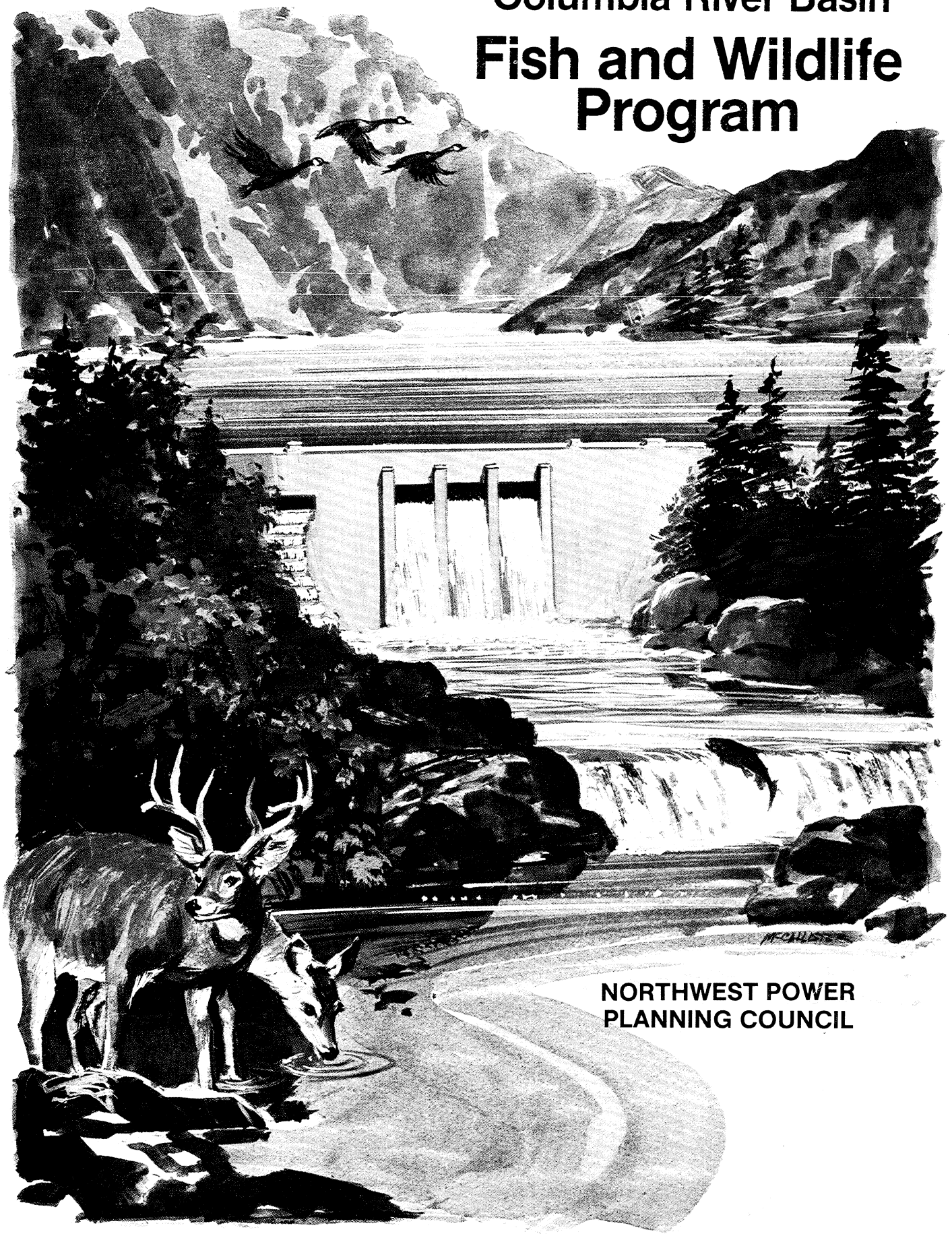
Columbia River Basin
Fish and Wildlife Program



NORTHWEST POWER
PLANNING COUNCIL

NORTHWEST POWER PLANNING COUNCIL

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PORTLAND, OREGON 97205 • (503) 222-5161

To the People of the Pacific Northwest:

Three generations ago, when the Columbia River and its many tributaries ran free to the sea and fish and wildlife were plentiful, the people of our region were presented an unmatched opportunity. To the credit of their vision, skill and courage, they harnessed this mighty river system into a seemingly boundless supply of low-cost electricity. Thanks to their foresight, we have all benefited immensely.

But this achievement, like all great achievements, had a price. The development of the Columbia River Systems's hydroelectric projects dramatically changed the natural fish and wildlife habitat, especially that of the prized Pacific salmon and steelhead. The fish runs were nearly destroyed, and it falls to this generation to rebuild the natural resources that flourished before we came.

The fish and wildlife program is an important step in this rebuilding. To use our region's rivers as a continuing source of renewable energy while implementing this program requires a new sense of purpose. By tapping the ingenuity and commitment of our citizens, we can rebuild our damaged fishery and wildlife habitat. It is with this renewed sense of stewardship for our natural resource heritage that we have developed this program.

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Chairman—Washington

ROBERT W. SAXVIK
Vice-Chairman—Idaho

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Washington

W. LARRY MILLS
Idaho

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ROY HEMMINGWAY
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Columbia River Basin Fish and Wildlife Program

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

November 15, 1982

NORTHWEST POWER PLANNING COUNCIL
700 S.W. Taylor
Portland, Oregon
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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

Treaties

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 that 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.

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.

The first dams

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 flood control and irrigation, decreasing the flows available for successful migration of salmon and steelhead, and blocking access to miles of upriver spawning habitat.

Advent of hydroelectric era

Despite these effects, the fisheries of the Columbia River Basin were still relatively strong in the early 1930s as the Northwest's hydroelectric era began. 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.

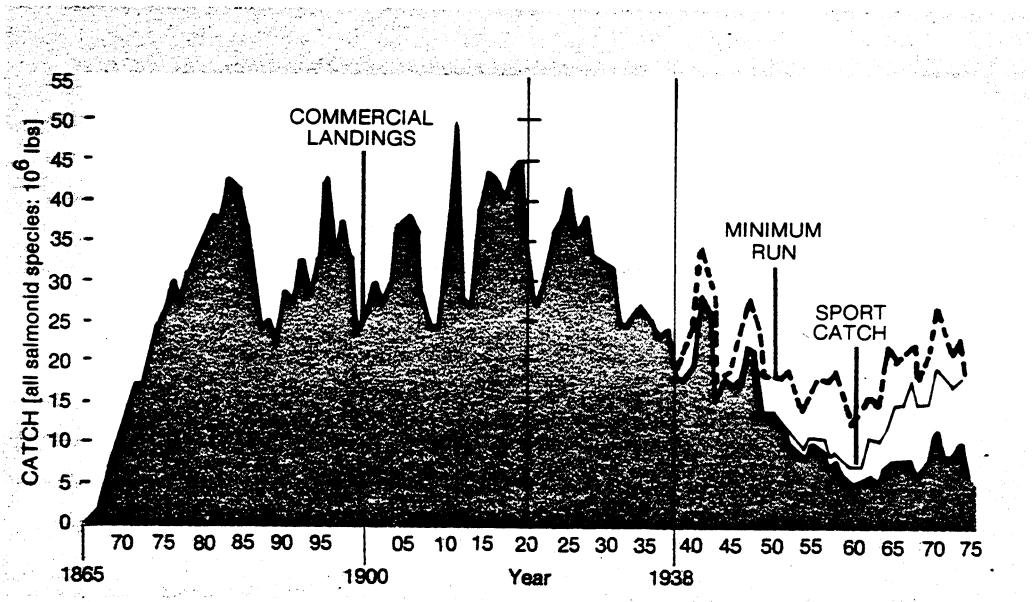
When it was finished in 1975, the Federal Columbia River Power System consisted of 28 dams that produce more than 13,000 megawatts of low-cost, renewable electricity, with a storage capacity exceeding 20 million acre-feet of water. Dams owned by public and private utilities generate even more power,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

Contents

Contents

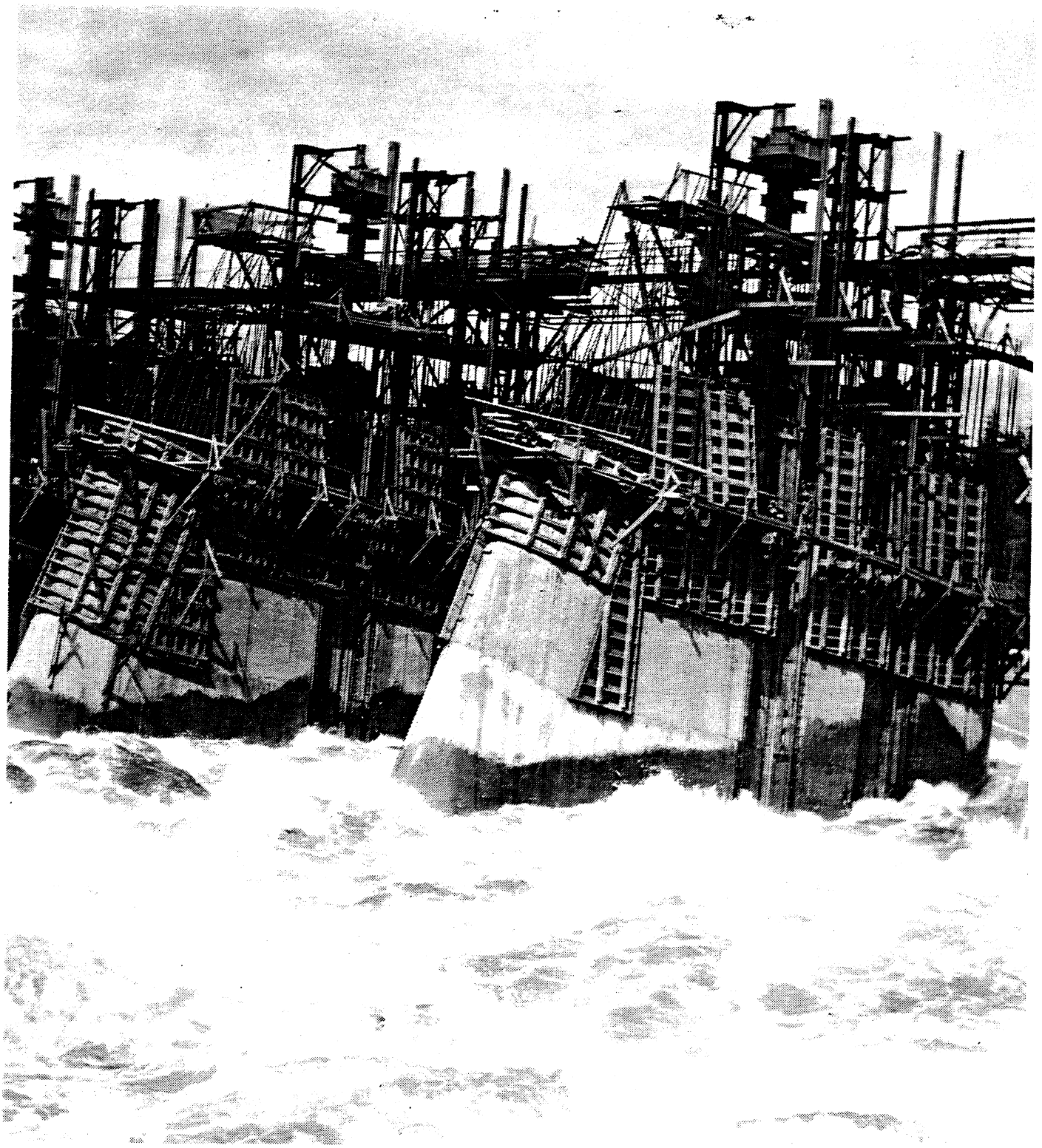
Contents

List of Illustrations

List of Tables

Section
100

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, rather than Congress and distant federal agencies, 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 intrested 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, the region's 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 totalling 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 totalling 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.

