 or change in existing storage

Figure 9.
Yakima River Basin



operations and/or water management practices. Although Bumping Lake has a long history of study and justification as a suitable site for added storage, several other sites also have significant potential. These sites are currently under investigation in a study being conducted by the Bureau of Reclamation and the Washington Department of Ecology. The Council believes that the results of this study should be considered in identifying the site or sites to be developed for additional storage.

The Council believes the primary purpose of additional water storage in the Yakima River Basin should be to provide sufficient flows to allow the rebuilding of anadromous fish populations and to protect resident fish. The U.S. Fish and Wildlife Service and the U.S. Bureau of Reclamation recently have concluded a comprehensive study to determine the flow requirements for anadromous fish. The results of this study will provide the Council with better information for the establishment of basinwide flows for anadromous fish protection. Results of the study will also provide a more detailed basis for determining the amount of storage necessary for fish flows, a key factor in basin water planning and selection of a storage site or sites.

Irrigation in the Yakima River Basin results in the loss of large volumes of water, primarily through transpiration, poorly maintained canals and ditches, and field flooding practices. In recent years water also has been used for frost protection of crops, a practice which appears to be gaining in popularity. There are other ways to irrigate which would use less water; for example, irrigation waters can be distributed through closed, pressurized systems. In addition, alternative allocation schemes, such as water banking, have been proposed. The Council proposes to adopt a policy of encouraging more efficient use of water in the basin.

Efficient water use practices

As discussed in Section 902, one of the purposes of the recommendation for additional storage was to increase flexibility in water management in the Yakima River Basin. The Council believes that when additional water storage is developed in the Yakima Basin, a major use of this water should be to protect, mitigate, and enhance the anadromous and resident fish and wildlife in the basin. Increased flexibility in water management is available through construction of reregulating dams. The Council endorses this method as a means to allow the additional stored water to be used for both agriculture and fish enhancement.

Reregulating dams

The Council adopts recommendations from the fish and wildlife agencies and tribes to correct structural problems at irrigation diversion dams, canals, and ditches that interfere with the passage of anadromous fish. (See map, Figure 10, at the back of this document.) The Council recognizes the critical importance of the Yakima River potential for natural propagation and as a system for releasing hatchery fish. Measures which would provide passage or protection in the lower Yakima River will receive priority. Once the lower river passage problems are solved, emphasis will be placed on the upper reaches.

Passage improvement

904. Measures: Anadromous and Resident Fish

(a) Additional Water Storage

(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 the U.S. Fish and Wildlife Service study of improved flows for anadromous fish [see Section 704(b)]. Based on this consultation and evaluation, the Council will develop measures that identify a site, or a combination of sites, and the amount of storage required. The Council believes that the 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.

Coordination

Site identification

Cost sharing

(2) The Council encourages all parties to use water in the most efficient ways currently available in order to satisfy the many needs in the Yakima River Basin, to take any interim steps which will improve the 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 such non-federal 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 the Water Supply Act of 1958, as amended (43 U.S.C. 390b), will promptly develop a water conservation plan which will contain definite goals, appropriate water conservation measures, and a time schedule for meeting the water conservation objectives.

(C) The Secretary of the Interior will enter into memoranda of agreement with those federal agencies having capability to assist in implementing water conservation measures to assure coordination of ongoing programs. 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 assure full public participation in water conservation efforts.

(b) Passage

Wapatox Dam

(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 shall be designed and operated to avoid unacceptable approach velocities.

Background. The existing screening devices and bypass system at Wapatox Dam are outdated. The screens are undersized in relation to the maximum flows experienced at the facility.

(c) Flows

Prosser Dam
Roza Dam
Wapatox Dam

(1) Upon approval by the Council, 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. The Council encourages Pacific Power and Light Company to work with the Washington Department of Ecology, fish 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 U.S. Fish and Wildlife Service flow study (see Section 904(a)(1)).

(2) Until the results of the U.S. Fish and Wildlife Service study are available, the Council will support the establishment of interim flows if the fish and wildlife agencies and tribes, especially the

Yakima Indian Nation, will identify specific flow control and monitoring locations and provide further information and data to the Council supporting 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, the Bureau of Reclamation, and fish and wildlife agencies and tribes.

(d) Natural Propagation

Roza Dam

(1) 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 faciities 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

(2) 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

(3) After consultation with the fish and wildlife agencies and 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.

(4) Upon approval by the Council, Bonneville shall fund the design and construction of the improvements listed in Table 3. All fish screening facilities shall meet current screening design standards.

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

(6) Upon approval by the Council, Bonneville shall fund a study to determine the feasibility of reestablishing 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.

(e) Artificial Propagation

(1) Bonneville shall fund design and construction of a hatchery for enhancement in the Yakima River Basin and elsewhere, in compliance with the requirements of Section 504 and in accordance with the appropriate measures in Section 704.

Table 3.
Fish Passage improvements to be implemented in the Yakima River Basin

PROJECT/RIVER	REQUIRED IMPROVEMENT
(A) Horn Rapids Diversion Dam	Two vertical-slot fishways Improved fish screening facilities
(B) Sunnyside Diversion Dam	Three vertical slot fishways Fish screening facilities on Sunnyside Diversion Canal and Old Reservation Canal
(C) Wapato Diversion Dam	Three vertical slot fishways Improved fish screening facilities on the Main Reservation Canal
(D) Easton Diversion Dam	Vertical slot fishway providing access and exit at all streamflows and having adequate attraction velocities Fish screening facilities on Kittitas Main Canal
(E) Snipes and Allen Canal	Fish screening and bypass facilities that will function efficiently at all flows
(F) Thorpe Mill Ditch	Fish screening facility
(G) West Side Ditch	Fish screening and bypass facilities
(H) Taneum Diversion Dam	Adult fish passage and fish screening and bypass facilities
(I) Naches/Cowiche Diversion Dam Naches River	Vertical slot fishway and counting facility
(J) Toppenish Creek Flood Control Project Toppenish Creek	Vertical slot fishway
(K) Toppenish Creek Diversion Dam Toppenish Creek	Vertical slot fishway Fish screening facility at headworks of Satus Main Canal
(L) Marion Drain Diversion	Fish screening facilities
(M) Stevens Ditch Naches River	Fish screening facilities

Wildlife

1001. The Problem

Habitat loss

The development of the hydroelectric power system in the Columbia River Basin has had far-reaching effects on many species of wildlife. Some floodplain and riparian habitats that were important to wildlife were lost through inundation when reservoirs were filled. Water level fluctuations from dam operations have in some cases led to 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 caused land and stream alterations which severely affect wildlife. These activities include construction of roads and facilities, draining and filling of wetlands, stream channelization, and shoreline riprapping. Finally, the construction and maintenance of transmission corridors in some cases has altered vegetation, increased access to and harassment of wildlife, and added to increased erosion and sedimentation in the Columbia River and its tributaries.

Beneficial effects

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

1002. Summary of Recommendations

The Council initially received recommendations concerning wildlife from the U.S. Fish and Wildlife Service, the Washington Department of Game, the Idaho Department of Fish and Game, and the Oregon Department of Fish and Wildlife (all of which were submitted through the Columbia Basin Wildlife Technical Committee), the Montana Department of Fish, Wildlife and Parks, and the Confederated Salish-Kootenai Tribes.

A number of these recommendations were for specific protection and mitigation measures to be implemented at various sites throughout the Columbia River Basin. The proposed measures included:

(A) Establishment of formal wildlife representation in all matters of power system planning, management, and operation;

(B) Establishment of a wildlife coordinator position;

(C) Development of comprehensive wildlife resource inventories of existing and future hydroelectric projects;

(D) Establishment of operational changes and wildlife management techniques at existing hydroelectric projects designed to avoid flooding of important islands; creation of subimpoundments not subject to fluctuation; regulation of water levels during critical wildlife use periods; creation and management of new waterfowl brooding areas; management of transmission corridors to produce more desirable habitat; and acquisition, development, and management of wildlife habitat for replacement of food, cover, and water needs;

(E) Development of measures for wildlife and habitat mitigation and enhancement programs; and

(F) Compensation for certain habitat lost in the past through offsite enhancement measures.

1003. Council Response

Wildlife coordinator

The Council has endorsed the recommendation of the wildlife agencies and tribes that wildlife representation be included in all matters of Columbia River power system planning, and has adopted program measures to ensure that representation. These measures include establishing a wildlife coordinator to act as a liaison between power and wildlife interests. Section 1304(c) requires the development of consultation and coordination procedures to ensure that wildlife representatives may participate in power system decisions that affect wildlife.

The Council has included program measures for additional research to document the effect of hydroelectric projects on wildlife and its habitat before implementing specific protection and mitigation measures at these projects.

Offsite enhancement

The Council also has included a number of measures for offsite enhancement. These measures call for acquisition of wildlife range lands to compensate for loss of such lands when the projects were developed. Recommendations for the protection of wildlife and its habitat from future hydroelectric development are addressed in Section 1200 of this program. Bonneville will complete memoranda of understanding with each of the four states of the region, in consultation with the wildlife agencies and appropriate tribes. These memoranda will specify the acts necessary to mitigate the effects of transmission systems on wildlife and its habitat.

The Council received several recommendations for additional investigation that may be needed to assess effects on wildlife from inundation, water level fluctuations, and land and stream alterations. These recommendations lacked the detailed background information needed to justify their funding at this time. The Council will support funding these recommendations when sufficient information is provided by the wildlife agencies.

In 1984 the Council amended this section to provide for an orderly transition between Bonneville funding of wildlife mitigation status reports and the implementation of mitigation projects by the responsible operators. The changes provide for Council participation in the process. The Council also provided new land acquisition criteria and added other hydroelectric projects in the Columbia River Basin to Table 4 for mitigation status analysis.

1004. Measures

(a) Wildlife Representation

(1) The Council will ensure, through compliance review and future measures, if necessary, that wildlife representation is included in all matters concerning the planning, management, and operation of the Columbia River power system where appropriate to provide equitable treatment for wildlife resources. In developing consultation and coordination arrangements pursuant to Section 1304(c) of this program, the federal project operators and regulators shall give particular attention to wildlife agencies when carrying out activities which affect wildlife and its habitat.

Wildlife coordinator

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

(b) Mitigation

Mitigation status report

(1) Upon approval by the Council, Bonneville shall fund a review and analysis of the status of past, present, and proposed future wildlife planning and mitigation programs at each hydroelectric project in the Columbia River Basin. This study 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 the 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 reports will provide the basis for developing the mitigation and enhancement plans provided for in the following measures.

Mitigation and enhancement plans for specific projects

(2) Upon completion of the mitigation status reports developed pursuant to 1004(b)(1), Bonneville shall initiate consultations, on each project or series of projects, among the appropriate fish and wildlife agencies, tribes, federal project operators and regulators, and Bonneville customers to discuss the need for and direction of further studies. The Council's wildlife coordinator will participate in all such discussions. If Bonneville and the Council's wildlife coordinator determine that the consultations, 1004(b)(1) reports, and/or 1004(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 Tables 4 and 5. These statements of wildlife and/or wildlife habitat losses 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 1004(b)(2) studies is expected to comply with the provisions of Section 1304(c).

(3) Upon completion of the 1004(b)(2) studies, the appropriate fish and wildlife agencies, tribes, Bonneville, and project operators for each project 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 upon these discussions, Bonneville shall fund the development of mitigation plans for each of these projects. The entity or entities preparing the plan shall document how the plan 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.

(4) Upon approval of the mitigation plans by the Council, Bonneville or the appropriate project operator shall fund implementation of the plans developed pursuant to 1004(b)(3) or those options for wildlife mitigation and enhancement projects agreed upon pursuant to 1004(b)(5).

(5) Should it be determined, either from consultation or from any planning stage throughout the 1004(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 process of developing mitigation status reports, loss statements, and plans for protection, mitigation or enhancement, followed by funding, is intended by the Council to provide a systemwide program for addressing the effects of development and operation of the Columbia River Basin hydroelectric system on wildlife. The Council, however, also recognizes the existence of ongoing wildlife programs, established by the U.S. Fish and Wildlife Service, state fish and wildlife agencies, and the tribes, as important in the protection of wildlife in the Columbia River Basin. Such programs will be identified by species and listed in the mitigation plans for protection, mitigation, or enhancement to permit any entity to manage its land in a voluntary fashion to support the Columbia River Basin program. By identifying specific programs in this fashion, the appropriate entity will be able to protect listed wildlife species.

(c) Transmission Systems

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

(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) A determination of the need for and level of mitigation at the project must be documented or agreed upon by the appropriate agencies, tribes, and project operators and the subsequent mitigation plan completed. This information should be developed from the process outlined in 1004(b);

(B) A plan for implementing the mitigation project must be developed. This plan must be based on the best available scientific knowledge. The plan also must show how the proposed mitigation project would be the most cost-effective alternative, while accomplishing the biological objectives of the mitigation plan developed in 1004(b)(3) and meeting the standards of Sections 4(h)(5) and (6) of the Northwest Power Act;

(C) Documentation that consultation and coordination activities have taken place pursuant to Section 1304(c)(2) of the Council's Fish and Wildlife Program must be completed; and,

(D) A detailed management plan for the proposed mitigation, which explains the participation, responsibilities and authorities of all parties involved, must be submitted. This plan also should include a schedule outlining the proposed mitigation activities, identify pertinent laws and regulations to be fulfilled, explain the operation and maintenance requirements associated with the measure, specify a biological objective for mitigation, and describe a plan for monitoring progress toward that objective.

(2) The Council will consider recommending approval of funding for the acquisition of suitable offsite or onsite wildlife habitat, or an appropriate alternative to acquisition, as protection, mitigation, and enhancement for wildlife impacts at appropriate projects listed in Tables 4 and 5. Such approval will be based on the results of Section 1004(b) reports, studies and plans and the process established in Section 1004(d)(1).