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 I explains the Council's disposition of recommendations. Appendix II describes the comments submitted on the draft program, 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, 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. 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 during most of the 1980s, 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, and withholding support for major hatchery funding activities until adequate controls are imposed on ocean and river harvest of salmon and steelhead.

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 off-site enhancement measures for the Yakima River Basin recognize another concern of the tribes. All program measures have been drafted carefully to promote full partnership by the tribes at each step of program implementation. To the limits of its authority, 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 1500 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 has also 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 have gone into this program represent a clear statement that the region views this program as a 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. In the case of anadromous fish, the Council seeks to develop fish runs that will support the reasonable needs of all parties — tribes, commercial fishermen, and sportsmen — and provide suitable environmental conditions for even larger runs in the future.

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 only 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 Parks 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 Wildlife; 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 State 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; Kalispell Indian Community; Kootenai Tribe of Idaho; Nez Perce Tribe of Idaho; Shoshone-Bannock Tribes of the Fort Hall Reservation; and Spokane Tribe of Indians

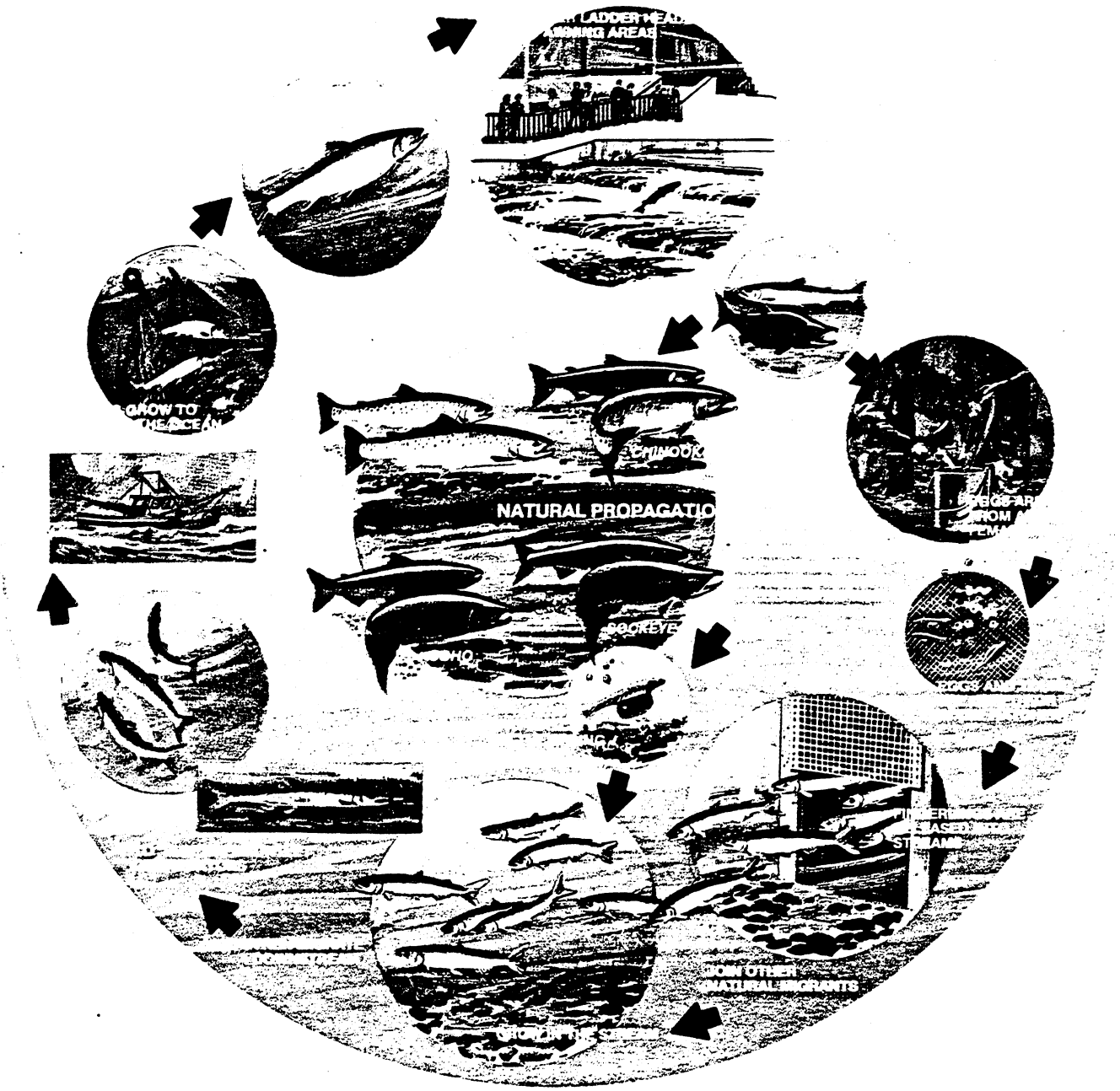
109. Key Elements of The Program

This program contains 15 sections. Sections 300 through 1400 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, 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 600 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, and the Council's procedures for amending the program.

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

Figure 2.
Life Cycle of Anadromous Fish



Length of the Life Cycle and of Hatchery Care Vary with Species and Conditions

Section
200

Program Goals

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 on 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.

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 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, the Council's fish propagation panel created under Section 704(a)(1) of this program, 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 off-site 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 report will be provided on a quarterly basis beginning on March 30, 1983.

(5) The fish and wildlife agencies and tribes will complete their study and will submit proposals to the Council by April 15, 1984. 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.

202. Resident Fish and Wildlife

Resident fish also 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 on-site or off-site mitigation. It is even arguable that in some cases resident fish have been enhanced by hydroelectric development. For these reasons, the Council will require further information before establishing resident fish goals.

The wildlife section of this program (Section 1000) already includes measures to evaluate wildlife losses caused by hydroelectric dams. It is clear that much wildlife habitat has been destroyed by reservoirs and by river level fluctuations for power purposes. It also appears, as in the case of resident fish, that some wildlife has been enhanced by hydroelectric development. The Council will await the results of the wildlife loss study under Section 1000 before establishing wildlife goals.

Anadromous Fish: Downstream Migration—Water Budget

Section
300

Anadromous Fish Species	
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Sockeye salmon	*Oncorhynchus nerka*
Steelhead trout	*Salmo gairdneri*

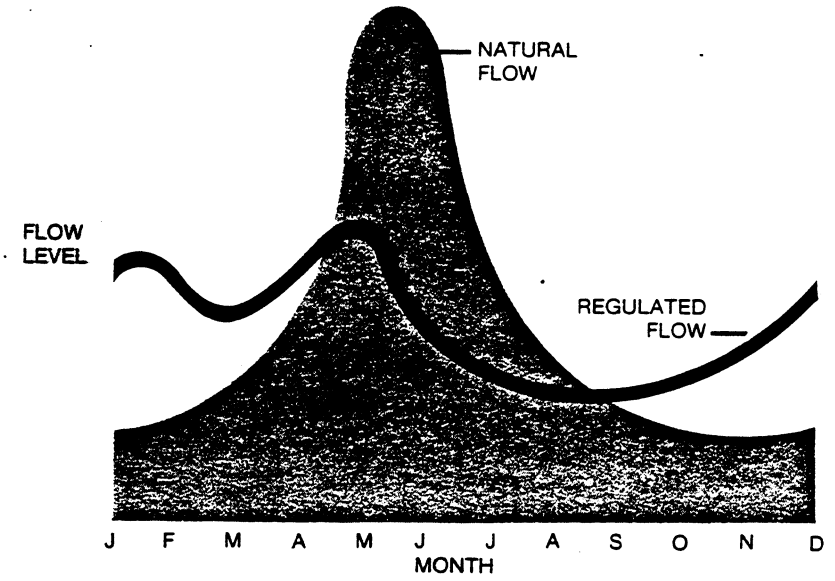
301. The Problem

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.

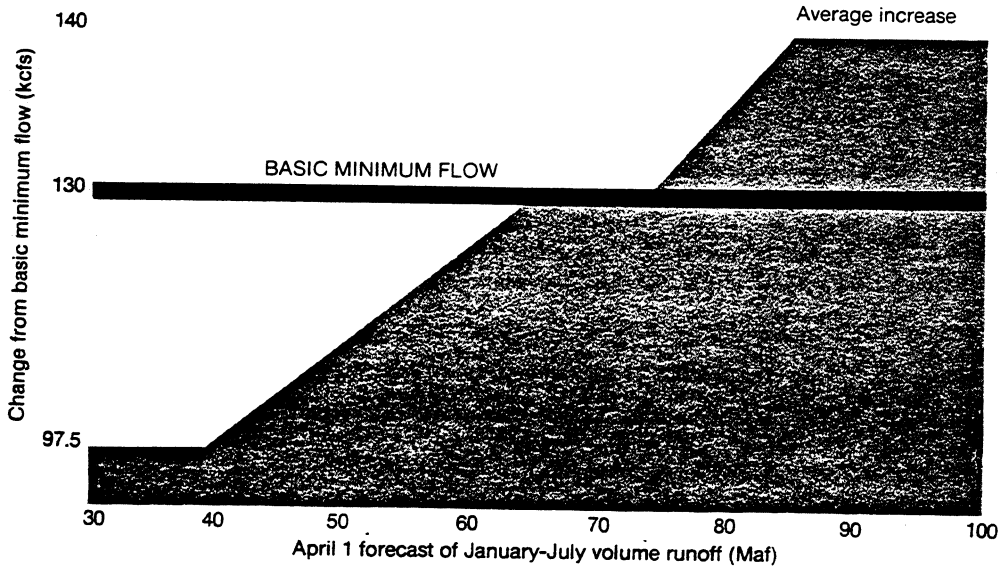
Coordination

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, 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, their 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 markedly increase 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.