Table 4.
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1004(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 three-foot fluctuations in pool levels. Recent reports, such as U.S. Fish and Wildlife Service August 1982 report detailing the wildlife mitigation measures for impacts of the second powerhouse and the current report by the Corps of Engineers caused by power peaking of the impacts, should be the basis for developing future mitigation measures.
Dworshak	The effects on wildlife of the initial inundation and current project operation at Dworshak Dam shall be analyzed. In developing the 1004(b)(2) and (3) studies and plans for the Dworshak facility, the following concerns of 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 power operation on osprey and bald eagles downstream from Dworshak reservoir; **(C)** Evaluation of the impacts of hydroelectric power 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. All affected parties will coordinate when preparing the 1004(b) studies and plans to incorporate the results of these studies into the mitigation plan developed for the Dworshak facility. The wildlife loss study and mitigation plan for Dworshak will not commence until the mitigation status report 1004(b)(1) is completed.
John Day Dam	P.L. 89-298 passed by Congress in 1965 authorized the Corps of Engineers 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.
McNary Dam and McNary #2 Powerhouse	The Corps of Engineers and the U.S. Fish and Wildlife Service are currently evaluating the mitigation needs for the McNary #2 Powerhouse.
Hells Canyon Complex	The three dams 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 freeflowing 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 1004(b) process for the Hells Canyon Complex, the lead agency is expected to consult with the U.S. Forest Service in the Wallowa-Whitman National Forest and incorporate, if appropriate, the mitigation and enhancement opportunities benefiting wildlife at Kirkwood Bar and Pittsburg Landing.
Hanford Reach	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 the system operation and not to particular dams.
Grand Coulee Dam	Impacts to wildlife from the initial inundation and current water level fluctuations should be analyzed thoroughly. In developing the 1004(b)(2) and (3) studies and plans for Grand Coulee, the following concern of the Colville Confederated Tribes will be incorporated:

Table 4.
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1004(b) (Continued)

PROJECT OR AREA	COUNCIL CONCERNS
Grand Coulee Dam (Continued)	**(A)** Determine the wildlife and wildlife habitat lost on the Colville Reservation portion of FDR Lake as a direct result of habitat inundated by the construction of Grand Coulee Dam. All affected parties will coordinate when preparing the 1004(b) studies and plans to incorporate the results of this concern into the mitigation plan developed for Grand Coulee Dam. The wildlife loss study and mitigation plan for Grand Coulee Dam will not commence until the mitigation status report 1004(b)(1) is completed.
Columbia River Gorge (Corps Projects)	Upon completion of the 1004(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 onsite 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 1004(b).
Hungry Horse Dam	Evaluation of the probable effects on wildlife and wildlife habitat associated with the development of Hungry Horse Dam needs to be analyzed and corresponding management plans developed.
Kerr Dam	A comprehensive mitigation and enhancement plan to mitigate the effects on wildlife and wildlife habitat from the original construction and current operating procedures at the Kerr Dam needs to be completed. The study shall 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)** Losses in production and habitat requirements for waterfowl, bald eagles, furbearers, and osprey. In addition, the study shall evaluate the effects of water level fluctuations on waterfowl, bald eagle and deer habitat along the lower Flathead River. Study components on the Refuge Waterfowl Production Area shall be coordinated by the U.S. Fish and Wildlife Service, those on the north half of Flathead Lake by the Montana Department of Fish, Wildlife and Parks, and those on the south half of Flathead Lake and the Flathead River by the Confederated Salish-Kootenai Tribes. **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 704(b).
Clark Fork Projects	Evaluation of the effects, if any, on wildlife and wildlife habitat associated with the development of Hungry Horse Dam needs to be analyzed and management plans developed.

PROJECT OR AREA	COUNCIL CONCERNS
The Dalles, Rock Island, Rocky Reach, Wells, Wanapum, and Chief Joseph Dams; Mayfield/Mossyrock, Yale/ Merwin/Swift, Spokane, Boundary, Hills Creek, Cougar, Green Peter/Foster, Lookout Point, Ashton, Swan Falls, Bliss, Post Falls, Albeni Falls, Palisades, American Falls, Minidoka, Anderson Ranch, Cascade, Black Canyon, Priest Rapids, Ice Harbor, Lower Monumental, Little Goose, C.J. Strike, Lower Salmon Falls, Upper Salmon Falls, Thousand Springs, Shoshone Falls, Twin Falls, Idaho Falls, River Mill, Faraday, North Fork, Oak Grove, Stayton, Detroit/Big Cliff, Cabinet Gorge, Albany, Foster, Leaburg, Carmen, Trail Bridge, Dexter, Bull Run (PGE), Bull Run (Portland), Powerdale, Condit, Pelton, Pelton Reregulating, Round Butte, Upper Malad, Lower Malad, Chandler, Roza, Wapato, Dryden, Chelan, Little Falls, Long Lake, Box Canyon, Sullivan, Smith, Walterville, Bend, Cline Falls, Wallowa Falls, Rock Creek, and Baker projects.	Further analysis may be needed to determine if the mitigation which has been provided because of the initial inundation and current fluctuation in the water levels in the following projects is sufficient. Mitigation has been, or is currently being, implemented at Wells, Rocky Reach, Chief Joseph Units 16-27, Wanapum, Priest Rapids, and Albeni Falls. A mitigation study was completed on The Dalles project in 1981. Mitigation studies are in the final stages of development for the Yale, Merwin, and Swift projects. The Washington Department of Game is currently working with the licensee for the Mayfield and Mossyrock projects on developing a mitigation plan. Supporting information on the success of these mitigation plans should be submitted as part of the report called for in Section 704(b)(1).

Table 4.
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1004(b) (Continued)

PROJECT	
Hells Canyon Complex	Acquisition of suitable offsite wildlife range in the states of Idaho and Oregon near the Hells Canyon hydroelectric complex.
Libby Dam	Acquisition of suitable offsite wildlife range as mitigation for the remaining balance of 9,500 acres of an amount previously authorized by Congress.
Grand Coulee Dam	Acquisition of suitable offsite winter range near the Grand Coulee project. The number of acres to be acquired will be determined in the mitigation plan developed under Section 1004(b)(2).
Willamette River Projects	Acquisition of suitable onsite or offsite wildlife range for the four Willamette River projects. The number of acres to be acquired will be determined in the mitigation plan developed under Section 1004(b)(2).

Table 5.
Acquisition of Offsite Wildlife Habitat

Fish and Wildlife Committee

1101. The Problem

Research funding mechanism

In the past, many fish and wildlife research projects that assessed the effects of the hydroelectric system in the Columbia River Basin were funded by Congress and the non-federal project operators and regulators. In the future, Bonneville will provide a primary source of funding, and the Council will be responsible for planning and approving appropriate proposed research programs. Although past research often has been productive and has advanced the knowledge and understanding of fish and wildlife issues related to hydroelectric power generation in the basin, the Council is concerned about the lack of independent review of present procedures for authorizing and funding research projects.

A major concern of the Council is whether the federal project operators and regulators, or the fish and wildlife agencies and tribes can be fully effective in establishing priorities and designing research projects that can and will resolve conflicting objectives between fish and wildlife management and hydroelectric system operation. In fact, inherent within the existing funding mechanism is the potential for establishing research programs which underemphasize or overemphasize fish and wildlife objectives.

Coordination of research

The Council also is concerned that research on the existing fish and wildlife resources of the Columbia River Basin has not provided needed data in some areas, whereas in other areas of study there are substantial overlaps among the research programs. The fish and wildlife agencies and tribes have expended substantial efforts on many important fish and wildlife research projects. However, these projects have not been subject to critical evaluation, nor have they been coordinated and integrated sufficiently to achieve maximum benefits for fish and wildlife. Proper coordination and integration of research could improve the knowledge of fish and wildlife resources of the basin and result in a better understanding of measures necessary to protect, mitigate, and enhance those resources.

The Council must ensure that ratepayer money spent on research and other program measures will lead to actual improvements in protection, mitigation, and enhancement of fish and wildlife in the Columbia River Basin. To achieve that objective, the Council believes some measures in this program require further development prior to funding. The Council wishes to participate in that development process to help protect the ratepayers' interests and ensure equitable treatment of fish and wildlife.

1102. Summary of Recommendations

No specific recommendations were submitted which addressed the concerns described in Section 1101.

1103. Council Response

Establish Fish and Wildlife Committee

The Council is determined to ensure full implementation of this program, to improve the coordination of fish and wildlife research, and to ensure that such research is consistent with the fish and wildlife program. To accomplish this objective and to deal with the concerns described in Section 1101, the Council will establish a Fish and Wildlife Committee. The specific objectives of the Committee will be to accomplish the following:

(A) Develop short- and long-term research objectives;

(B) Review individual research proposals to ensure agreement of parties of interest on research design;

(C) Identify specific areas where data is needed;

(D) Improve coordination of fish and wildlife research by serving as a clearinghouse for such research;

(E) Evaluate contractor proposals and contracting procedures prior to funding program measures; and

(F) Review and oversee fish and wildlife program implementation.

1104. Measures

(a) Establishment of Fish and Wildlife Committee

(1) The Council will establish a Fish and Wildlife Committee. The Committee will consist of four Council members, one from each state in the region.

Relationship to Council

(2) The Committee will serve in an advisory capacity to the Council. All final decisions of the Committee must be approved by the full Council before implementation.

(b) Relationship of Fish and Wildlife Committee to Other Entities

Relationship to Bonneville

(1) Pursuant to the requirements of sections 4(h)(5)(A) through 4(h)(11) of the Act, Bonneville shall fund those program measures which 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, and 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 which it plans to conduct, and provide the Council an opportunity to comment on the design of such projects.

(2) The Council will negotiate an intergovernmental agreement with Bonneville to ensure an expedited review of all funding proposals in accordance with Section 1104(b)(1).

(c) Specific Duties and Functions of Fish and Wildlife Committee

Development of research objectives

(1) The Committee will develop research objectives to carry out this program. This effort will include the following:

(A) Assess past and present fish and wildlife research projects and determine their relationship to the Council's fish and wildlife program;

(B) Prepare a report on data needs or provide comments on the adequacy of such a report prepared by others;

(C) Prepare a research plan to be carried out over five years; and

(D) Provide the Council with information on the scope of work presented in each research proposal and on the proposed selection of contractors.

Monitoring programs

(2) The Committee will monitor the progress of the program and will report to the Council regularly regarding this program.

(d) Consultation Responsibilities of Fish and Wildlife Committee

Consultation with other entities

(1) The committee will encourage improved coordination of fish and wildlife efforts by consulting with the following:

(A) State and federal fish and wildlife agencies;

(B) Tribes of the Columbia River Basin;

(C) Federal project operators and regulators including Bonneville, the Corps of Engineers, the Bureau of Reclamation, and the FERC;

(D) Bonneville customers;

(E) State water management agencies;

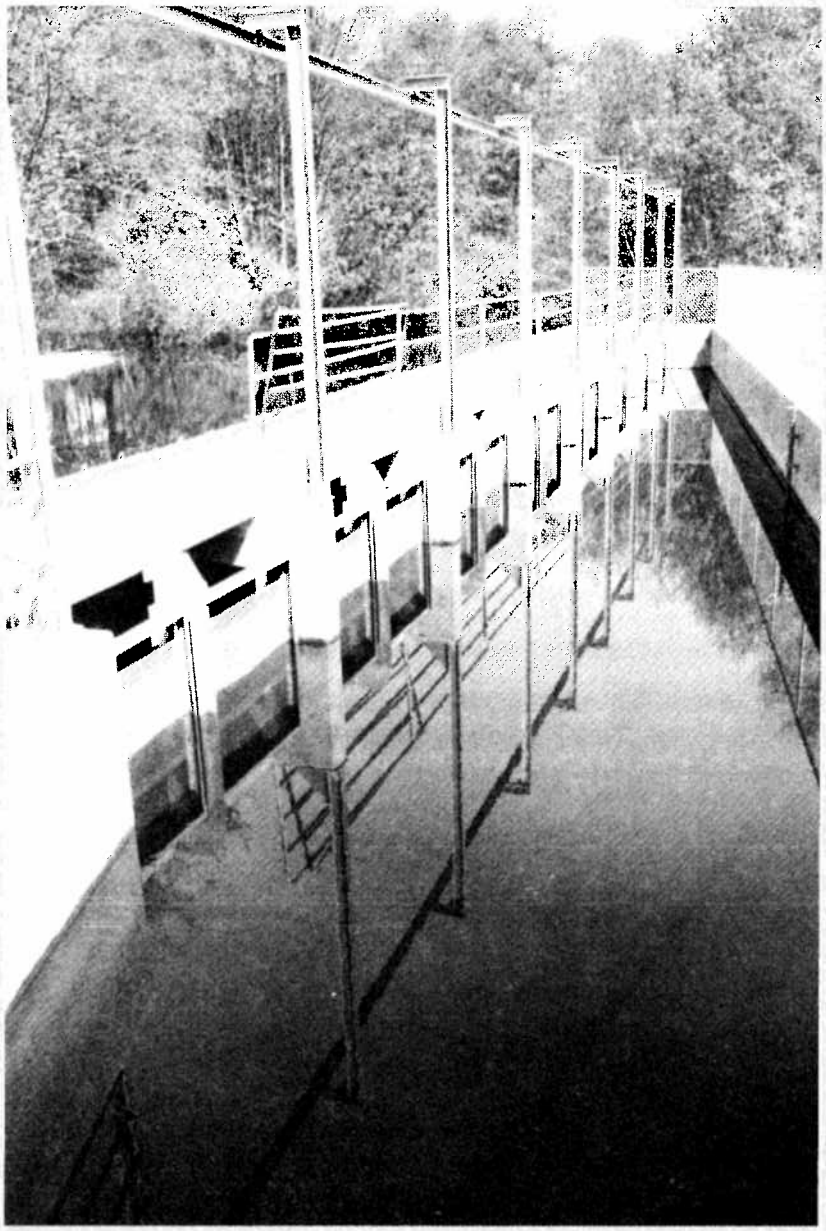
(F) Irrigation districts;

(G) Federal land management agencies;

(H) Fish and wildlife experts in the academic communities; and

(I) Interested citizen groups.

Future Hydroelectric Development



1201. The Problem

Fish and wildlife resources of the Columbia River Basin have been adversely affected by past hydroelectric development and could be harmed even more by future development. 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. The records of the Federal Energy Regulatory Commission (the FERC), which licenses non-federal hydroelectric development, suggest that most new hydroelectric development will be accomplished by private or non-federal public entities. The FERC has at least 400 applications pending for hydroelectric development in Idaho, Oregon, Montana, and Washington, and approximately 400 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. Twenty to fifty small to medium hydroelectric projects are proposed for tributary drainage basins which contain important anadromous fish habitat.

Applications pending

Many of the recent proposals are for small hydroelectric projects of less than 5 megawatts. Although individual 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 to migratory fish. At present, federal review procedures generally are limited to assessments of individual projects. Little or no consideration is given to the cumulative effects of such dams.

Cumulative effects

1202. Summary of Recommendations

Approximately 40 recommendations for anadromous fish, resident fish, and wildlife program measures call for Council influence over federal development and licensing of new hydroelectric development in the Columbia River Basin. In addition, the Columbia River Inter-Tribal Fish Commission submitted lengthy comments proposing a process to review proposed hydroelectric project development to help ensure that treaty rights are not violated.

Treaty rights

The recommendations proposed procedural and substantive standards designed to ensure that no new hydroelectric development takes place without consideration of cumulative effects and adequate mitigation of any adverse effects on fish and wildlife. A significant number of recommendations request that certain unaltered streams and priority wildlife habitat areas be protected from all hydroelectric development as compensation for the extensive fish and wildlife losses caused by hydroelectric development in the past. These proposals raise the question of whether the region can forego such development in the interest of fish and wildlife protection and still maintain an adequate, efficient, economical, and reliable power supply.

Protected areas

1203. Council Response

The Council agrees that future hydroelectric developers in the basin should be required to mitigate harm to fish and wildlife, and adopted program measures calling for such mitigation.

The Council also agrees that federal agencies should assess and mitigate cumulative effects of multiple hydroelectric projects on fish and wildlife. It appears that additional study is needed to design methods for assessing cumulative effects and incorporating such assessments into federal review processes.

Develop assessment methods

The Council further agrees with the concept of protecting some streams and wildlife habitats from all hydroelectric development. However, the Council will not adopt a permanent moratorium on hydroelectric development in any area until the Council, with review and participation by the fish

Fish and wildlife habitat

and wildlife agencies and tribes, has completed a study of alternative means for developing and protecting a system of critical fish and wildlife habitat areas throughout the Columbia River Basin. Recommendations for protective classification did not have the benefit of a standard set of systemwide criteria. This study would establish such criteria, taking into account the power supply trade-offs involved.

Council review

The Council also proposes regular Council review of applications for FERC permits and licenses and of Corps of Engineers and Bureau of Reclamation proposals for hydroelectric development. Such reviews would be designed to ensure that new development in the Columbia River Basin is consistent with the fish and wildlife program and the Council's regional energy plan. Reviews by the Council would complement and recognize, not supplant, the role of the fish and wildlife agencies and tribes in review of proposals for hydroelectric projects.

There are several new turbine intake screen designs that have been developed in recent years, but these screens have not been tested sufficiently to be characterized as proven, even though they have the potential for reducing costs as well as improving juvenile mortality. Responding to concerns about the available technology on turbine intake screen design, in 1984 the Council added a new measure to this section which provides for Bonneville funding of design studies for turbine intake screens. Installation and maintenance of currently available screening systems are expensive, and significant juvenile mortality can result from their use.

1204. Measures

(a) Conditions of Development

Fish resources

(1) The FERC, the Corps of Engineers, 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 or fish habitat losses through habitat restoration or replacement, appropriate propagation, or similar measures consistent with the provisions of Section 704;

(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 commences operation.

Wildlife resources

(2) The FERC, the Corps of Engineers, 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 all 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 defined in consultation with the 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 carrying 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 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 Section 1204(a)(1) and (2) will be accomplished or the reasons why the provisions cannot be incorporated into the project.

(b) Cumulative Effects

Consolidated review

(1) The federal project operators and regulators shall review all applications or proposals for hydroelectric development in a single river drainage simultaneously 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.

Methods of analysis

(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

Designation of critical habitat

(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 other requirements of the Act, the Council will designate stream reaches and wildlife habitat areas which 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 underway and 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

(1) 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

FERC applications

(1) The 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) The 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 is able to comment in a timely manner on the consistency of the proposed project with this program. This provision is not intended to supplant review of such applications by the fish and wildlife agencies and tribes.

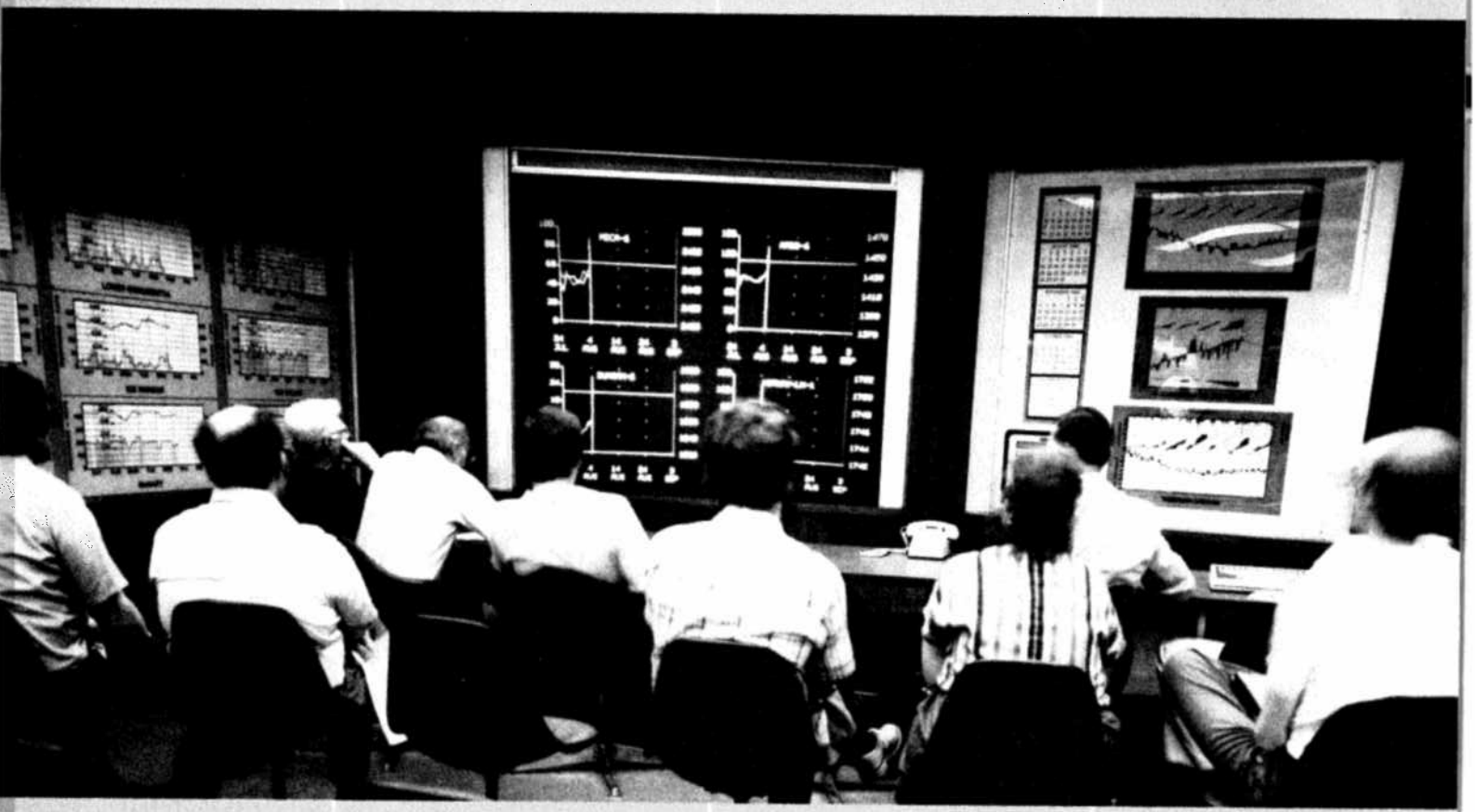
FERC exemptions

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

Federal project proposals

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

Coordination of River Operations



1301. The Problem

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 otherwise change their hydroelectric activities to accommodate the needs of fish and wildlife. Specifically, the Act requires Bonneville and the federal agencies which 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 shall provide "equitable treatment" to fish and wildlife by managing and operating water power projects to protect, mitigate, and enhance fish and wildlife while carrying out other purposes of these projects. Furthermore, they shall fulfill these responsibilities in consultation and coordination with the fish and wildlife agencies, tribes, and affected project operators.

Active role for Bonneville

The Act anticipates that Bonneville will play an active role in program implementation by requiring Bonneville 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 also shall 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 must be consistent with requirements of the Act, and the Council's program. Powers available to Bonneville include the authority to buy, sell, and exchange 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 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 incorporate this program and other requirements related to fish and wildlife.

1302. Summary of Recommendations

Program measures as hard constraints

The fish and wildlife agencies and tribes recommended that the Council characterize program measures as hard constraints on power system planning and decision-making, incorporate fish flow requirements into rule curves, and otherwise provide for incorporation of fish and wildlife requirements into power system decision-making. Another recommendation called for accommodation of fish and wildlife requirements in federal agency activities under the Columbia River Treaty and the Pacific Northwest Coordination Agreement. Recommendations also were received that addressed the need for coordination and consultation among the fish and wildlife agencies and tribes and the federal project operators and regulators. Still others requested the Council to ask the federal project operators and regulators to develop plans and schedules for implementing the program.

1303. Council Response

Need for procedural changes

The Council agrees with the fish and wildlife agencies and tribes that the Northwest Power Act requires changes in planning, operations, regulation, and other decision-making processes to implement this program and fulfill its fish and wildlife objectives. To address that necessity, it 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 consistently with the program when it signs contracts, grants billing credits, acquires resources, and takes other action pertinent to this program. The FERC is to initiate promptly appropriate proceedings to implement program measures at non-federal projects. All federal project operators

and regulators are to integrate program 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 requests them 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 it is not practicable to do so.

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. It also has included an explanation of what it means when it specifies that "Bonneville shall fund" a program measure "upon Council approval."

1304. 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 Act, including their obligation to provide equitable treatment to 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 constraints) into power system rule curves.

Bonneville

(3) With respect to Bonneville, the requirements of Section 1304(a)(1) and (2) shall apply to relevant decisions on contracts, billing credits, resource acquisitions, environmental cost/benefit analysis, 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 has decided to implement the program measures, or

(B) explanations, citing supporting information, why it will not be physically, legally, or otherwise practicable 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 the Council for review and comment prior to a final decision.

(b) Use of Canadian Storage Water

(1) 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 for 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)** The project operators and regulators.

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

(d) Maintenance Plans

(1) The federal project operators and regulators of each dam shall develop a plan for repair and maintenance of any part of each dam that relates 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 appear at a Council meeting and explain the reasons for such failure. The Council will decide upon appropriate action at that time.

(e) Bonneville Funding

(1) The Council expects Bonneville to initiate promptly appropriate proceedings 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) 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 which 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) In those instances in which the Council has specified in this program that "Bonneville shall fund" a program measure at a federal project, Bonneville immediately shall initiate discussions with the appropriate federal project operator and the Council to determine the most expeditious means for funding each such measure. 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. Amounts so allocated 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.

(3) 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.

(4) In selecting among alternative means for funding program activities on Indian reservations, Bonneville shall choose a means which 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 the Constitutional provisions, treaties, executive orders, legislation, regulations, and court decisions which 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.

Amendments

1401. The Problem

Dynamic process

Congress gave the Council one year to develop a program that would address the complex technical, legal, economic, and political problems associated with the effects of hydroelectric power development on fish and wildlife in the Columbia River Basin. The Council has developed a fish and wildlife program which it believes responds to these problems. The Council is aware, however, that this program is unlikely to please all interested parties or anticipate all implementation problems. The Council must be able to change the program as needed if the program is to be effective. 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.

1402. Summary of Recommendations

The Council did not receive any recommendations which addressed the potential need for program changes.

1403. Council Response

Resolution of concerns

The Council provided for amendment of the program through motion of the Council and on recommendation 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.

The Council believes that the program must be in operation for a reasonable time before its strengths and weaknesses become evident. To ensure that the recommended amendments are well-substantiated and clearly presented, the Council also has established requirements for applications to amend the program. The Council, on its own motion, may amend the program at any time.

Amendment process

Whether an amendment is proposed by the Council or recommended by another entity, amendments to the program must satisfy the criteria established by the Northwest Power Act, including the Act's requirements for public comment and consultation. The Council's amendment process also must accommodate the provision in section 4(g)(3) of the 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 regional energy plan, and the direction in section 4(h)(9) to act on recommendations within one year after their receipt.

In 1984 the Council changed the Fish and Wildlife Program amendment cycle to alternate with the Council's Power Plan amendments.

1404. Measures

(a) Council Motion

(1) 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 in Section 1404(b)(4).

(b) Applications for Amendment

Timing

(1) The Council will consider applications for program amendment on the schedule as specified in the Council's Power Plan. Applications for amendments to the program which have been submitted at any other time may be returned by the Council with a request for resubmission during the next review period.

Contents

(2) The Council will prepare application forms which specify the Council's requirements for information to amend the program. The application form will require the following items:

(A) A proposed amendment;

(B) A description of how the proposed amendment qualifies as a "recommendation" under section 4(h)(2) of the Act;

(C) A detailed description of how the proposed amendment would satisfy the standards of sections 4(h)(5) and 4(h)(6) of the Act, including:

(i) A description and analysis of all available scientific knowledge related to the proposed amendment;

(ii) An estimate of the costs, losses of power, and impact on rates, if any, which would result if the amendment were adopted; and

(iii) A plan and schedule for funding and implementing the proposed amendment.