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 critial 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 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.

Conflict with flood control

(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 1500).

(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 entitities) designated by a majority of the Columbia River Basin 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 fish and wildlife agencies and tribes will inform the Council in writing of their choices for Water Budget managers by January 1, 1983. Such written notices to the Council also will contain certification that those choices are supported by a majority of the fish and wildlife agencies and tribes.

(3) 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 October 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.

(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

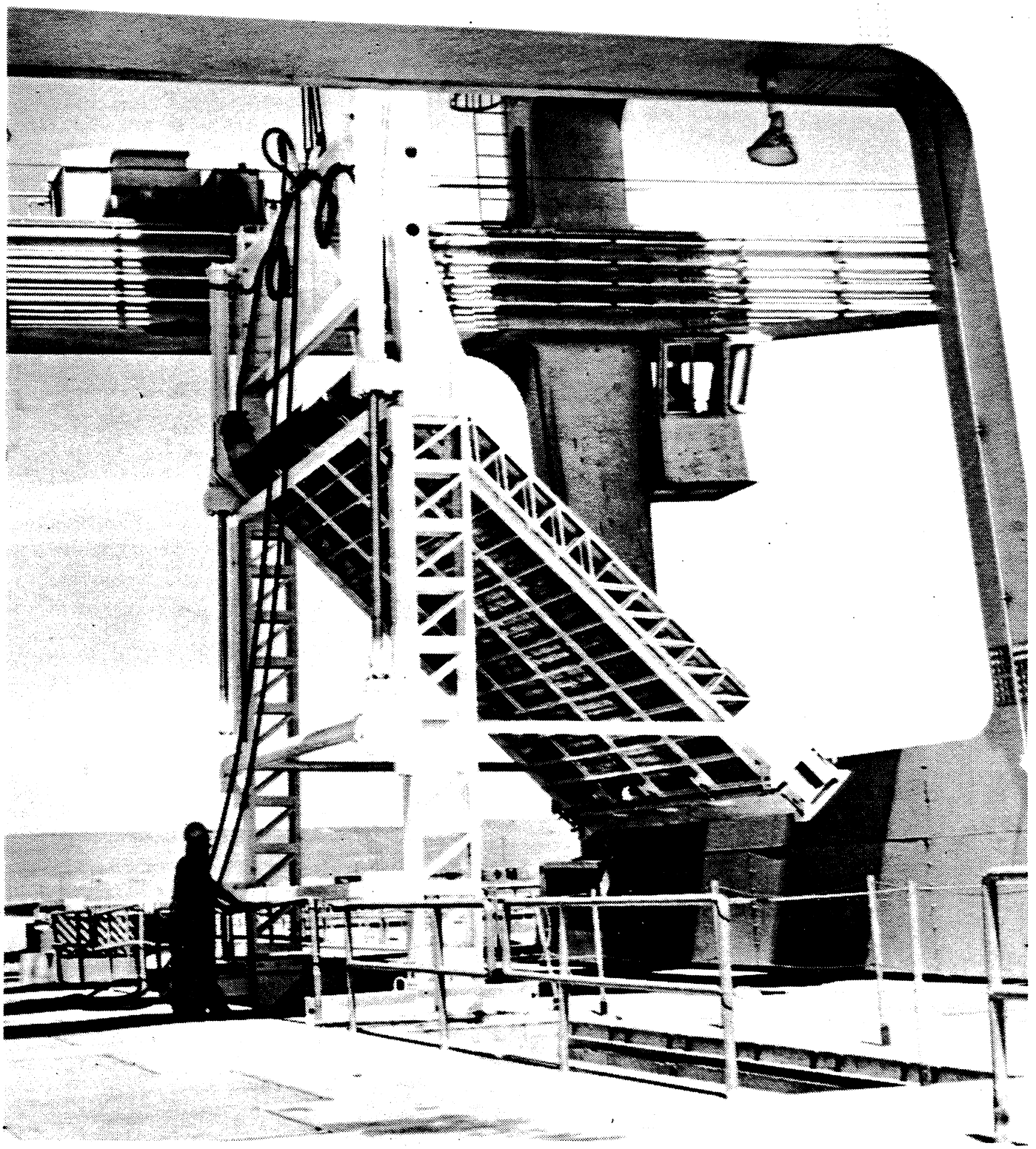
(1) In the event that the fish and wildlife agencies and tribes are unable to agree on a flow schedule for the Water Budget, their Water Budget managers will immediately notify the Council,

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).

Anadromous Fish: Downstream Migration—Passage

Section
400



401. The Problem

When hydroelectric dams were originally 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

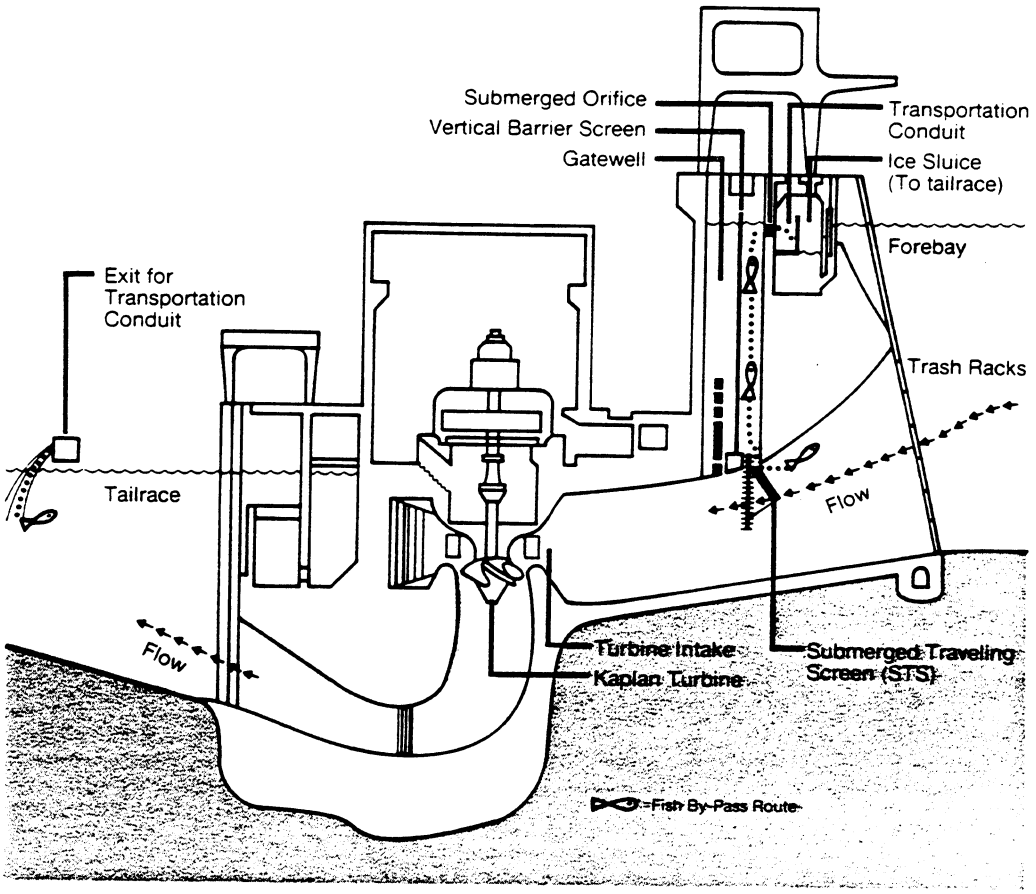


Figure 5.
Typical Traveling Screen Bypass System

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. Prototype testing must be completed by July 15, 1985. Bypass systems must be installed at Wells, Rock Island, Rocky Reach, and Wanapum dams by March 20, 1987.

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.

404. Measures

(a) Mid-Columbia River Passage

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

Wells Dam

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

Collection and bypass systems

(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 by July 15, 1985. 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 by March 20, 1987, or such later date as the Council may specify.

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

Rocky Reach Dam
Rock Island Dam

(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 by July 15, 1985. 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.

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 by March 20, 1987, or such later date as the Council may specify.

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

Wanapum Dam
Priest Rapids Dam

(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 by July 15, 1985. 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.

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 by March 20, 1987, or such later date as the Council may specify.

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 by January 1, 1983. 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 by March 20, 1987. 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 by December 31, 1985. 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 by December 31, 1988, 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.

All Mid-Columbia Dams

(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

Interim spills

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.

(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

Figure 6 illustrates the mid-Columbia implementation plan described in these measures.