(D) A verification of the truth of the facts stated in the application, signed by the person who prepared the application and the person authorizing the application; and

(E) 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.

Council action

(3) The Council will review and then propose action on each recommendation for amendment which has been accepted for consideration. In considering the recommendations, 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.

(4) 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.

(5) The Council will act on each recommended amendment within one year after its receipt.

(c) Recommendations for Amendment

(1) The Council will request recommendations for amendments to the fish and wildlife program from the fish and wildlife agencies and tribes prior to review or major revision of its regional energy plan. All the requirements of Section 1404(b) will apply to such recommendations, except that the time schedules may differ.

Five-Year Action Plan

1501. The Problem

Program implementation

As adopted in 1982, the Council's Columbia River Basin Fish and Wildlife Program contained more than 220 action items. It included deadlines for completion of some of those action items. Otherwise, it left the details of implementation to Bonneville, the other federal implementing agencies, and the fish and wildlife agencies and tribes. Unfortunately, those entities experienced difficulty in agreeing on the appropriate sequence for implementation, scheduling priorities, objectives, and mechanisms for measuring progress and evaluating results. Many of these issues continue to plague program implementation. Consequently, implementation of some measures has been delayed while interested parties debate priorities. Given the number of program measures and the complexity of their implementation and funding, designation of interim objectives and more definite scheduling direction clearly are warranted.

Scientific uncertainty

It also appears that the Council must develop a systematic means for articulating and addressing the problems of scientific uncertainty. Congress directed the Council to develop a program to protect, mitigate and enhance fish and wildlife on the basis of the "best available scientific knowledge." Unfortunately, the Indian tribes, state and federal fish and wildlife agencies, Bonneville and its customers, and the other federal project operators and regulators sometimes disagree in matters related to the scientific basis for action in the fish and wildlife arena. In some instances, these disagreements involve policy disputes over the pace of funding, the distributional impact of program actions, and other non-scientific matters. However, in other situations the "available" scientific knowledge is sparse or inconclusive. Moreover, the biological consequences of some aspects of the program are unclear in some respects. The challenge for the Council is to develop a means to identify consistently and apply the best available scientific knowledge and continue to promote an action-oriented program in the face of scientific uncertainty.

1502. Recommendations

Scheduling problems

In 1983, the Council received eight applications for amendment which addressed scheduling problems. They proposed changes in deadlines for a limited number of measures, but none proposed a comprehensive solution to scheduling problems. However, most parties agreed, during the comment period and consultations, that an action planning approach to program implementation is sound.

1503. Council Response

The Council has adopted a five-year action plan to provide scheduling direction for fiscal years 1985-1989. The Council has concluded that 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. It also changes some of the original program deadlines, in response to amendment applications submitted in 1983. Most dates in the original program 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 expects the implementing agencies to explore every avenue available to them to ensure that these schedules are met.

The action plan does not add new measures to the program or indicate that program measures not in the action plan should not be implemented. It is simply a schedule for implementation. Program measures which are 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, after giving first priority to action plan items. All measures will be implemented over time. The Council expects that program measures not in this action plan which require rescheduling will be brought to the attention of the Council, through the amendment process, when action on those measures is necessary.

Flexibility

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 which can be changed to accommodate new information, technological advances and unforeseeable problems, needs, and solutions identified in regular program monitoring and upon completion of the Section 201 goals study, the Section 1204 protected areas study, and other major planning efforts. For this reason, the Council plans periodically to review and update the action plan to ensure that the schedules remain feasible and reflect other changes in circumstances.

Sections 1400-1404 of the Council's program provide two ways for changing the program or the action plan based on new information and developments. First, the Council can change the program in the periodic amendment proceedings on the cycle specified in Chapter 11 of its Power Plan. Second, the Council may change the program on its own motion at any time, based on the recommendations of its staff or on the petition of any interested party. In either case, the Council would provide for public review and comment on the proposed changes. Both mechanisms will allow the Council to update and extend the action plan. The Council has concluded that it could amend the program, including the action plan, on its own motion, in less than 60 days, or even faster in the case of an emergency.

Primary Action Parties

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 100). The actions of those agencies must complement the activities of the fish and wildlife agencies and tribes which are 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.

Annual Work Plans

The action plan calls on Bonneville to develop work plans for habitat and passage restoration projects under criteria specified in Section 704(d) (action item 34.5). Work plans also are requested of Bonneville on hatchery effectiveness studies under Section 704(h) of the program (action item

34.23). All implementing agencies are to submit program work plans and budget evaluations for past and future activities to assist in the Council's overall evaluation of program effectiveness. (Section 1304(a) and (e), action item 39.2.) The form and content of work plans vary depending on the measure(s) or action item(s) but should be comprehensive in scope. The criteria identified in amended Section 704(d) should provide a guide for work plan criteria on other measures or action items. A program and budget work plan should include the implementing agency's rationale relative to funding one or more projects under a program measure or action item. The Council should be consulted whenever questions regarding work plans and evaluations arise.

Annual Reports

As part of this action plan, the Council has set a yearly reporting schedule for the major topics of emphasis in the next five years. The Council expects all pertinent implementing agencies to follow this schedule in submitting reports on and evaluations of implementation. The schedule will provide a regular means of reviewing the progress towards implementation. The reporting provisions of the action items reflect the following schedule:

Yearly Reporting Schedule*

SUBJECT	MONTH DUE
Mainstem Passage	January
Harvest Controls	April
Wildlife	April
Resident Fish	May
New Hydro Development	June
Hatcheries/Reprogramming	July
Habitat and Passage Improvement/Research	October
Water Budget	November

As part of this reporting, the Council expects the fish and wildlife agencies and tribes to evaluate progress as well. Annual reports from project operators will be made available to interested parties including members of the public. The availability of the reports will be announced in *Energy News*, a Council publication. The objective for the next five years will be to develop this process fully and to establish it as a regular means of evaluation. As a starting point, the reports should:

- Explain the relevancy of actions, research or development to specific fish and wildlife program measures as well as the interrelationship to other program measures.
- Provide a technical review of results to date.
- Describe the degree of program measure fulfillment and necessary further actions.
- Demonstrate interagency and tribal coordination efforts and those required to complete the program measure.
- Describe methods for determining the effectiveness of actions taken, research or development completed and the applicability of knowledge gained to future implementation.
- Describe methods used to ensure adequate and independent technical review of research and development designs, as appropriate.

*Since these amendments were adopted in October 1984, those annual reports due between October 1984 and January 1985 will be due in January 1985. The above schedule will then be followed after January 1985.

Adaptive Management

Learning by doing

The Council intends to clarify the responsibility to develop the program on the basis of the best available scientific knowledge by adopting a policy of adaptive management. Adaptive management is learning by doing. Faced with scientific uncertainty, the region should act affirmatively to protect and enhance fish and wildlife affected by hydroelectric development. However, such action must not be precipitous. Instead, action should be based on careful design so that information useful in guiding future action can be gained. In particular, measures affected significantly by scientific uncertainty should be designed, where possible, as experimental probes of the natural system so that monitoring can test the effectiveness of measures as quickly and unambiguously as the natural system permits.

Scientific policy

Adaptive management is a scientific policy. It expresses a conscious effort to improve fish and wildlife management, using elements of this program as experiments that can return valuable information not otherwise obtainable. Adaptive management is not a rationale for acting without scientific justification; nor is it a rubric within which any measure can be labeled "experimental" in the sense that other measures should be delayed pending the results of actions already underway. Adaptive management explicitly states a bias toward taking action for protection and enhancement, but it is not a substitute for meeting the legal, economic, and coordination requirements of the Northwest Power Act and this program.

Consultation with scientific community

The Council is mindful that a scientifically sophisticated approach to implementation will require extensive consultation, review by the scientific community, and appraisal of the utility of adaptive management within each of the program's principal sections. In light of the basinwide effort to develop program goals under Program Section 201, the Council intends to carry out detailed planning which addresses adaptive management principles as part of the process of achieving goals. As a result, adaptive management will be incorporated in detail into the program only after full public review in a formal amendment process.

Workshop

The Council also intends to sponsor a workshop in fiscal year 1985, to which representatives of the scientific and resource management communities will be invited. The workshop should help develop a strategy for integrating adaptive management principles into the program, identify sections and measures that offer important learning benefits to the program as a whole, and provide guidance to the Council on the practicality of adaptive management as an implementing philosophy.

Evaluations

Program related research
Need for evaluative systems

The provisions for project evaluations were included in the action plan to provide the Council with information for decision-making relative to ongoing research. The relationship between the presently funded research under measures identified in action item 39.1 and the program is not well understood. In an effort to define this relationship and future research objectives the Council is calling for (1) continuation of ongoing work under these measures, (2) evaluations which will address the relationship to program objectives and future research needs, and (3) no new project starts by federal implementing agencies until the Council identifies future research needs appropriate under the program and the Northwest Power Act.

At the present time some implementing agencies either lack such a comprehensive evaluation and reporting process or internalize it. This section is intended to encourage the development of a comprehensive analysis of research projects being undertaken as part of the program. The analysis not only should address the technical merits of the research project but also should focus on the relation between the federal implementing agency's program, the action plan, and the Fish and Wildlife Program. Research data and results should be in a form that allows independent evaluation.

Interim Goals and Objectives

Goal 1: Increase the quantity and quality of salmon and steelhead produced in the Columbia River Basin.

The Council has adopted an action plan which reflects the Congressional expectations that this program will emphasize prompt action over unnecessary study and delay. The Council has included five-year action items from the anadromous fish, resident fish, and wildlife sections of the program. However, it will give preference in the next five years to anadromous fish measures, in light of the jeopardized state of salmon and steelhead stocks and their special social and economic importance to the region and the nation. See 16 U.S.C. 839b(6). As a result, the primary goal of the five-year action plan is to direct action on those measures which are most likely to increase the number and quality of salmon and steelhead produced. The Council believes that goal can best be accomplished by selecting action items that meet the following objectives:

Anadromous fish preference

Improve survival at mainstem hydroelectric facilities.

Mainstem survival clearly is a key objective of the Northwest Power Act, which specifically directed the Council to adopt program measures which provide for "improved survival of [anadromous] fish at hydroelectric facilities. . . ." 16 U.S.C. 839b(h)(6)(E)(i). Mainstem passage plans and improvements also are crucial to the success of all program measures. Without those improvements, the benefits of offsite and tributary work will be diminished or nullified. Because many of these improvements entail major capital expenditures, timely budgeting will be the main challenge.

Mainstem passage improvements

Provide mainstem flows.

This objective also matches a key provision of the Northwest Power Act which calls for program measures to provide "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." 16 U.S.C. 839b(h)(6)(E)(ii). By proposing this set of action items, the Council restates its commitment to the Section 300 Water Budget measures as a keystone to program success.

Water Budget flows

Increase systemwide production capability through a selective mix of offsite enhancement measures.

These action items respond to Congressional direction to the Council to develop a "systemwide" program which includes offsite enhancement as compensation for hydropower-related losses (such as the loss of habitat above Grand Coulee Dam). It also would help avoid the historical emphasis on lower river enhancement to the detriment of upriver fishing.

Increase systemwide production

The primary ways to increase systemwide production capability are through: 1) habitat and passage restoration, to increase natural and wild production on major tributaries; 2) new hatchery construction; 3) improvements at existing hatcheries by correcting problems, such as disease, associated with hatcheries; and, 4) reprogramming lower river hatcheries by changing the timing and locations for release of hatchery-propagated fish into rivers and streams, especially in the upper basin areas.

The Council believes that all four types of actions should be pursued vigorously in the next five years because no single type of action alone may be sufficient to slow the declines of the fish runs. In addition, a multi-faceted approach to increasing production capability in the next five years makes sense from a planning point of view, for several reasons. First, habitat and passage restoration must begin now to prepare for increases in mainstem survival which should result from

mainstem passage improvements and Water Budget flows. Second, hatcheries require a long lead time to allow for siting, design, engineering and financing, as well as construction. Finally, control of fish disease, like human disease, may require long-term research to determine causes and cures.

Goal 2: Protect the ratepayer investment in the program.

At the same time that the Council supports an aggressive restoration program, it continues to recognize the importance of ensuring that ratepayers' expenditures for fish and wildlife measures are well spent. To that end, the Council proposes five-year action items which will help protect the ratepayer investment.

Mainstem passage improvement

Improvement in mainstem passage to protect juvenile outmigrants is one major area of emphasis in this action plan. If survival of juveniles can be improved steadily over the next five years above present levels, adult returns also should improve. Expenditure in hatchery production, outplanting programs, offsite enhancement, and habitat passage restoration in tributaries represent major expenditures by the ratepayers in restoration of upriver runs. This investment must be protected, especially at mainstem projects, in order to assure an acceptable rate of return.

Establishment of goals

Key to that objective is establishment of anadromous fish goals based on the extent of losses attributable to the hydropower system. Such an effort would reflect statutory directives to define the scope of the program within the limits of hydropower system liability. 16 U.S.C. 839b(h)(5), (8), (10). It would respond to Section 201 of the program.

New hydro development license conditions

Another important way to protect the ratepayer investment is to ensure that new hydroelectric development is conditioned from the beginning to protect salmon and steelhead, resident fish and wildlife. That objective is central to the Council's Power Plan, as well as its Columbia River Basin Fish and Wildlife Program. It responds to the Congressional directive to devise a program which "protects" as well as "enhances" and "mitigates." It also responds to the preference, in the Council's power plan, for orderly planning and development of hydroelectric projects which will avoid adverse fish and wildlife impacts.

Improve harvest controls

The Council also believes that improving harvest controls to increase salmon and steelhead returns to the Columbia River Basin is essential to protection of the ratepayer investment. This objective reflects continuing concern that enhancement expenditures in the basin will benefit inadequately controlled ocean fishing as long as there is no interception agreement between the United States and Canada, along with other indicators of adequate harvest controls. Initiation of electrophoresis and known-stock fisheries studies under the program is an attempt to remedy this problem.