(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. This study shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time. **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 by March 30, 1986. Bonneville shall fund the installation, operation, and maintenance costs for this project. **John Day Dam**

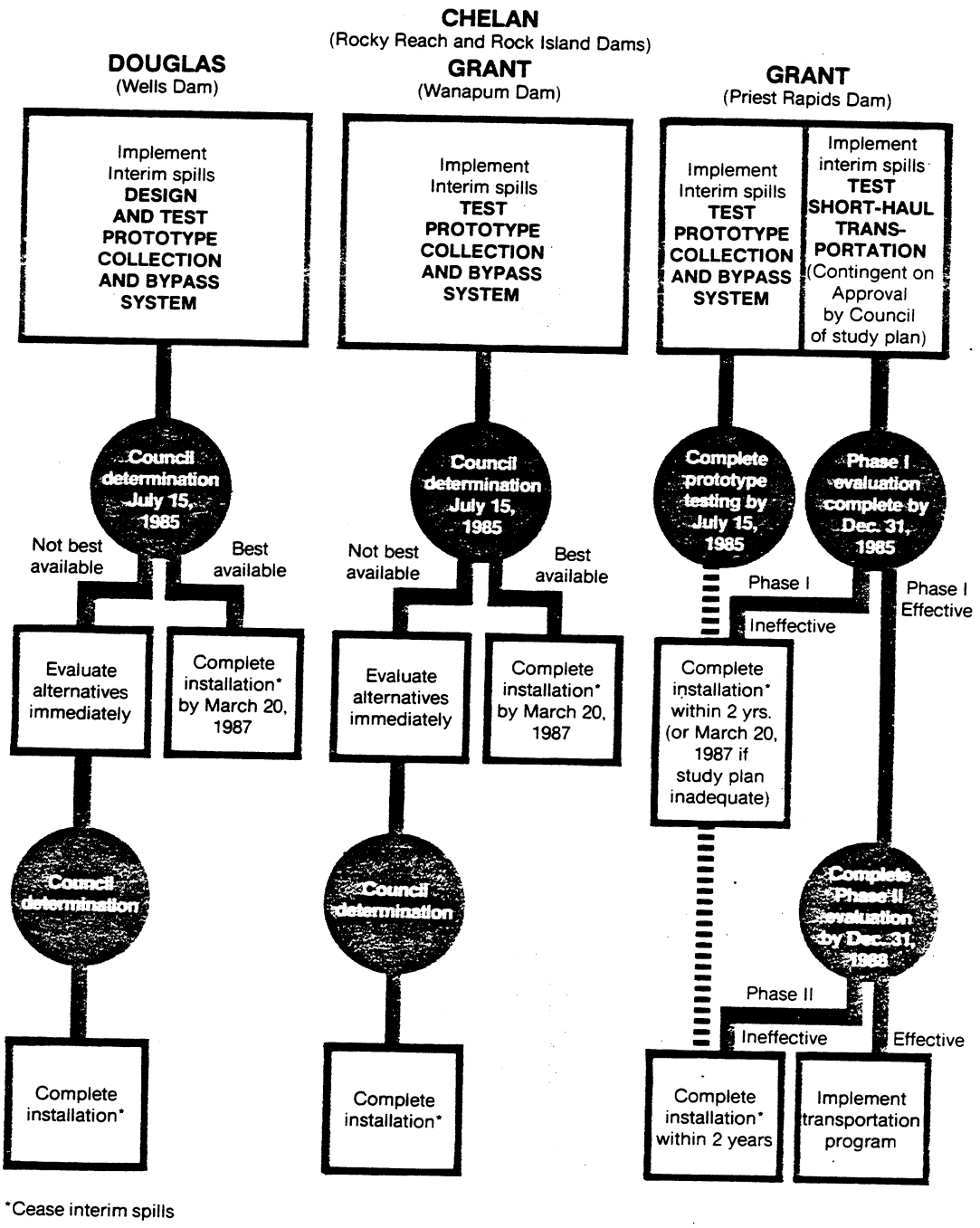
(3) In consultation with the fish and wildlife agencies and tribes, the Corps of Engineers shall develop and implement a plan for spills which will achieve a level of smolt survival comparable to or better than that achievable by the best available bypass and screening systems. This shall be done by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

(4) The Corps of Engineers shall continue studies at The Dalles Dam for the purpose of determining bypass efficiency of the sluiceway. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time. **The Dalles Dam**

Background. The Dalles sluiceway is now operating at its fullest potential as a salmon bypass system. However, a question still remains as to its actual collection efficiency. A study is needed to estimate efficiency accurately.

(5) The Corps of Engineers shall complete the installation of submersible traveling screens and appropriate bypasses in the two Bonneville Dam powerhouses and shall carry out studies to evaluate their effectiveness. These studies shall be completed by December 31, 1984. Proposals for further action shall be made to the Council at that time. **Bonneville Dam**

Figure 6.
Mid-Columbia Passage Implementation Plan



*Cease interim spills

Background. The Corps of Engineers is currently completing installation of submersible traveling screens and bypass systems at the two Bonneville Dam powerhouses. These systems need to be evaluated after they go into operation so that any need for structural and operational improvements can be identified and provision can be made for completion of such changes.

(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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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 continue to conduct studies to evaluate the effectiveness of the current transportation program from Lower Granite and Little Goose dams in reducing juvenile mortalilty at Lower Monumental Dam. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time. If the Council determines that the current transportation program would not be as effective as the best available screening and bypass systems, the Corps shall evaluate alternative screening and bypass systems at Lower Monumental and Ice Harbor dams.

Lower Monumental Dam

(9) In consultation with the fish and wildlife agencies and tribes, the Corps of Engineers shall develop a plan for spills at Lower Monumental Dam which will achieve a level of smolt survival at least comparable to that achievable by the best available collection and bypass system. This shall be done by April 1 of each year. The Corps shall implement such plans until the required studies demonstrate that the effectiveness of the current collection and transportation program is comparable to the best available collection and bypass system, or until a full bypass system is approved by the Council and installed.

Background. The problems at Lower Monumental Dam are similar to those at Ice Harbor Dam with regard to juvenile migration [see Section 404(b)(10)]. 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 of Engineers has initiated 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, and would prefer to see intake screens installed. The Corps, on the other hand, feels that more time is needed to evaluate the program.

(10) Bonneville shall fund the Corps of Engineers to continue its research program on development of permanent solutions to problems of downstream migration associated with Ice Harbor Dam. The program shall include the following studies:

Ice Harbor Dam
Research

(A) A study to determine the horizontal distribution of salmon and steelhead entry into the powerhouse under spill and no-spill conditions when the sluiceway is not operating;

(B) A study to determine the best operating criteria for the sluiceway under spill and no-spill conditions. This study shall (1) evaluate the effects of open sluice gates in attracting salmon and steelhead into the sluiceway, (2) determine the depth of individual gate openings required to balance flows among a combination of open gates to achieve optimum fish attraction, and (3) compare alternative flow patterns identified by the above activities to determine the relative fish attraction characteristics of each. Data will also be gathered to aid in determining the required annual period of operation of a sluiceway bypass; and

(C) A study to determine the effectiveness of the sluiceway as a fish bypass system under spill and no-spill conditions. This study shall include estimates of powerhouse passage and sluiceway passage which, when compared, provide a reliable estimate of sluiceway bypass efficiency under optimum operating conditions. The study shall also determine (1) the mortality rate associated with the sluiceway bypassing, (2) the seasonal and other daily variations in patterns of fish attraction into the sluiceway, and (3) the effects of environmental factors (such as powerhouse loading, forebay water level, and trash accumulation) on the passage of juvenile migrants through the sluiceway.

The Corps of Engineers shall complete these studies by November 15, 1983. Proposals for further action shall be made to the Council at that time.

Interim spills

(11) After consultation with the fish and wildlife agencies and tribes, the Corps of Engineers shall develop and implement a plan for spills at Ice Harbor Dam which will achieve a level of smolt survival comparable to or better than that achievable by the best available bypass system. This shall be done by April 1 of each year until the Council approves a permanent solution to downstream migration problems.

Background. Currently, no approved juvenile bypass system exists at Ice Harbor Dam. Spill is required to protect fish during periods of peak migration. Ice Harbor Dam is equipped with an ice and trash sluiceway that can be operated as a surface-skimming bypass system. However, the efficiency of this bypass system is unknown. Studies at other Columbia River dams have shown that the attraction of juvenile fish into the sluiceway is directly related to the amount of flow which can be passed through it. The Corps of Engineers has begun some of the research necessary to determine the efficiency of the sluiceway bypass system.

Marmot Dam

(12) 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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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.

The Sullivan Plant

(13) The FERC shall require Portland General Electric Company (PGE) to conduct studies to evaluate the juvenile bypass system and screening at the Sullivan Plant. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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.

(14) The Corps of Engineers shall evaluate existing studies and investigate alternative methods of providing adequate downstream fish passage at Foster Dam. This evaluation shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

Foster Dam

Background. Foster Dam is a lowhead 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 less than 500.

(15) 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 of shutdown if necessary to improve fish passage on the South Santiam River.

(16) 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. Construction shall be completed by November 15, 1984.

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.

(17) 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. These studies shall be completed by November 15, 1984. Proposals for further action shall be made to the Council at that time.

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.

(18) 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.

(19) 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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

(20) Bonneville shall fund a study of the homing behavior of fish transported from Lower Granite, Little Goose, and McNary dams. This study shall be completed by November 15, 1987. Proposals for further action shall be made to the Council at that time.

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. The existing study shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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

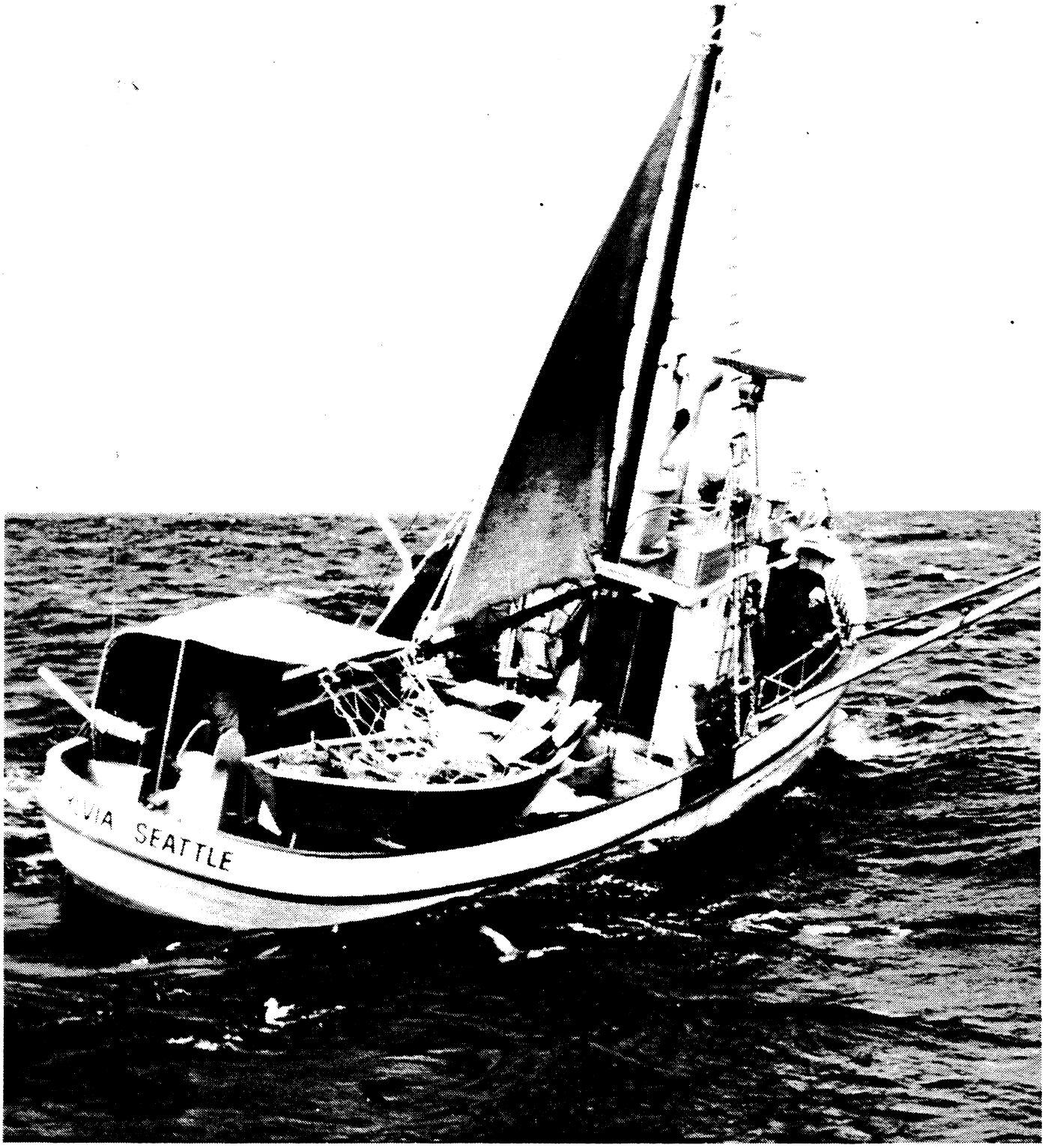
(2) Bonneville shall fund studies to determine the causes of juvenile salmon mortality in mainstem reservoirs, as well as the potential for rearing anadromous fish and improving the survival of hatchery-produced fish in these reservoirs. These studies shall be completed by November 15, 1987. Proposals for further action shall be made to the Council at that time.

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.

Anadromous Fish: Ocean Survival

Section
500



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 7).

(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

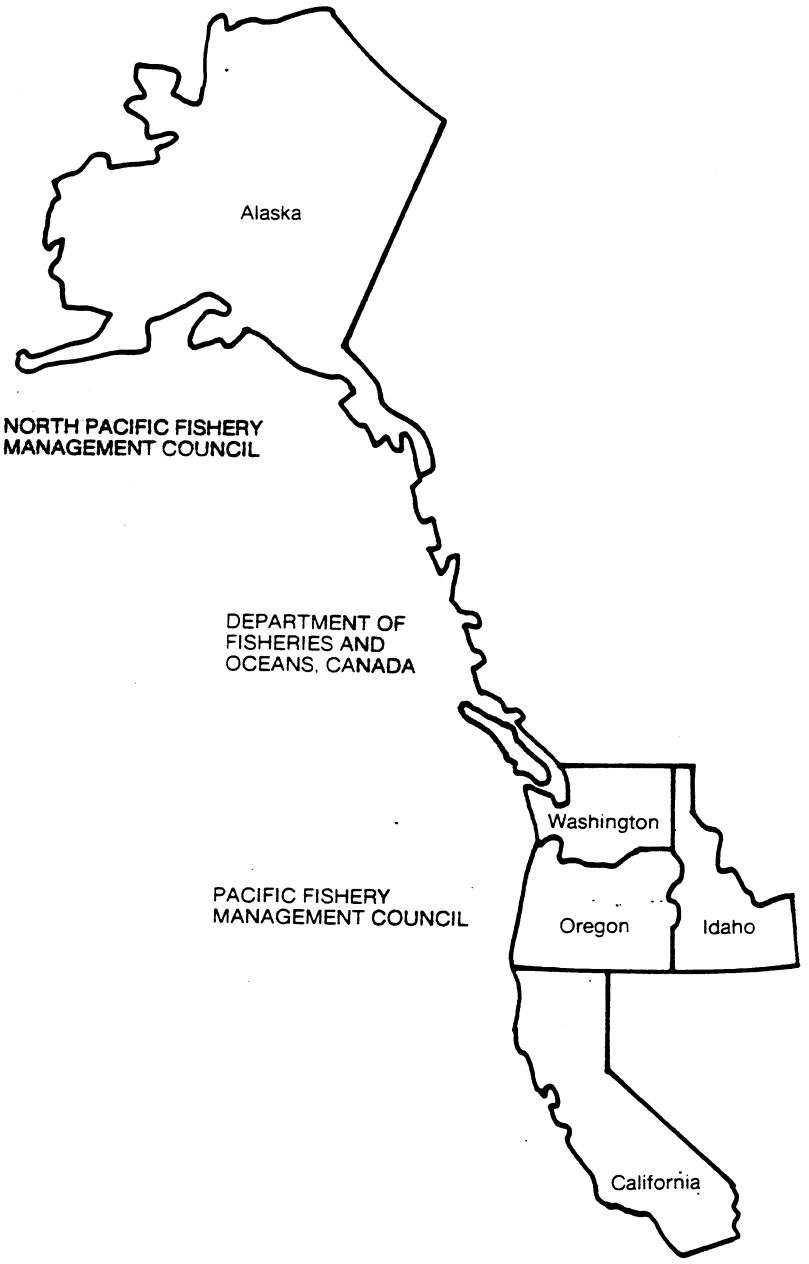
The mixed-stock ocean harvest of the Columbia River Basin stocks occurs primarily off the coasts of Alaska, British Columbia, Washington, Oregon, and California. Ocean harvest in United States waters is regulated by the Pacific Coast states, and by the Pacific Fishery Management Council and the North 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 7.
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 consultation and coordination with these entities, 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.

504. Measures

(a) 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) U.S. Department of State (regarding U.S.-Canada fishery negotiations);

(D) All state and federal fish and wildlife agencies engaged in the implementation of the Northwest Power Act, as well as the Alaska Department of Fish and Game and the California Department of Fish and Game; and

(E) Tribes.

(2) In addition to improving the coordination of ocean and river management, a primary objective of the consultations under Section 504(a)(1) will be to ensure that the following plans and this fish and wildlife program are consistent:

(A) Fishery Management Plans developed pursuant to the Fishery Conservation and Management Act of 1976 (amended in 1980 to be entitled the "Magnuson Fishery Conservation and Management Act") (16 U.S.C. 1801 et seq.); and

(B) 'Management structure' and 'enhancement plans' developed pursuant to the Salmon and Steelhead Conservation and Enhancement Act of 1980.

(b) Funding

Salmon and Steelhead Conservation and Enhancement Act

(1) If the Council determines that adequate controls have been imposed on ocean and river harvest of salmon and steelhead stocks, it will support development of an agreement with 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).

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.

Propagation facilities

(2) The Council will support funding of the design of two new fish propagation facilities referred to in Section 704(i)(2) and (3), which are:

(A) An acclimation pond at John Day Dam; and
(B) A hatchery to enhance fish runs in the Yakima River Basin.

The Council will not approve final funding for the construction of these fish propagation facilities unless adequate controls are imposed on the ocean and river harvest of salmon stocks.

(3) The Council will not support funding of the construction of the acclimation pond at John Day Dam without a commitment to reprogram lower river hatcheries to provide fish for that acclimation pond. The Council will not support funding of any portion of the acclimation pond to be used for sockeye and steelhead until adequate controls are imposed on the river harvest of sockeye and steelhead and will not support funding of any portion of the acclimation pond to be used for any other salmon until adequate controls are imposed on ocean and river harvest.

(4) The Council will not support funding of a hatchery to enhance the Yakima River Basin until (A) adequate controls are imposed on the mixed-stock ocean harvest of salmon (excluding sockeye), and (B) adequate controls are imposed on the river harvest of salmon and steelhead.

(5) 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.

Anadromous Fish: Upstream Migration

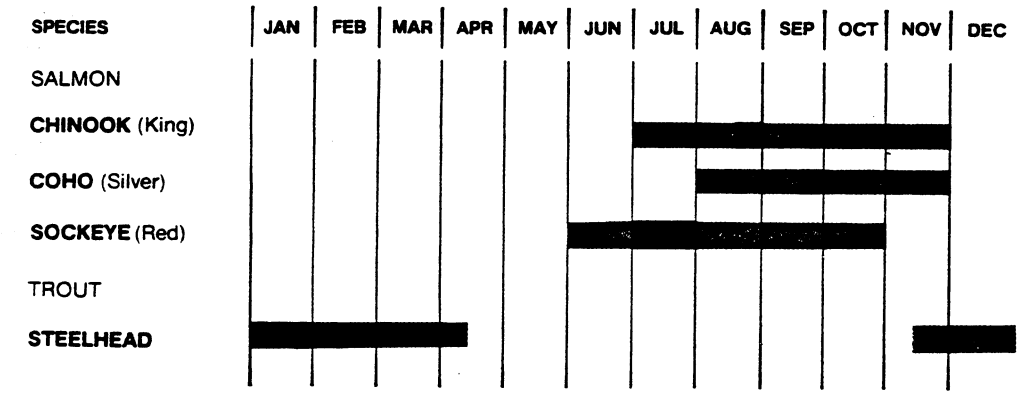
Section
600

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 8). 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 reduces 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 8.
Timing of Upstream Migration

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. These studies shall be completed by November 15, 1984. Proposals for further action shall be made to the Council at that time.

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. By November 15, 1983, the Corps and the mid-Columbia PUDs, as required by the FERC, shall submit recommended spill configuration guidelines to the Council for the projects each operates. 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. These studies shall be completed by November 15, 1984. Proposals for further action shall be made to the Council at that time.

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.

These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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. On November 15, 1983, the Corps shall report to the Council the results of its efforts.

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) Bonneville shall fund the Corps of Engineers to install a new vertical slot counter at the existing east fishway at The Dalles Dam to count adult runs accurately and to improve adult fish passage. The Corps shall complete installation of this facility by November 15, 1985.

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. This shall be done by November 15, 1983. 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 FERC shall determine which entity is responsible for funding studies to investigate adult fish passage problems associated with Portland General Electric Company's (PGE) Clackamas River hydroelectric dams. This determination shall be made by June 15, 1983, and reported to the Council at that time.

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 their fish ladders, but is caused by the Oregon Department of Fish and Wildlife's smolt release program. Summer steelhead smolts that would normally 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.

Tumwater Dam
Dryden Dam

(3) Bonneville shall fund feasibility studies to correct fish passage problems associated with Tumwater and Dryden dams on the Wenatchee River. These studies shall be completed by June 15, 1984. Proposals based on the results of these studies shall be made to the Council at that time.

Background. Tumwater and Dryden dams were not operated as hydroelectric projects after 1957. The remaining fish passage facilities are inadequate, resulting in the delay of adult migrants.

(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. These studies shall be completed by November 15, 1984. Proposals for further action shall be made to the Council at that time.