Improved reporting and evaluation

In response to ratepayer concerns, the Council also proposes development and refinement of mechanisms for reporting on and evaluating the effectiveness of program measures. Evaluation and reporting mechanisms already are included in some program measures (such as the Water Budget). The Council proposes to expand this important concept by calling for prompt evaluation of ongoing activities, such as research and other studies, to determine their contribution to program effectiveness, and by establishing a regular schedule for reporting progress in each of the key areas of action. Annual work plans are requested from federal implementing agencies for habitat and passage restoration projects and artificial production projects. Further development of the adaptive management concept may lead to an integrated, comprehensive evaluation of funded activities.

Wildlife and Resident Fish

The action plan addresses the need to protect, mitigate and enhance wildlife, to the extent that they are affected by hydroelectric operation and development, by establishing a basis for proceeding with mitigation planning, starting mitigation where it is clearly indicated, and continuing to call for conditions on new hydroelectric development to avoid adverse effects on wildlife.

In the resident fish area, the action plan proposes action where conflicts with anadromous fish goals would be nonexistent or inconsequential, where significant biological gains can be achieved, and where there is a clear link to the effects of hydropower development and operation. The action plan calls for particular emphasis on resident fish measures in Montana and the upper Columbia River (Colville Reservation) where no conflicts with anadromous fish arise. 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 other program measures. Cross-references to the complete program measures are provided at the end of each action item. Reference to the complete measure is needed for a full understanding of the action expected. The action item numbering starts with 32, where the Power Plan's action items end.

1504. Action Items

32. Mainstem Passage

This section outlines a process for improving adult and juvenile passage at mainstem hydroelectric projects through use of spill, mechanical bypass systems, fishway operating procedures, and other actions. During the next five years, particular emphasis must be placed upon actions which 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 Actions

32.1 Test and evaluate an alternative conduit system for juvenile fish by November 15, 1986. Report results to the Council by January 1987. [Section 404(c)(3).]

Corps Actions

32.2 All projects.

- Develop and implement a coordinated systemwide annual juvenile passage plan to achieve at least a 90 percent smolt survival level at each project. Include estimates of fish bypass efficiencies and smolt survival for each project and for the system. Submit the plan to the Council by February 15 and implement it by April 1 of each year. [Section 404(b)(1)-(9), (16)-(17).]

- Continue to implement adult fish criteria and evaluate measures to protect adult passage at each project. [Section 604(a)(1), 604(a)(2), 604(a)(3), 604(b)(1), 604(b)(2).]

- Submit a draft comprehensive transportation evaluation report and proposal for further action to the Council by March 1985. Submit a final report, incorporating a review of comments, to the Council by May 1985. [Section 404(b)(17).]

- Present an annual report to the Council each January on each project's fish passage facilities, research results, and operations. Include proposals for future actions to improve fish passage facilities. [Section 404(b)(1)-(9), 604(a)(1)-(3).]

32.3 Bonneville Dam

- Develop and submit to the Council a coordinated interim juvenile passage plan by February 15, 1985. Implement the plan by April 1, 1985, and annually thereafter until problems with juvenile fish passage efficiency at the second powerhouse are resolved. [Section 404(b)(5).]

- Evaluate effectiveness of screens and bypass at both powerhouses. Report results to the Council by January 1986. [Section 404(b)(5).]

- For Bonneville Dam second powerhouse, develop a report on the feasibility and cost of all alternatives, including forebay excavation, and a work schedule for timely completion of all needed improvements to achieve 85 percent juvenile fish passage efficiency. Submit to the Council by January 1986. [Section 404(b)(5).]

32.4 The Dalles Dam

- Develop and submit to the Council a coordinated interim juvenile passage plan each year by February 15. Implement the plan by April 1 each year until a bypass system is installed. [Section 404(b)(4).]

- Complete biological and prototype testing by September 30, 1985, and report test results to the Council. [Section 404(b)(4).]

- Develop and submit to the Council a permanent juvenile passage plan, including estimated costs and installation schedule of a bypass system, by July 31, 1986. [Section 404(b)(4).]

- Complete the design and installation of a juvenile bypass system by the end of fiscal year 1989. [Section 404(b)(4).]

- Install a vertical slot counter at the east fishway by November 1985. [Section 604(b)(3).]

- Install a vertical slot counter at the north fishway by November 1989. [Section 604(b)(3).]

32.5 John Day Dam

- Develop and submit to the Council a coordinated interim juvenile passage plan by February 15, 1985. Implement the plan by April 1, 1985. [Section 404(b)(3).]

- Complete installation of juvenile bypass system by March 30, 1986. [Section 404(b)(2).]

- Evaluate the effectiveness of the juvenile bypass system, beginning with a partially completed facility in 1985. Report the results of annual research with proposals for improvements to the Council by January of each year. [Section 404(b)(2).]

- Complete investigation of adult passage delays. Report to the Council by January 1986 with proposals. [Section 604(a)(5).]

32.6 McNary Dam

- Continue to evaluate and upgrade juvenile bypass system. Report results of annual research with proposals for improvements to the Council by January of each year. [Section 404(b)(1).]

32.7 Ice Harbor Dam

- Develop and submit a coordinated interim juvenile passage plan to the Council each year by February 15. Implement the plan by April 1 each year until a bypass system is installed. [Section 404(b)(9)(A).]

- Complete biological and prototype testing by September 30, 1985, and report test results to the Council. [Section 404(b)(9)(C).]

- Complete smolt injury and mortality study by September 30, 1985, and report study results to the Council. [Section 404(b)(9)(B).]

- Develop and submit to the Council a permanent juvenile passage plan, including estimated costs and an installation schedule for a bypass system, by July 31, 1986. [Section 404(b)(9)(D).]

- Complete design and installation of juvenile bypass system by the end of fiscal year 1989. [Section 404(b)(9).]

32.8 Lower Monumental Dam

- Develop and submit to the Council an annual coordinated interim juvenile passage plan by February 15. Implement the plan by April 1 each year until a bypass system is installed. [Section 404(b)(8)(A).]

- Complete biological and prototype testing by September 30, 1985, and report test results to the Council. [Section 404(b)(8).]

- Develop and submit to the Council a permanent juvenile passage plan, including estimated costs and an installation schedule for a bypass system, by July 31, 1986. [Section 404(b)(8)(B).]

- Design and install a powerhouse collection and bypass system by the end of fiscal year 1989. [Section 404(b)(8).]

32.9 Little Goose Dam

- Evaluate an open flume as an alternative to a pressurized fish transport conduit in the design of scheduled bypass system improvements. Coordinate the study with Bonneville and complete it in fiscal year 1985. [Sections 404(c)(3), 404(b)(7).]

- Continue to evaluate and upgrade the juvenile bypass system. Report progress to the Council with proposals for improvements by January of each year. [Section 404(b)(7).]

- Complete installation of juvenile bypass system modifications by the end of fiscal year 1987. [Section 404(b)(7).]

32.10 Lower Granite Dam

- Continue to evaluate and upgrade juvenile bypass system. Report progress to the Council with proposals for improvements by January of each year. [Section 404(b)(6).]

FERC Actions

32.11 Grant County Public Utility District (PUD) — Priest Rapids/Wanapum Dams

- Continue short-haul transport research in fiscal years 1985 and 1986 at Priest Rapids. Report to the Council on study design and progress by January of each year. [Section 404(a)(4), (5).]

- Determine spill effectiveness at Priest Rapids by use of hydroacoustics. Report results of the studies conducted in 1983 and 1985 by January 1986. [Sections 404(a)(3) and (10).]

- Develop a prototype intake deflection screen at Priest Rapids Dam. Conduct prototype tests in 1986. Report results by January 1987. [Section 404(a)(3).]

- Report results of spill effectiveness tests at Wanapum Dam to the Council by January 1985. [Sections 404(a)(3) and (10).]

- Develop an analysis of bypass alternatives and schedule for intake deflection screen installation at Priest Rapids and Wanapum dams. Report on analysis, results and progress annually to the Council in January. Complete and submit schedule by July 1987. [Section 404(a)(3).]

- Evaluate short-haul transport versus turbine bypass collection test results. Coordinate with the fish and wildlife agencies and tribes to report annually to the Council. [Sections 404(a)(4), (5), (8), (9).]

- Install permanent juvenile bypass systems by March 20, 1988, at Priest Rapids and Wanapum dams. [Sections 404(a)(3)-(9).]

32.12 Chelan County PUD — Rocky Reach/Rock Island Dams

- Continue design and modeling studies at Rock Island Dam to determine the most effective bypass system. Report results to the Council by January 1986. [Section 404(a)(2).]

- Develop an analysis of bypass alternatives and schedule for an intake deflection screen 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 1986. [Section 404(a)(2).]

- Report results of spill effectiveness tests to the Council by January 1985. [Sections 404(a)(2) and (10).]

- Report results of bypass prototype testing and evaluation for Rocky Reach Dam by October 15, 1985. [Section 404(a)(2).]

- Install permanent juvenile bypass system at Rocky Reach Dam by March 20, 1987. [Section 404(a)(2).]

32.13 Douglas County PUD — Wells Dam

- Report results of spill effectiveness tests by January 1985. [Section 404(a)(10).]
- Report results of 1984 prototype juvenile passage test to the Council by January 1985. Include work plan for further testing. [Section 404(a)(1).]
- Install permanent juvenile passage modifications by March 20, 1987. [Section 404(a)(1).]

32.14 All Mid-Columbia Projects (Grant, Chelan and Douglas PUDs)

- Develop and implement annual juvenile passage plans in accordance with the terms of Program Section 404(a)(10). Report to the Council by January of each year. [Section 404(a)(10).]
- Develop and implement adult fishway operating criteria. Report progress to the Council by January 1985 and annually thereafter. [Section 604(a)(1), 604(a)(2), 604(b)(1).]
- Continue to evaluate adult fish counts as needed. Report to the Council by January of each year. [Section 604(d)(1).]
- Prepare and present an annual report on passage, survival and fish protective measures at each project in January of each year. [Section 404(a)(10).]
- Consult and coordinate with all interested parties on all mid-Columbia passage flow and spill measures. [Section 404(a)(11).]

32.15 Portland General Electric

- Report on the Willamette Falls adult trap program to the Council by March 1985. If modifications are required, initiate a design phase so that construction can commence no later than July 1986, and the project can be completed for the 1987 adult runs. [Section 604(c)(1).]

32.16 Portland General Electric

- Complete juvenile bypass system studies at Marmot Dam and Sullivan and propose corrective action on or before November 15, 1986. [Section 404(b)(10), 404(b)(11).]

32.17 Pacific Power and Light

- Operate the Albany facility on Lebanon Canal according to existing agreements and license requirements unless changes in operation or juvenile bypass systems are required. [Section 404(b)(13).]

32.18 Eugene Water and Electric Board

- Report to the Council on the installation and operation of the best available juvenile bypass system at the Leaburg Canal facility by November 15, 1984. Complete additional changes or modifications to this facility by November 15, 1987. [Section 404(b)(14).]

32.19 Eugene Water and Electric Board

- Report to the Council on juvenile migrant bypass facilities studies at the Walterville Canal power project by November 15, 1984. Install facilities by November 15, 1986. [Section 404(b)(15).]

33. Water Budget and Other Mainstem Flows

Implementation of the Water Budget is underway 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 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. A long-range goal is to provide necessary information for use in determining if and to what degree 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 help resolve disputes.

Bonneville Actions

33.1 Continue to implement Water Budget measures, including funding of Water Budget managers and tribal coordination expenses. [Sections 304(a)-(c).]

33.2 Continue to fund research and monitoring. Report on activities by November of each year. [Section 304(d).]

Water Budget Managers' Actions

33.3 Provide an annual report by November 1 of each year. Provide a research and monitoring plan, noting the availability of test fish, by December 1 of each year. [Sections 304(c), 304(d).]

Corps Actions

33.4 Continue to implement Water Budget measures and coordinate with Water Budget managers. [Sections 304(a)-(c).]

33.5 Provide a report to evaluate 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 1985. Report to the Council on all items by November 1988. [Sections 304(a)(6) and 704(b)(14)(A),(B).]

Bureau of Reclamation Actions

33.6 Continue to implement Water Budget measures. [Sections 304(a) and (c).]

33.7 Provide report to the Council by November 1988 to evaluate feasibility of constructing new reservoirs and using uncontracted stored water to provide improved Water Budget flows, particularly in the Snake River Basin. [Sections 704(b)(14)(b)-(c).]

FERC Actions (Mid-Columbia PUDs)

33.8 Provide suitable flows for spawning, incubation and rearing of fall chinook salmon at mid-Columbia projects. Complete flow studies, develop instream flow plan, implement the plan and report results to the Council. [Sections 704(b)(1)-(4).]

Council Actions

33.9 Continue to evaluate Water Budget reports and to help resolve Water Budget disputes. [Section 304(e)(1).]

34. Production Capability

In the next five years the Council expects to see the production capability of the basin improve through a mix of offsite 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 or are not subject to substantial ocean harvest, such as Upper Columbia spring chinook and Snake River summer chinook, steelhead and sockeye. It is anticipated that the Council will play a more active role in defining the adequacy of harvest controls and, through the results of the 201 goals study, in helping establish production goals throughout the basin.

To provide a mix of measures, the following program areas will be emphasized: 1) habitat and passage restoration, 2) new hatchery construction, 3) improved production practices at existing hatcheries, and 4) development of cooperative hatchery reprogramming. The Council expects Bonneville to initiate evaluation of all of the ongoing research projects, in coordination with the fish and wildlife agencies and tribes.

Habitat and Passage Restoration

Bonneville/Bureau Actions

34.1 Complete construction of juvenile fish passage facilities at Roza Dam by March 1, 1986. Complete construction of adult facilities by December 1, 1986. [Section 904(d)(1).]

34.2 Complete construction of juvenile fish passage facilities at Prosser Dam by March 1, 1986. Complete construction of adult facilities by December 1, 1986. [Section 904(d)(2).]

34.3 Complete construction of all Yakima River fish passage improvements listed in Table 3 of Section 904(d)(4) by December 1, 1987. Perform post-construction evaluations to determine the success of passage improvements. [Section 904(d)(4).]

Bonneville Actions

34.4 Design fishway and bypass for Ellensburg Town Diversion Dam by October 1987 and complete construction by October 1988. [Section 904(d)(5).]

34.5 Develop an annual work plan for submission to the Council by September 15 of each fiscal year for implementation of Section 704(d). Prepare and submit, to the Council, an annual report on activities in October. (For fiscal year 1985, Bonneville is expected to submit this work plan by January 15, 1985.)

Bureau Actions

34.6 Provide minimum flows for fish in the Yakima Basin and report by October of each year to the Council on the status. [Section 904(c)(1), 904(c)(2), and 904(c)(3).]

34.7 By January 1985 and annually thereafter, prepare and submit a report of the investigations on the feasibility of new storage to provide instream flows for anadromous fish. [Section 704(d)(2)].

FERC Actions

34.8 Provide for construction of passage facilities at Condit Dam by November 15, 1986. [Section 704(d)(3).]

Council Actions

34.9 Consult on water conservation, storage, and flows in the Yakima Basin on a regular basis. [Sections 904(a) and (c).]

34.10 Continue monitoring of passage work under Section 904(d).

Artificial Production

Bonneville Actions

34.11 Operate and maintain juvenile release and adult collection and holding facilities on the Umatilla Reservation. [Section 704(i)(1).]

34.12 Submit siting, feasibility and preliminary design for a Umatilla steelhead hatchery to the Council by July 1986. Upon Council approval, fund construction of expansion. [Section 704(i)(1).]

34.13 John Day acclimation facility

- Upon approval by the Council of the plan prepared by the fisheries agencies and tribes (34.20), complete construction of temporary facilities by spring 1986. [Section 704(i)(2).]

34.14 Yakima Hatchery

- Upon approval by the Council of the master plan (34.21), fund design beginning in FY 1986. [Section 704(i)(3).]

- Fund construction of hatchery and associated facilities upon completion of design. [Section 704(i)(3).]

34.15 Complete hatchery survey and report to the Council by October 1985. [Section 704(f)(1).]

34.16 Report on the status of studies to develop low capital production facilities by July 1985. Fund no more studies under this measure prior to report. [Section 704(j)(1).]

34.17 Design low capital production facility on the Nez Perce reservation and initiate construction by May 1985. [Section 704(j)(2).]

34.18 Fund the habitat survey associated with Action Item 34.17. [Section 704(e)(1).]

34.19 Prepare and submit to the Council an annual report on hatchery and other artificial production facilities in July. [Section 704(f), (h), (i), (j).]

Fish and Wildlife Agencies and Tribes

34.20 John Day acclimation facilities

- Provide the Council with a plan for design, construction, and monitoring of John Day acclimation ponds by April 1985. [Section 704(i)(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 704(i)(2).]

Council Action

34.21 Begin development of a master plan for a Yakima hatchery and associated facilities in fiscal year 1985. [Section 704(i)(3).]

34.22 Review and evaluate work plans and progress reports associated with action items above. [Section 1304(a)(5).]

Improved Hatchery Effectiveness

Bonneville Actions

34.23 Evaluate ongoing work under 704(h) and submit a work plan to the Council for future efforts by October 1985. [Section 704(h)(2).]

34.24 Submit a work plan for funding supplementation studies by October 1985. [Section 704(k)(1).]

34.25 Fund the Willamette Basin Study Plan. [Section 704(k)(2).]

Council Action

34.26 Complete study to aid development of research objectives by end of fiscal year 1985. See Action Item 39. [Section 1104(c)(1).]

Development of Cooperative Reprogramming

Bonneville Actions

34.27 Fund an evaluation of hatchery fish release sites and levels of release compatible with natural propagation and harvest management by October 1985. [Section 704(g)(1).]

34.28 Upon approval of a reprogramming plan, fund hatchery releases in the upper Columbia to assist in restoring naturally spawning stocks. [Section 704(g)(2).]

Fish and Wildlife Agencies and Tribes Action

34.29 Upon completion of the study identified in 34.27, submit joint proposals for reprogramming hatchery operations to the Council by October 1985. [Section 704(g)(1).]

Council

34.30 Utilizing the information available from the evaluation (34.27) and proposals (34.29) above, develop and adopt a comprehensive plan for reprogramming lower river hatcheries by December 1986. [Section 704(g)(1).]

35. Protection from New Hydroelectric Development

The Council has emphasized throughout its program that new hydroelectric development in the Columbia Basin must take into account fish and wildlife protection. The Council will continue to emphasize this in the next five years, particularly by developing methods for assessment of cumulative effects and by designating protected areas.

All Implementing Agencies

35.1 Continue to apply Program Sections 1204(a), (b), (c) and (e) to all new projects.

35.2 If new reservoirs are constructed, dedicate specific portions of storage to protect, mitigate and enhance fish and wildlife. [Section 704(b)(16).]

35.3 Prepare and submit to the Council annual reports on activities undertaken in this area each June. [Section 1304(a)(5), 1304(c).]

Bonneville Actions

35.4 Complete study and develop methods for assessing cumulative effects by November 1985. [Section 1204(b)(2).]

35.5 Complete the Bonneville portion of the protected areas study by January 1986. [Section 1204(c)(1).]

35.6 Develop new designs for turbine intake screens. Propose study design to the Council by January 1987. Complete tests and report to the Council by January 1989. [Section 1204(d)(1).]

Council Actions

35.7 Complete the Council portion of the protected areas study and designate protected areas in fiscal year 1986. [Section 1204(c)(2).]

35.8 Review action plan and other program sections in light of protected-area designations. [Section 1204(c).]

35.9 Work with FERC on assessment of new hydro projects. [Section 1204(e), 1304(a)(4).]

36. Goals

Design of the goals study described in Section 201 of the Fish and Wildlife Program is now underway. The Council feels that the establishment of goals is necessary to evaluate long-term responsibilities for Bonneville and the Northwest ratepayers and to guide future direction. The Council is committed to working with all entities to develop the goals.

Fish and Wildlife Agencies and Tribes Action

36.1 Submit a proposal for goals to the Council. [Section 201(5).]

Bonneville Action

36.2 Fund the goals study. [Sections 201(1)-(4).]

Council Action

36.3 Evaluate results of the goals study and establish goals. [Section 201(6).]

36.4 Re-evaluate program, including the action plan, in light of goals by December 1986. [Section 201(7).]

37. Limit Action Prior to Goals

The action plan does not include all measures in the Fish and Wildlife Program. Until program goals are established, completion and evaluation of ongoing work will take priority over initiation of new work in many areas. Once goals are established, the Council will review the program, including the action plan, in light of the goals.

38. Improve Harvest Controls

While most measures in the program are likely to benefit many runs of fish, it is particularly important to monitor and influence harvest management decisions for the benefit of all Columbia River anadromous fish. The Council's five-year objective is to see that adequate controls continue to be placed on harvest, consistent with the Fish and Wildlife Program. By supporting the following efforts for the next five years, the Council hopes to increase the level of understanding of stock patterns and significantly improve harvest management decisions.

Bonneville Actions

38.1 Known-Stock Fisheries

- Share funding, with the fishery management agencies, of a five-year demonstration program to determine the effectiveness of using electrophoresis as a fishery management tool. Initiate the demonstration program during the 1985 ocean fishing season or subsequent seasons if and when they occur. [Section 504(c)(1).]

- Determine which known-stock fishery measures currently funded under Section 704(k)(3) should be classified as research (Section 504(c)(2)) and which should be classified as demonstration programs (Section 504(c)(3)). Evaluate the research projects pursuant to Action Item 39.

Council Actions

38.2 Consult on harvest management issues prior to establishment of harvest seasons. [Section 504(b)(1).]

38.3 Consult in the development of the management plan required by the Salmon and Steelhead Conservation and Enhancement Act of 1980 (16 U.S.C. 3311). [Section 504(b)(1).]

38.4 Monitor United States/Canada salmon treaty negotiations to encourage maximum consistency with the Council's Fish and Wildlife Program. Provide testimony and comment as needed. [Section 504(b)(3).]

Fishery Management Agencies and Tribes Actions

38.5 Report to the Council each April on escapement objectives, harvest levels and regulations for all runs and their potential effect on program objectives. [Section 504(b)(2).]

38.6 Report to the Council on the effectiveness of known-stock fishery demonstration programs funded pursuant to Sections 504(c)(1) and 504(c)(3).

39. Evaluation and Research

The action plan calls for at least two types of evaluations to provide checkpoints to determine whether program objectives are being met. The first is an independent evaluation of a series of research projects related to homing behavior, predation, reservoir losses, known-stock fishery, adult losses, and hatchery diseases or practices (action item 39.1). This type of evaluation should determine, for example, how effective the research projects are likely to be in resolving a major problem. It should examine the experimental design and hypothesis, as well as the quality and usefulness of data from related projects. It also should determine the benefits of implementing results in terms of program goals and objectives and indicate what future actions would be appropriate.

A second type of evaluation will take place in the context of Council review of the federal implementing agencies' work plans, program plans and budget proposals (action item 39.2). The Council will examine and compare federal expenditures to the program measures and call for periodic reporting.

Bonneville Action

39.1 Continue ongoing work funded under the following measures until the Council has established research objectives (action item 39.3). No new research projects under these measures shall be funded in fiscal year 1985 until establishment of those objectives.

404(b)(18)	604(d)(2)	704(k)(1)
404(c)(1)	604(d)(3)	
404(c)(2)	704(h)	
504(c)(2)	704(j)(1)	

Bonneville, Corps, FERC, Bureau Actions

39.2 To ensure proper coordination in the implementation of the program, submit to the Council by January 15, 1985, and by September 15 of each year thereafter (starting in 1985), expenditure and obligation plans and program work plans. Include schedules with key

milestones for the subsequent fiscal year. Thereafter, on a quarterly basis, update expenditure and obligation information and submit it to the Council. Also submit to the Council a review of each prior year's expenditure and obligation, explicitly comparing projected and actual expenditures and obligations. Report expenditures for each program measure or project related to a program measure. Also, identify the responsible persons within each agency. [Section 1304(a), 1304(e).]

Council Actions

39.3 Initiate a study in fiscal year 1985 to aid establishment of research objectives for the program. Upon completion of the study, establish research objectives for the program and revise the action plan accordingly. [Section 1104(c)(1).]

39.4 Conduct a workshop in fiscal year 1985 on the application of adaptive management concepts in appropriate parts of the program.

39.5 Schedule periodic consultations with affected parties to review budgets proposed by federal implementing agencies. [Section 1304(a), 1304(e).]

40. Wildlife

The wildlife section of the program sets out a means for proceeding from status reports through mitigation for hydroelectric effects on wildlife. During the next five years this process should continue, but will not be expected to be completed for all projects. The Council's wildlife coordinator will continue to monitor progress and schedule implementation. The Council also will continue to support protection of wildlife from new hydroelectric development.

Bonneville Actions

40.1 Upon completion of all mitigation status reports, the fish and wildlife agencies and tribes will submit a list of priority projects to Bonneville and the Council. Consultations among affected parties should begin. The consultation should define the need for either loss estimates or actual mitigation projects. Prepare and submit to the Council an annual report on activities each April. [Section 1004(b)(1),(2),(3).]

40.2 Fund loss statements as needs are identified. [Section 1004(b)(2).]

40.3 Initiate consultation on loss statements as the statements are completed. [Section 1004(b)(3).]

40.4 Where appropriate, develop funding plans for these projects. [Section 1004(b)(3) and (5), 1004(d)(1) and (2).]

40.5 Upon Council approval, implement mitigation plans and land acquisition proposals. [Section 1004(b)(3) and (5), 1004(d)(1) and (2).]

Corps, Bureau of Reclamation, FERC

40.6 Where indicated, implement mitigation plans, following Council approval. [Section 1004(b)(3) and (5), 1004(d)(1) and (2).]

40.7 When and where feasible, implement on a voluntary basis, management plans designed to protect wildlife species identified in Section 1004.

Council Actions

40.8 Review mitigation plans and land acquisition proposals. [Sections 1004(b)(3), 1004(b)(5), 1004(d)(1) and (2).]

41. Resident Fish

Activities in the resident fish area will be limited over the next five years. Recognizing that this relative order of priority may be changed by the Council on its own motion at any time, the Council still favors initiation and continuation of projects that do not conflict with anadromous fish measures and that directly address losses due to hydroelectric development. The Council also will continue to support protection of resident fish from new hydroelectric development.

Bonneville Actions

41.1 In consultation with Montana Department of Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service, continue ongoing work and submit a coordinated work plan to the Council by May 1, 1985, for measures to be implemented in Montana before November 15, 1986. [Sections 804(a)(2), 804(a)(3), 804(a)(6), 804(a)(9), 804(b)(1)(C), 804(b)(1)(D), 804(b)(3-6).]

41.2 Initiate design of the Colville hatchery by fiscal year 1986. Build the hatchery in fiscal years 1987-1988. [Section 804(e)(15).]

41.3 Evaluate current ongoing activities on sturgeon. Develop a work plan for future action. Submit to the Council by May 1985. [Section 804(e)(8).]

41.4 Complete construction of Pend Oreille hatchery by October 1986. [Section 804(e)(5).]

41.5 Develop a work plan for Clark Fork fishery loss, including augmenting flows in the Bitterroot River through a water purchase in Painted Rocks Reservoir. Submit it to the Council in May 1985. Provide interim funding for flow augmentation until funding is provided by the Montana Power and Washington Water Power companies under action item 41.14. [Section 804(e)(1), 804(e)(2), and 804(e)(11).]

41.6 Initiate removal of accumulated materials in the Kootenai River, where appropriate. [Section 804(d)(1).]

41.7 Initiate assessment of impacts of the construction and current operation of Dworshak dam on resident fish. [Section 804(e)(12).]