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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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 Hatchery Propagation

Section
700

701. The Problem

Genetic diversity

Maintenance of genetic diversity of stocks is essential to the vigor and survival of a species. 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 9).

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 can actually 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 fully integrated with natural propagation objectives.

Coordination with harvest management

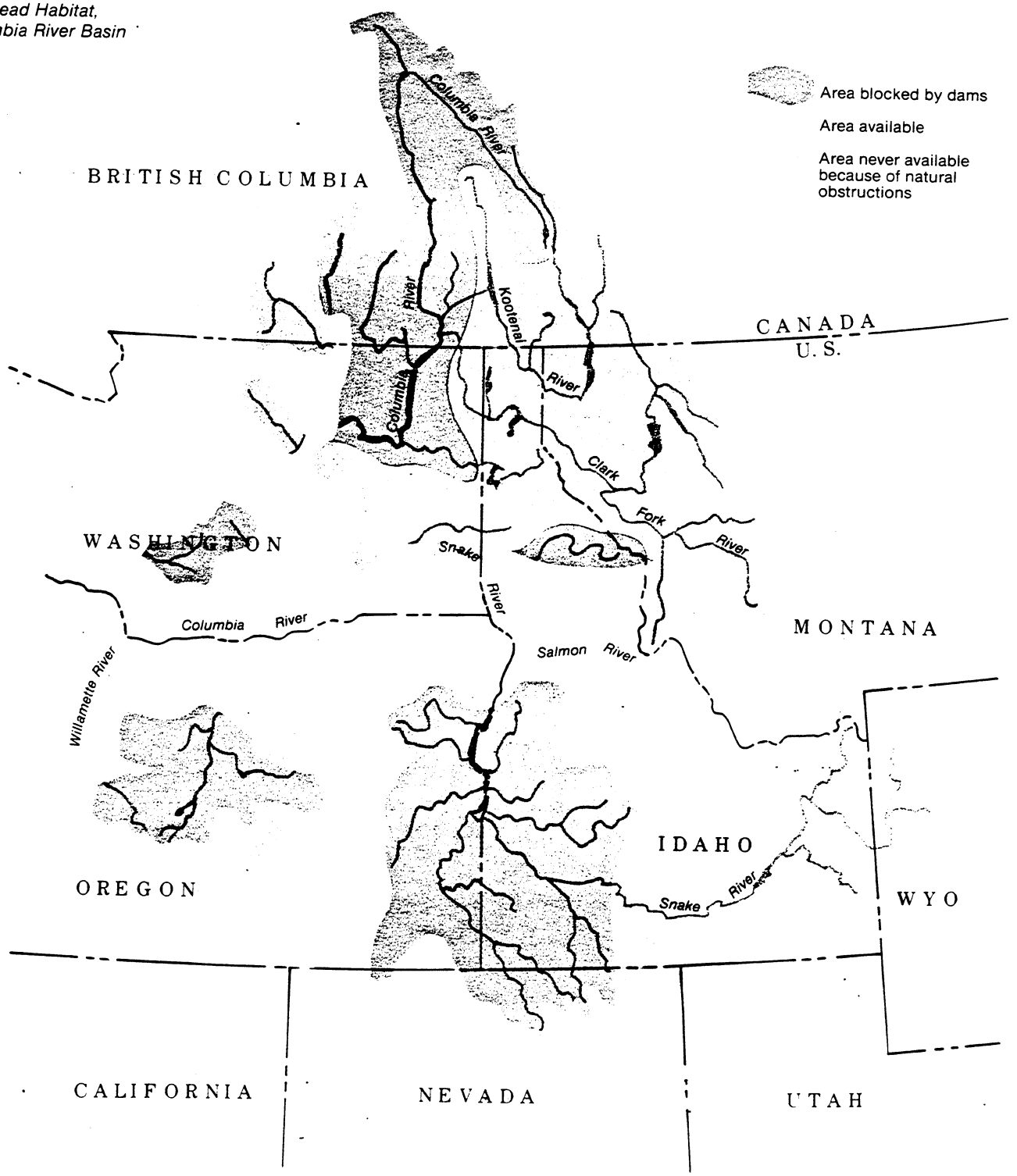
Finally, if the Council's fish propagation objectives are to be implemented successfully, they must be coordinated with harvest management. Until salmon and steelhead harvest management moves further in the direction of 'known-stock' harvest practices rather than a mixed-stock harvest, the Council's 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.

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;

Figure 9.
Anadromous Salmon and Steelhead Habitat, Columbia River Basin



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

Low-capital salmon and steelhead 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,

Integration of natural and hatchery propagation

program measures provide for the establishment of a 'fish propagation panel' consisting of individuals knowledgeable and experienced in hatchery and natural propagation. The panel will assist the Council to determine the extent of hatchery propagation necessary and how it most effectively can be integrated 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.

704. Measures

(a) Coordination of Propagation Measures

Fish propagation panel

(1) By March 15, 1983, the Council will select individuals to make up the panel. The recognized collective knowledge of these individuals will cover 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.

(2) This panel, as directed by the Council, will perform the following tasks:

(A) Develop an inventory of Columbia River tributaries and evaluate their potential for the increase of wild and natural propagation by (1) providing suitable flows, (2) improving spawning, incubation, rearing, and migration habitat, and (3) providing or restoring passage;

(B) When task (A) is complete, establish priorities for improvement projects to accomplish the goals of task (A);

(C) Develop measures to preserve wild fish and enhance natural propagation in the Yakima River Basin (see Section 900);

(D) Develop more detailed hatchery propagation objectives and criteria that are consistent with natural and wild propagation objectives;

(E) Develop a list of potential hatchery sites identified under Section 704(f)(1) in order of priority based on the detailed objectives and criteria developed in (D) above. The Council will recommend funding of hatchery projects based on this list; and

(F) Review all natural and hatchery propagation measures to ensure coordination with the Salmon and Steelhead Conservation and Enhancement Act.

(3) Specific responsibilities of the panel related to these overall assignments are described where appropriate in the following measures. The activities of the panel shall be funded by Bonneville.

(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. These studies shall be completed by June 1, 1983. Results shall be reported to the Council and to the FERC at that time.

(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, the FERC directed Grant County 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 will be 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. These studies shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

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, beginning with a status report by November 15, 1983.

(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 one-year 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. A status report on this study, and proposals for further action, shall be submitted to the Council by November 15, 1983. **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 temperature control devices to control the temperature of the water discharge from Detroit Dam. This study shall be completed by November 15, 1983, and design proposals shall be made to the Council at that time. Upon Council approval, Bonneville shall provide funds to the Corps to construct, operate, and maintain the devices.

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) Upon approval by the Council, Bonneville shall provide funds to the Corps of Engineers to install temperature control devices in the Cougar and Blue River dams to aid in restoration of runs of spring chinook and other species in the upper McKenzie River. Before making a decision, the Council will require a description of the design, an installation schedule, and a listing of anticipated effects on fish. Installation shall be completed by November 15, 1985.

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.

Dworshak Dam

(3) Bonneville shall fund a joint Corps of Engineers/U.S. Fish and Wildlife Service study. This study shall determine the feasibility of installing alterations or additions to the existing water systems so that the temperature of the Dworshak National Fish Hatchery and the Clearwater River may be controlled at the same time to encourage propagation of wild, resident, and anadromous fish. This study shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

Background. The Clearwater River below Dworshak Dam offers a spring and fall steelhead fishery that is supported primarily by plantings from the Dworshak hatchery. Mainstem spawning, if any, has not been documented. Summer operations at Dworshak hatchery require cooler waters from the reservoir. Existing selector gates in the dam can provide waters of the required temperature either to the Clearwater River or the hatchery, but not to both. Providing an alternate or additional water supply to the hatchery would enable regulating the temperature of the hatchery and the Clearwater River to improve propagation of resident and anadromous fish.

(d) Habitat Improvement

(1) Upon approval by the Council, Bonneville shall provide funds for habitat improvement measures in the Columbia River Basin. The fish propagation panel, in consultation with the fish and wildlife agencies and tribes, and the federal land management agencies which have responsibilities for the management of fish and wildlife habitat, shall review the projects shown in Tables 2 (John Day River Basin), 3 (Salmon and Clearwater river basins), and 4 (other Columbia River Basin projects) and shall advise the Council on the priority of measures to be implemented and the dates proposed for completion. The fish propagation panel will require additional information on species and races to be enhanced, habitat improvement methods to be employed, length and locations of stream reaches to be affected, and the potential for propagation enhancement which is anticipated. The Council encourages the development of agreements providing for cost-sharing between Bonneville and the federal land management agencies for the implementation of those measures which are necessary to mitigate non-hydroelectric effects. An example of such measures is the improvement of riparian habitat designed to mitigate the effects of grazing.

SYSTEM SEGMENT	SPECIES	OBJECTIVES						PROJECTS					
		Additional Rearing Habitat	Riparian Revegetation	Reduce Summer Water Temperatures	Repair Dredge Damage	Additional Adult Holding	Open Stream Access	Environmental Assessment Report	Pools to be Constructed	Protective Fencing	Revegetation	Construct Adult Holding Pools	Remove Access Blockage
(A) Main Stem John Day River	Ch & St[1]	X							30[2]				
(B) Deer Creek	St	X	X	X				X	200	X	X		
(C) Murderer's Creek	St	X		X				X	162	X	X		
(D) Field's Creek	St	X						X	X				
(E) East Fork, Beech Creek	St							X					
(F) Clear Creek	Ch & St	X						X	25				
(G) Squaw Creek	Ch & St	X					X	X	80				X
(H) Canyon Creek	St	X						X	60				
(I) Middle Fork John Day R.	Ch & St	X				X		X				15[3]	
(J) Big Boulder Creek	Ch & St	X						X	75				
(K) Granite Boulder Creek	Ch & St	X						X	100				
(L) Clear & Granite Creek	Ch & St	X			X	X						95	
(M) North Fork John Day R.	Ch & St	X			X		X						X

Table 2.
Fish Habitat Improvement Projects. John Day River Basin

[1]Ch = Chinook, St = Steelhead Trout
[2]Number of Pools for Juvenile Rearing
[3]Number of Pools for Adult Holding

Table 3.
Fish Habitat Improvement Projects on Tributaries to the Salmon and Clearwater Rivers