41.8 Prepare and submit to the Council an annual report on resident fish implementation in May.

Corps Action

41.9 Develop and implement operating procedures for resident fish at Libby Reservoir on the schedules provided in Sections 804(a)(7), 804(b)(1), 804(b)(2).

41.10 Continue existing resident fish stocking program. Coordinate with fish and wildlife agencies and tribes. [Section 804(e)(9).]

FERC Actions

41.11 Maintain minimum flows between Big Fork Dam and the powerhouse. Initiate studies and research. [Sections 804(a)(4), (5).]

41.12 Initiate evaluation of operating procedures at Milltown Dam. [Section 804(b)(8).]

41.13 Continue existing operations at Post Falls Dam. [Section 804(b)(9).]

41.14 Provide that Montana Power and Washington Water Power companies fund water purchases at Painted Rocks Reservoir to provide instream flows for resident fish. [Section 804(e)(1).]

Bureau of Reclamation Action

41.15 Develop and implement operating procedures for resident fish at Hungry Horse Dam on the schedules provided in Sections 804(a)(1), 804(a)(8), 804(b)(1), and 804(b)(2).

41.16 Ensure that Anderson Ranch Dam is operated to maintain established minimum flows. [Section 804(a)(10).]

41.17 Install a barrier net system at Banks Lake. [Section 804(e)(7).]

42. Coordination

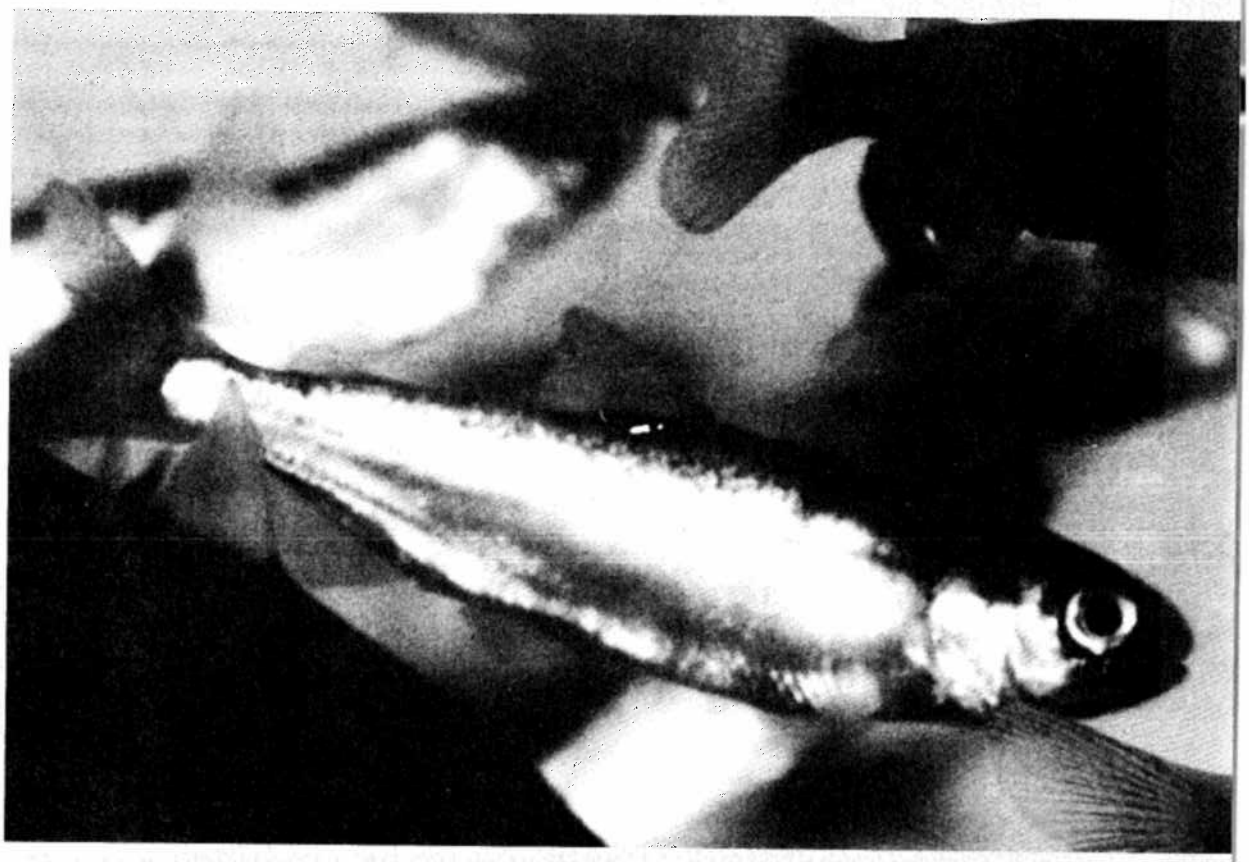
Consultation and coordination among all interested parties will continue to be crucial to program success. The following measure deserves to be highlighted.

Actions

42.1 All federal project operators and regulators shall continue to coordinate and consult, as indicated in Section 1304.

42.2 Prior to revision of its Power Plan, the Council will request recommendations for amendment of the Fish and Wildlife Program. [Section 1404.]

Disclaimers



1601. Nothing in this program will:

(A) Affect or modify any treaty or other right of an Indian tribe; — Tribes

(B) Authorize the appropriation of water by any federal, state, or local agency, Indian tribe, or any other entity or individual; — Water

(C) 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;

(D) Alter, amend, repeal, interpret, modify, or conflict with any interstate compact;

(E) 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;

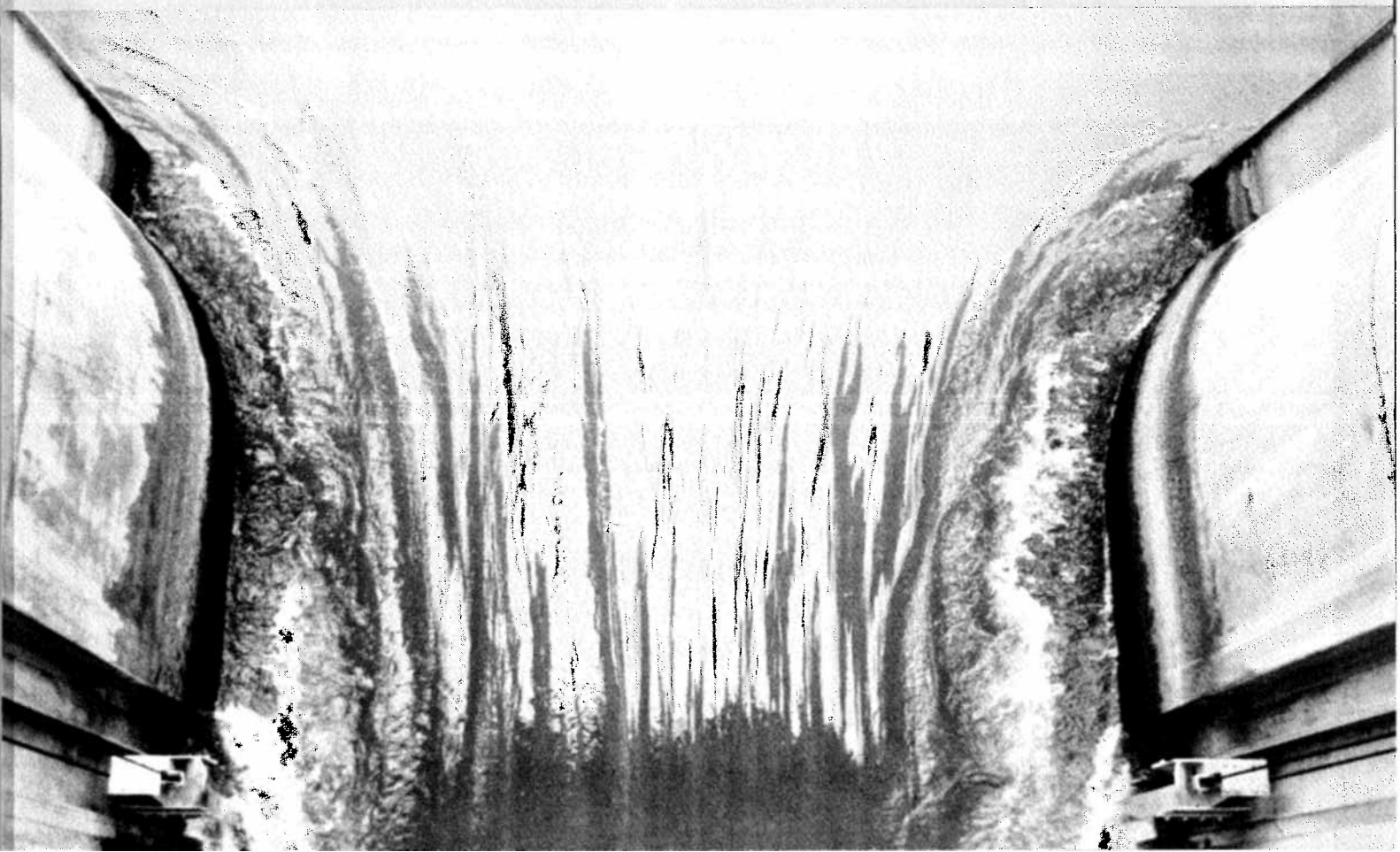
(F) Affect the validity of any existing license, permit, or certificate issued by any federal agency pursuant to federal law; or — Licenses

(G) Otherwise conflict with the savings provisions in Section 10 of the Northwest Power Act.

1602. 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. — **Columbia River Basin**

1603. If any provision of this program or the application of such provision is held invalid, no other provision of this program or its application will be affected thereby. — Severability

Glossary



Glossary

This list of terms has no legal significance and is provided for clarification purposes only.

Acclimation Pond — Concrete or earthen pond used for rearing and imprinting juvenile fish in waters of a particular stream before releasing the fish into that stream.

Acre-Foot (af) — A unit of hydraulic volume measurement used to describe the quantity of storage in a reservoir. It is the volume covering one acre to a depth of one foot or 325,850 gallons.

Advanced Energy Withdrawal — Drawing reservoirs below rule curves during fall in anticipation of better than critical period runoff in spring.

Anadromous Fish — Fish that ascend freshwater rivers and streams to reproduce after maturing in the ocean.

Anatomical — Structural or morphological make-up of fish or organism.

Artificial Propagation — Spawning, incubating, hatching, and rearing fish in facilities constructed for mass-production hatcheries.

Barrier Net — A net system that is placed across a river, stream, or channel to block passage of fish without impeding waterflow.

Base Case — Hydroregulation run against existing minimum flow constraints at hydroelectric projects.

Biochemical — Characterized by or involving chemical reactions in living organisms.

Bypass System — Structures which provide a route for fish movement around or through dams or other passage barriers.

Catadromous Fish — Fish that descend rivers and streams to the ocean to reproduce after maturing in freshwater.

Channelization — The excavation or removal of stream bottom materials to create or improve a channel.

Collection Efficiency — An indirect estimate of the percentage of the total number of fish approaching a project which enter the powerhouse collection/bypass system. Collection efficiency is a function of many interacting variables, such as project operations, flow and spill conditions, fish distribution and specific fish facilities.

Critical Period Runoff — The "worst case" under which the determination of maximum firm energy capability of the present hydroelectric system is made using current storage capacity. This is the interval during which all reservoirs are drafted from full to empty without failing to meet a given firm load requirement. The critical period generally used in planning reflects the 42-1/2 months of low-water conditions from August 16, 1928, through February 1932.

Dewatering — Elimination of water from a lake, river, stream, reservoir, or containment.

Drawdown — Release of water from a reservoir for purposes of power generation, flood control, irrigation, or other water management activity.

Emergence — The act of fish leaving their incubation environment.

Entrainment — The capture of weakly swimming aquatic organisms into moving water at intakes and diversions.

Escapement — The success of upstream migrating adult fish in avoiding harvest by man or predators; the number of fish that succeed in passage to spawning grounds.

Estuary — Semi-enclosed body of water within which freshwater and seawater meet.

Fingerling — A young fish from time of disappearance of the yolk sac to the end of the first year of growth.

Firm Energy Load Carrying Capability (FELCC) — The amount of firm energy (non-interruptible power) that can be produced from a hydroelectric power system based on that system's lowest recorded sequence of streamflows and the maximum amount of reservoir storage currently available to the system.

Fish Guidance Efficiency — That percentage of the total number of fish moving into the turbine intake, over the test period, which are deflected out of the intake (usually into a gatewell) by the fish guidance device.

Fish Ladder — A device that enables fish to migrate upstream past dams, waterfalls, and rapids under their own effort.

Fish Passage Efficiency — That percentage of the total number of fish passing a project which do not pass through the turbine units.

Flow — See Streamflow

Forage Fish — Species which serve as a food source for carnivorous species.

Forebay — The portion of the reservoir at a hydroelectric dam which is immediately upstream of the generating station.

Fry — The life stage of a fish from the hatching of the egg through absorption of the yolk sac to growth to one inch in length.

Genetic Diversity — Variability, plasticity, resiliency, and adaptability of a species resulting from genetic make-up.

Habitat — The place or type of natural site where a plant or animal normally lives and grows.

Harvest Management — The process of controlling the commercial, recreational, tribal, and natural fish harvest for the purpose of achieving a goal within the fishery.

Homing — The ability of migratory fish to use natural and physical cues to return to their river or stream of origin.

Horizontal Distribution — The location of fish in the cross section of a river or a lake.

Husbandry — The scientific management and control of the hatchery environment for propagation of fish.

Imprinting — The physiological and behavioral process by which migratory fish assimilate environmental cues to aid return to their stream of origin as adults.

Incubation — The period of time from egg fertilization until hatching.

Instantaneous Flows — The velocity of a volume of water.

Instream Flow Work Group — An interagency group of technical experts and water resource managers from the fish and wildlife agencies, federal operators and regulators, and state water management agencies, which has simulated the effects of various fish flow regimes through the use of existing hydroregulation models.

Intake — The entrance to a turbine at a hydroelectric project.