TRIBUTARY	SPECIES	PROBLEM								ENHANCEMENT PROJECTS									
		Irrigation Dewaters Stream	Low Summer Flows	Grazing/Degraded Riparian	Sedimentation & Pollution	Water Temperature	Logging Activities	Channel Degraded	Mining/Dredging	Improve Irrigation Efficiency	Fish Screens	Augment Stream Flow	Control Water Temperature	Riparian Revegetation	Bank Stabilization	Livestock Fencing	Channel Rehabilitation	Storage Dam and Reservoir	Restore Passage
Clearwater River																			
(A) Pole Creek	Ch & St[1]	X								X	X								
(B) Lapwai Creek	St		X	X	X	X						X	X	X					
(C) Potlatch River	St		X	X	X	X	X					X	X	X	X	X			
(D) Clear Creek	Ch & St		X	X	X		X					X	X		X		X	X	
Salmon River																			
(E) Lemhi River	Ch & St	X		X								X		X		X		X	X
(F) Alturas Lake Creek	Ch & So	X		X								X						X	X
(G) Carmen Creek	Ch & St	X	X									X						X	
(H) Lolo Creek	Ch & St			X			X	X						X	X		X		
(I) Red River	Ch			X				X						X	X	X			
(J) East Fork/South Fork Salmon River	Ch & St			X										X	X				
(K) Camas Creek	Ch & St			X				X						X		X			
(L) Marsh Creek	Ch & St			X				X						X		X	X		
(M) Bear Valley Creek	Ch & St			X	X			X	X					X	X	X	X		
(N) Elk Creek	Ch & St			X										X	X	X			
(O) Panther Creek	Ch & St				X				X					X		X			
(P) East Fork, Salmon River	Ch & St			X				X						X		X			
(Q) Yankee Fork, Salmon River	Ch & St				X				X					X		X			
(R) Jordan Creek	Ch & St			X				X	X					X	X		X		
(S) Valley Creek	Ch & St			X										X	X	X			
(T) Upper Salmon River	Ch & St	X		X										X	X	X			

[1]Ch = Chinook, St = Steelhead Trout, So = Sockeye

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 its latest reports on these projects by February 15, 1983.

(e) Passage Restoration

(1) Upon approval by the Council, Bonneville shall provide funds for anadromous fish passage restoration or improvement measures in the Columbia River Basin. The fish propagation panel, in consultation with the fish and wildlife agencies and tribes and the federal land management agencies which have responsibilities for the management of fish and wildlife habitat, shall review the projects shown in Table 5 and advise the Council on the priority of measures to be implemented and the dates proposed for completion. The fish propagation panel will require additional information on species and races to be enhanced, passage restoration methods to be employed, length and locations of stream reaches to be affected, and the potential for propagation

RIVER SYSTEM/TRIBUTARY	PROBLEM	SPECIES
Deschutes River	Gravel degradation	Steelhead Fall chinook
Bakeoven Creek Buckhollow Creek Trout Creek	Riparian vegetation Increased flows	Fall chinook Summer chinook
Deschutes River (Warm Springs Reservation)		
Shitite Creek Beaver Creek Mill Creek Badger Creek Warm Springs River	Under Bonneville study	Under study
Clackamas River		
Fish Creek Wash Creek	Channel damage Road construction Logging Riparian vegetation	Coho Winter and summer steelhead
Hood River		
Lake Branch Project	Channel structure Riparian vegetation	Winter and summer steelhead
Grand Ronde River		
Phillips Creek Josephs Creek	Inadequate pool: riffle Riparian vegetation	Summer steelhead Spring chinook
Entiat River		
Burns Creek Fox Creek	Riparian vegetation Fire damage	

Table 4.
Other Fish Habitat Improvement Projects in the Columbia River Basin

enhancement which is anticipated. The Council encourages the development of agreements providing for cost-sharing between Bonneville and the federal land management agencies for the implementation of those measures that are necessary to mitigate non-hydroelectric effects.

Background. A potential exists for increasing the capacity of several river systems for propagation of salmon and steelhead by designing and installing juvenile passage facilities at projects that now have none or whose facilities do not function. Alternatively, the emptying of reservoirs at critical times of the year has proven effective in releasing smolts. Other projects involve development or restoration of passage for adult fish. This will open many miles of spawning and rearing habitat for salmon and steelhead.

(2) 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. Construction shall be completed by November 15, 1985. The FERC shall require PP&L to assume full responsibility for annual operation and maintenance costs of these facilities.

Condit Dam

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 has ordered PP&L to study the feasibility of providing fish passage past the dam. This study was completed in September 1982. Also, the Klickitat County PUD is funding fisheries studies required under their preliminary permit for the proposed White Salmon River. These studies are examining the potential for increased anadromous fish propagation upstream of Condit Dam and the effect of improved fish flows.

Table 5.
Passage Development and Restoration Projects in Washington, Oregon, and Idaho

PROJECT/RIVER	PROBLEM	RECOMMENDATION	SPECIES/HABITAT POTENTIAL
(A) Enloe Dam Similkameen R.	Passage blocked	Remove or ladder dam	Coho, chinook, steelhead 100 miles spawning & rearing habitat
(B) Box Canyon & Entiat Falls Entiat R.	No passage facilities	Feasibility study Construct ladder	Spring chinook, steelhead 10 miles
(C) Cougar Dam McKenzie R.	Downstream passage facility failure. Reservoir suited to salmonid rearing	Construct downstream and adult collector systems. Follow-up study	Spring chinook, sockeye use reservoir for rearing
(D) Blue River Dam McKenzie R.	No passage facilities. Reservoir suited to salmonid rearing	Construct adult collection facility. Juvenile release by reservoir evacuation	Spring chinook use reservoir for rearing
(E) Collowash Falls Collowash/ Willamette R.	Natural barrier to adult passage	Construct fishway	Spring chinook, coho, steelhead 8.4 mile spawning and rearing habitat
(F) Falls on Little Falls Creek Willamette R.	Natural barriers to adult passage	Construct fishway	Spring chinook, steelhead, 6 miles of habitat
(G) Falls on Klaskanine R.	Natural barrier to adult passage	Construct fishway	Coho, steelhead, sea-run cutthroat 10-12 miles spawning and rearing habitat
(H) Meadow Creek, Clearwater R.	Natural rock falls	Stair-step blast	Steelhead 15 miles
(I) Crooked River, Clearwater R.	Culvert blocks passage. Riparian habitat destroyed by mining	Replace culvert with bottomless arch type. Level dredge tailings. Revegetation	Spring chinook 9 miles
(J) Crooked Fork Lochsa River, Lochsa R.	Natural rock barrier	Blast removal of a barrier	Steelhead 6 miles
(K) Colt Creek Lochsa R.	Debris barrier	Remove debris	Spring chinook 6 miles
(L) Eldorado Creek, Clearwater R.	Natural rock barriers	Blast out barriers, create stair-step pools	Spring chinook, steelhead 10 miles
(M) Badger Creek Lochsa R.	Culvert blocks passage	Replace culvert with bottomless arch type	Steelhead 2 miles
(N) Wendover Creek Lochsa R.	Culvert partially blocks passage	Replace culvert with bottomless arch type	Steelhead 2 miles
(O) Boulder Creek Little Salmon R.	Natural rock falls	Blast removal of barrier	Spring chinook, steelhead 10-12 miles
(P) Cabin Creek	Culverts block passage	Replace 3 culverts with a bridge	Summer chinook 12 miles
(Q) South Fork Salmon River Salmon R.	Logs and debris	Remove blockage	Summer chinook 15 miles
(R) Touchet R.	Irrigation diversion; culvert blocks passage	Ladder; replace culvert with open arch type	Steelhead
(S) Klickitat R.	Natural barriers to adult passage	Ladder	Spring chinook, coho, steelhead
(T) Umatilla R.	Stream channel/ irrigation diversions	Channel: correct upstream and downstream passage problems	Spring chinook, fall chinook, coho, steelhead
(U) White River Falls, Deschutes R.	Natural rock falls	Feasibility study to open passage	Fall chinook, steelhead
(V) Lake Branch Project, Hood R.	Natural rock falls; log jams	Open passage; remove blockage	Winter and summer steelhead

(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. The study shall be completed by June 1, 1984. Proposals for further action, including any studies required to supplement available data, shall be made to the Council at that time.

(g) Release Sites for Hatchery-Reared Fish

(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, which will be defined by the fish propagation panel under Section 704(f)(1). The basinwide studies shall be completed by April 1, 1984. Proposals for reprogramming hatchery operations and a release plan shall be made to the Council at that time. The Council will adopt a comprehensive plan for reprogramming lower river hatcheries. This shall be done by November 15, 1984. 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.

Needs of upriver stocks

Reprogramming plan

(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. The fish propagation panel will develop detailed recommendations on the selection of brood stocks, production levels, and release sites. The fish and wildlife agencies and tribes shall submit a status report to the Council by February 15, 1983.

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

(1) Priority shall be given to improving and reprogramming propagation at existing hatchery facilities over construction of new facilities.

Priority

(2) Bonneville shall fund an evaluation by the fish propagation panel of existing and proposed hatchery facilities to determine the most effective rearing programs. This evaluation will be completed by November 15, 1984. Proposals for further action will be made to the Council at that time.

(3) Upon approval by the Council, Bonneville shall fund an assessment of Columbia River Basin spawning stocks to ensure proper use of these stocks in hatcheries so that genetic integrity is maintained. The assessment shall be completed by November 15, 1983. Proposals for further action shall be submitted to the Council at that time. The assessment shall include an evaluation of all stocks in terms of the following characteristics:

Fish stock assessment

(A) Species, strain, or stock;
(B) Run timing;
(C) Disease tolerance;
(D) Stock size and ability to reproduce;
(E) Migration characteristics;
(F) Survival and fecundity of the stock;
(G) Age and size composition, life stages; and
(H) Current rearing and release methods.

Disease control

(4) Bonneville shall fund development of methods to improve diagnosis and control of fish disease and parasites in hatchery facilities. The development of methods shall be completed by November 15, 1985. Proposals for further action shall be made to the Council at that time. The fish propagation panel shall coordinate implementation of the recommended methods at hatcheries in the Columbia River Basin.

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

Smolt survival index

(5) Upon approval by the Council, Bonneville shall provide funds to develop a sensitive, reliable index by which smolt quality and readiness to migrate can be predicted. The index shall be validated by conducting a test using a selected species and selected hatchery. This work shall be completed by November 15, 1985. The fish propagation panel will then use the index to develop a proposed program of hatchery practices to improve smolt survival.

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.

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 for imprinting before release. Returning adults would provide an improved fishery for the Umatilla tribes and all other fishermen.

John Day Dam

(2) Upon approval by the Council pursuant to Section 504(b)(2) and (3), Bonneville shall fund the design, construction, operation, and maintenance of an acclimation pond to be located above John Day Dam. This pond will be used to imprint fall chinook.