Juvenile — Fish from one year of age until sexual maturity.

Known Stock Fishery — A harvest management technique by which specific stocks in a mixed stock are harvested and others allowed to escape.

Limnology — The study of the physical, chemical, meteorlogical, and biological conditions of freshwaters.

Littoral Zone — The shoreward region of a body of water; in lakes the region from shore to the outer limit of rooted vegetation.

Load Carrying Capability — See Firm Energy Load Carrying Capability

Low-Capital Salmon Production — The artificial propagation of salmon and steelhead trout using multiple, low-cost, small-scale structures and systems.

Mainstem — The main channel of a river.

Migrant — Life stage of anadromous and resident fish species which moves from one locale, habitat or system (river or ocean) to another.

Mixed Stock — A run of fish comprised of groups of different species, strains, races, origins, and migration timing.

Natural Fish — Stocks propagated normally in rivers and streams but originated or supplemented from hatcheries.

Natural Propagation — Spawning, incubating, hatching, and rearing fish in natural rivers, lakes, and streams.

Offsite — Away from the locus of detrimental effects; in this context it is used often in conjunction with mitigation and refers to the improvement in conditions for fish or wildlife species away from the site of a hydroelectric project with detrimental effects on fish and/or wildlife, as part or total compensation for those detrimental effects. An example of offsite mitigation is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects of mainstem hydroelectric projects.

Outmigration — The activity of smolts moving into the ocean.

Outplants — Hatchery-reared fish released into streams for rearing and maturation.

Pacific Northwest Coordination Agreement — An agreement, signed by Bonneville, the Corps, and a number of private and public utilities, designed to provide for coordinated operation of electric power facilities in the Pacific Northwest.

Passage — The movement of migratory fish through, around, or over dams or other obstructions in a stream or river.

Pathogen — The specific causative agent of fish disease.

Power Peaking — The generation of electricity to meet maximum instantaneous power requirements; usually refers to daily peaks.

Raptor — A bird of prey, adapted for seizing and tearing prey.

Rearing — The life stage of anadromous fish spent in freshwater rivers, lakes, and streams before migrating to the ocean.

Recruitment — The number of fish of a single year class entering the harvestable phase in a given period.

Redd — A salmon or steelhead trout spawning nest in river or stream gravel.

Reprogramming — The development of a new plan for the time and location of release of hatchery-propagated fish into rivers and streams, especially in the upper river areas.

Reregulating Project — A dam and reservoir, located downstream from a hydroelectric peaking plant, with sufficient pondage to store the widely fluctuating discharges from the peaking plant and to release them in a relatively uniform manner downstream.

Resident Fish — Fish species which reside in freshwater during their entire life cycle.

Riparian Vegetation — Vegetation growing along the shore of a river, lake, or stream.

Riprap — A streambank protection method which utilizes large rocks or boulders along a streambank to reduce water energy and erosion.

Rough Fish — Resident fish also classified as nuisance fish, of low value as sport or food.

Rule Curve — Graphic guides to the use of storage water which are developed to define certain operating rights, entitlements, obligations, and limitations for each reservoir.

Run — A group of fish of the same species consisting of one or more stocks migrating at a discrete time.

Runoff — The portion of the rain or snowmelt water that runs over the land surface and ultimately reaches streams.

Scarify — Break up or dislodge streambed materials to improve spawning substrate.

Scouring — The vigorous flushing action of rapidly flowing water which resuspends sediments and relocates gravels in rivers and streams.

Shaping — The ability to achieve various flow levels for movement of downstream migrants when the smolts are present, and within the prescribed volume of water contained in the Water Budget.

Site Specific — Having a quality or character determined by location.

Smolt — The juvenile life stage of salmon or steelhead trout migrating to the ocean and undergoing physiological changes from freshwater to saltwater existence.

Smoltification — The physiological process of salmon and steelhead trout changing from freshwater to saltwater existence.

Spawning — 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.

Spillway — The channel or passageway around or over the dam through which excess water is released or "spilled" past the dam without passing through the turbines.

Stock — The fish spawning in a particular stream during a particular season which to a substantial degree do not interbreed with any group spawning in a different stream or at a different time.

Storage Reservoir — A reservoir in which storage is held over from the annual high water period to the following low water period. Storage reservoirs which refill at the end of each annual high water season are "annual storage" reservoirs. Those which cannot refill all usable storage by the end of each annual high water season are "cyclic storage" reservoirs.

Stream Reach — A section or segment of a river or stream.

Streamflow — The rate at which water passes a given point in a stream or river, usually expressed in cubic feet per second (cfs).

Subimpoundment — An isolated body of water within a reservoir or lake created by diking or berm construction.

Submersible Traveling Screen (STS) — A mechanical fish bypass device designed to deflect fish from a turbine intake into a fish bypass system.

Substrate — River, stream, or lake bottom materials.

Tailwater — The water surface immediately downstream from a dam or hydroelectric powerplant.

Transpiration — The passage of water vapor from plants through pores in the leaves.

Turbine — An enclosed rotary type of hydraulic machinery in which mechanical energy is produced by the force of water directed against blades fastened to a vertical horizontal shaft.

Vertical Slot Counter — A fish counting station associated with a vertical slot fishway.

Warmwater Species — Species of fish which are intolerant of cold water temperatures.

Water Banking — A water allocation scheme which aids in fulfilling competing needs for water, and based on the existence of willing sellers and buyers.

Wild Stocks — Genetically unique populations of fish which have maintained reproduction successfully without supplementation from hatcheries.

Wildlife — Mammals and birds, game and non-game species that are not domesticated.

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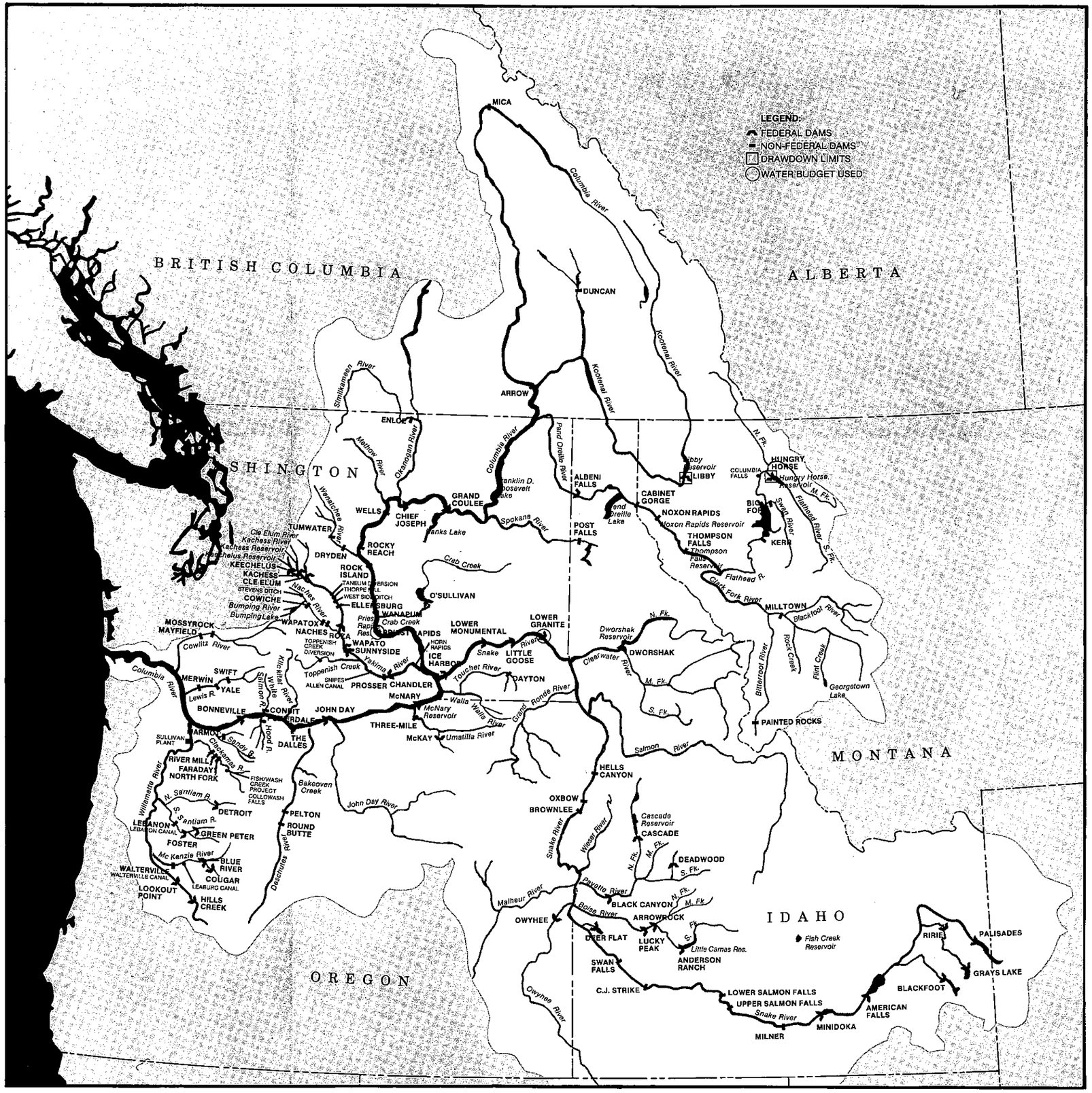
Figure 1.
Columbia River Basin



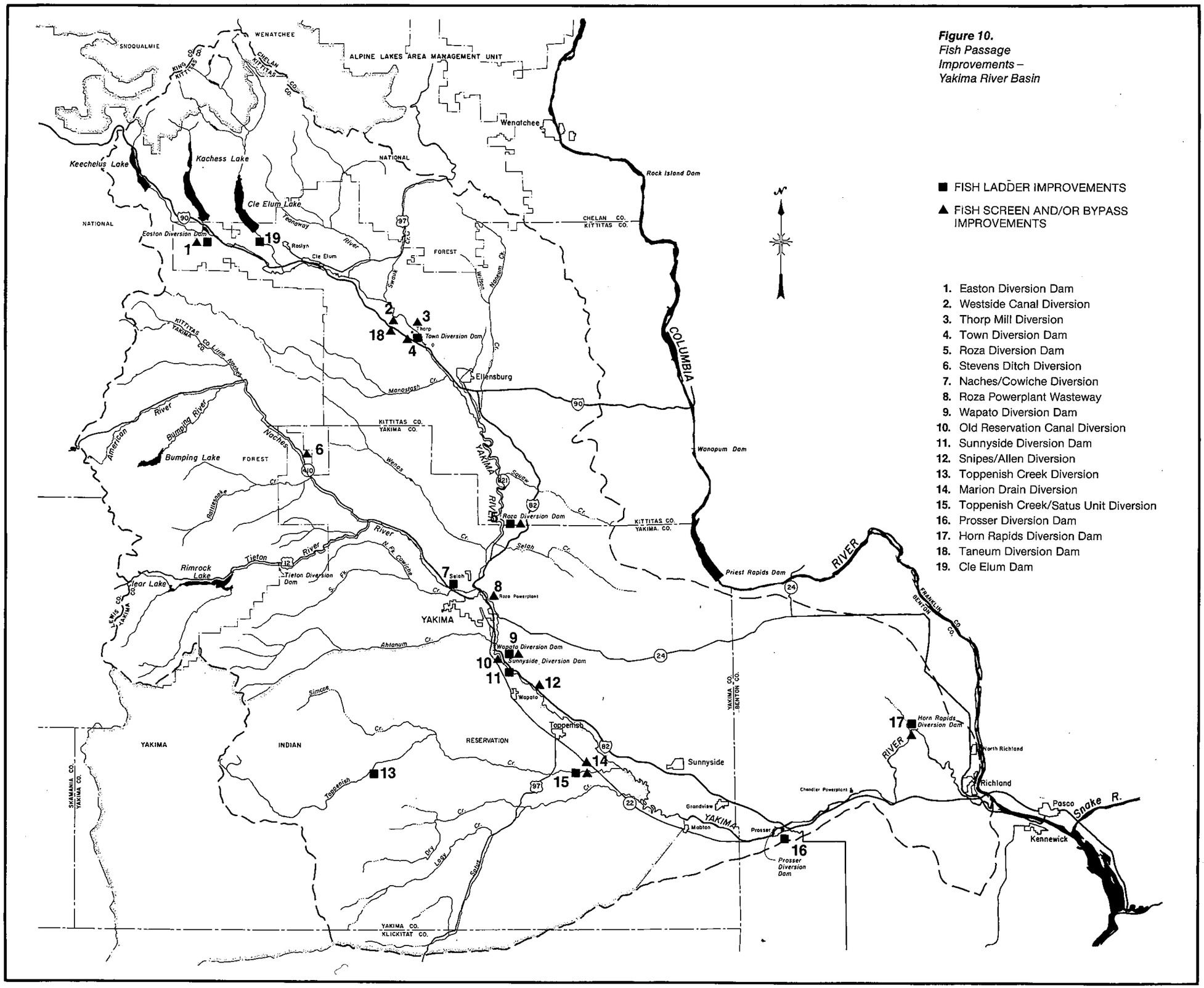


Figure 10.
Fish Passage Improvements – Yakima River Basin

■ FISH LADDER IMPROVEMENTS

▲ FISH SCREEN AND/OR BYPASS IMPROVEMENTS

1. Easton Diversion Dam
2. Westside Canal Diversion
3. Thorp Mill Diversion
4. Town Diversion Dam
5. Roza Diversion Dam
6. Stevens Ditch Diversion
7. Naches/Cowiche Diversion
8. Roza Powerplant Wasteway
9. Wapato Diversion Dam
10. Old Reservation Canal Diversion
11. Sunnyside Diversion Dam
12. Snipes/Allen Diversion
13. Toppenish Creek Diversion
14. Marion Drain Diversion
15. Toppenish Creek/Satus Unit Diversion
16. Prosser Diversion Dam
17. Horn Rapids Diversion Dam
18. Taneum Diversion Dam
19. Cle Elum Dam