Background. In an effort to restore the level of adult returns to the John Day Pool, 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 necessary to imprint the smolts with water from the John Day Pool.

Yakima Reservation

(3) Upon approval by the Council pursuant to Section 504(b)(4), Bonneville shall fund the design, construction, operation, and maintenance of a hatchery to enhance the fishery for the Yakima Indian Nation as well as all other harvesters, also referred to in Section 904(e)(1). The Yakima Indian Nation will be responsible for operation and maintenance of the facility.

Background. The Outlet Creek Springs water supply coupled with available acreage appear to make it a prime location for a hatchery on the Yakima Indian Reservation. However, this site will be evaluated in detail according to the criteria developed in Section 704(a)(2)(E).

(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.

Other locations

Background. The Council anticipates that the fish propagation panel may find additional hatchery capacity necessary for the restoration of Columbia River fish and particularly natural fish.

(j) Construction of Low-Capital Propagation Facilities

(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)(3) and (4) 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.

Columbia River Basin

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). The program shall be implemented by November 15, 1985.

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. The fish propagation panel will work with the Salmon and Steelhead Advisory Commission and in consultation with the fish and wildlife agencies and tribes to identify research needs and develop a program to supplement natural stocks with some hatchery fish.

Supplementing naturally spawning stocks with hatchery fish

(2) Upon approval by the Council of a study plan to be developed by the fish propagation panel, Bonneville shall provide funds to study the best method of supplementing natural stocks of spring chinook with hatchery stocks in the Willamette River. This study shall be completed by November 15, 1983. Proposals for further action shall be made to the Council at that time.

Based on these proposals, the fish propagation panel will develop a program for planting hatchery-reared chinook stocks. Bonneville shall fund this program upon approval by the Council.

Known stock fisheries

(3) Bonneville shall fund development of a plan to use some hatchery fish to develop a known stock fishery. The plan shall be completed by November 15, 1984. Bonneville shall fund this program upon approval by the Council.

Background. The harvest of known stocks is particularly useful when the population harvested comprises a mixture of stocks, one or more of which is in a depleted state. Under these conditions, the depleted stock would be vulnerable to over-harvest.

Section
800

Resident Fish

Resident Fish Species

Kokanee	*Oncorhynchus nerka*
Cutthroat trout	*Salmo clarki*
Rainbow trout	*Salmo gairdneri*
Brown Trout	*Salmo trutta*
Dolly Varden/bull trout	*Salvelinus confluentus*
Brook trout	*Salvelinus fontinalis*
White sturgeon	*Acipenser transmontanus*
Mountain whitefish	*Prosopium williamsoni*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*Micropterus salmoides*
Walleye	*Sitzostedion vitreum*
Yellow perch	*Perca flavescens*
Channel catfish	*Ictalurus punctatus*
Bullheads	*Ictalurus spp.*
Sunfishes	*Lepomis spp.*
Crappies	*Pomoxis spp.*
Ling (burbot)	*Lota lota*
American shad	*Alosa sapidissima*
Northern squawfish	*Ptychocheilus oregonensis*

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 no anadromous fish runs remain.

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 there are no anadromous fish runs.

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

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 of 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.

Big Fork Dam
Minimum flow

(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.

Research

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

(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.

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

(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

(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:

Hungry Horse Reservoir
Libby Reservoir
Operating guidelines

(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. Ir. 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 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.

(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.

Mitigation

Hungry Horse Dam
Kerr Dam

(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:

(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.

Flint Creek Project

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

Milltown Dam

(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.

Post Falls 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.

Banks Lake

(10) The Bureau of Reclamation, in consultation with the fish and wildlife agencies, tribes, and the Washington Department of Ecology, shall develop operating procedures for Banks Lake designed to protect reproduction of kokanee. The Bureau shall submit its proposed procedures for the drawdown of Banks Lake to the Council by November 15, 1983.

(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) The Corps of Engineers shall remove accumulated material in Kootenai River tributary deltas. The Montana Department of Fish, Wildlife and Parks will determine when accumulated materials interfere with migration of spawning fish.

(e) Additional Restoration Measures

Painted Rocks Reservoir

(1) Upon approval by the Council, Bonneville shall fund 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 3200 acre-feet base flow and 5000 acre-feet already purchased in perpetuity by the Montana Department of Fish, Wildlife and Parks, Western Mountain Fish and Game Association, and Ravallie County Fish and Wildlife Association. The

Montana Department of Fish, Wildlife and Parks will submit a proposal for the purchase of such water to the Council by June 1, 1983.

(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) Bonneville 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.

Snake River and Tributaries

(8) Upon approval by the Council, Bonneville shall fund a study to determine the potential for artificial propagation of white sturgeon. This study shall be coordinated with similar investigations being conducted by the Montana Department of Fish, Wildlife and Parks and referred to in Section 804(b)(1)(C).

(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) Assessment of the suitability of existing habitat for species now present as well as those to be considered for possible introduction. The assessment shall consider availability of suitable spawning, rearing, food, and cover habitat, as well as hydrological, limnological, and water quality conditions.

(B) Determination of the most feasible methods to improve suitability or increase availability of habitat for desirable species, considering the needs of individual species, project operation, costs, and other constraints.

(C) Determination of whether there is sufficient food in the lower Clark Fork reservoirs for game fish to prosper. If necessary, this portion of the study shall recommend methods to improve food production, such as stabilizing water levels along the shoreline to encourage establishment of a productive littoral zone, or providing artificial substrate to increase insect production.

(D) Identification and listing of areas where spawning and rearing habitat could be provided for certain species of resident fish, and determination of the water levels required. An evaluation shall be made of the identified areas based on shoreline topography, water level changes, and the potential for establishing a productive littoral zone.

(E) Determination of the potential of Marten Creek and the Vermillion River as spawning streams. The study shall determine whether access to spawning areas could be provided best by maintaining water levels at Noxon Rapids Reservoir, constructing an access channel, or other means.

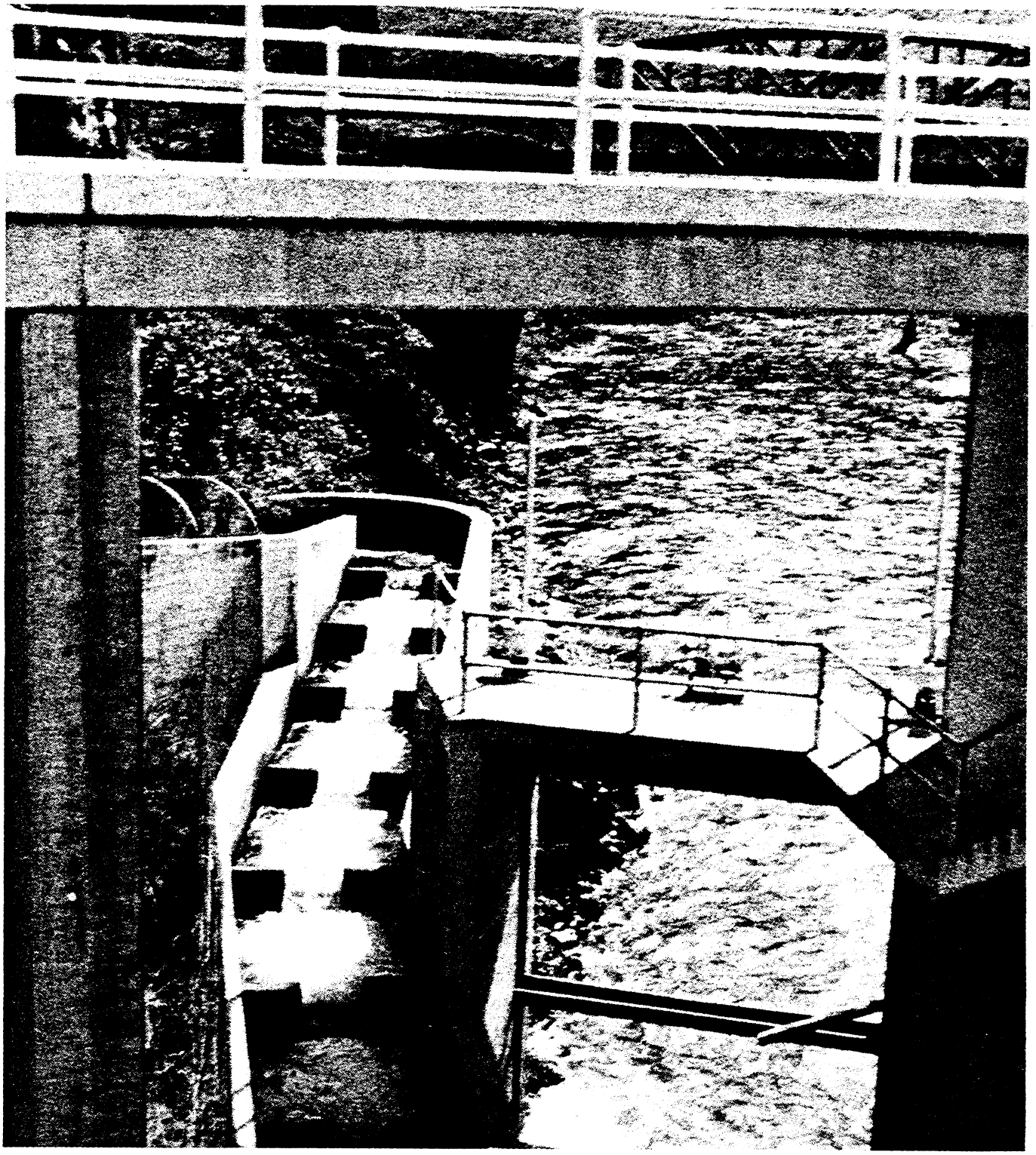
(F) Determination of the spawning potential of 1.5 miles of river habitat below Thompson Falls Dam, addressing the problems of scouring of spawning-sized gravel and maintenance of favorable spawning flows.

(G) Identification of important spawning tributaries and determination of appropriate measures to increase the reproductive success of reservoir fish in tributaries to Cabinet Gorge, Noxon Rapids, and Thompson Falls reservoirs.

(H) Determination of whether water quality, flows, spawning substrate, channel and hydraulic characteristics, and streamside cover in the lower Clark Fork reservoirs are suitable for survival, growth, and reproduction of lake and mountain whitefish, brown trout, and largemouth bass. This portion of the study shall also identify opportunities for passage improvements as well as suitable flows, spawning substrate, channel and hydraulic characteristics, water quality, and streamside cover.

Yakima River Basin Enhancement

Section
900



901. The Problem

Demand for irrigation water

The Yakima River Basin (Figure 10) 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 off-site 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.

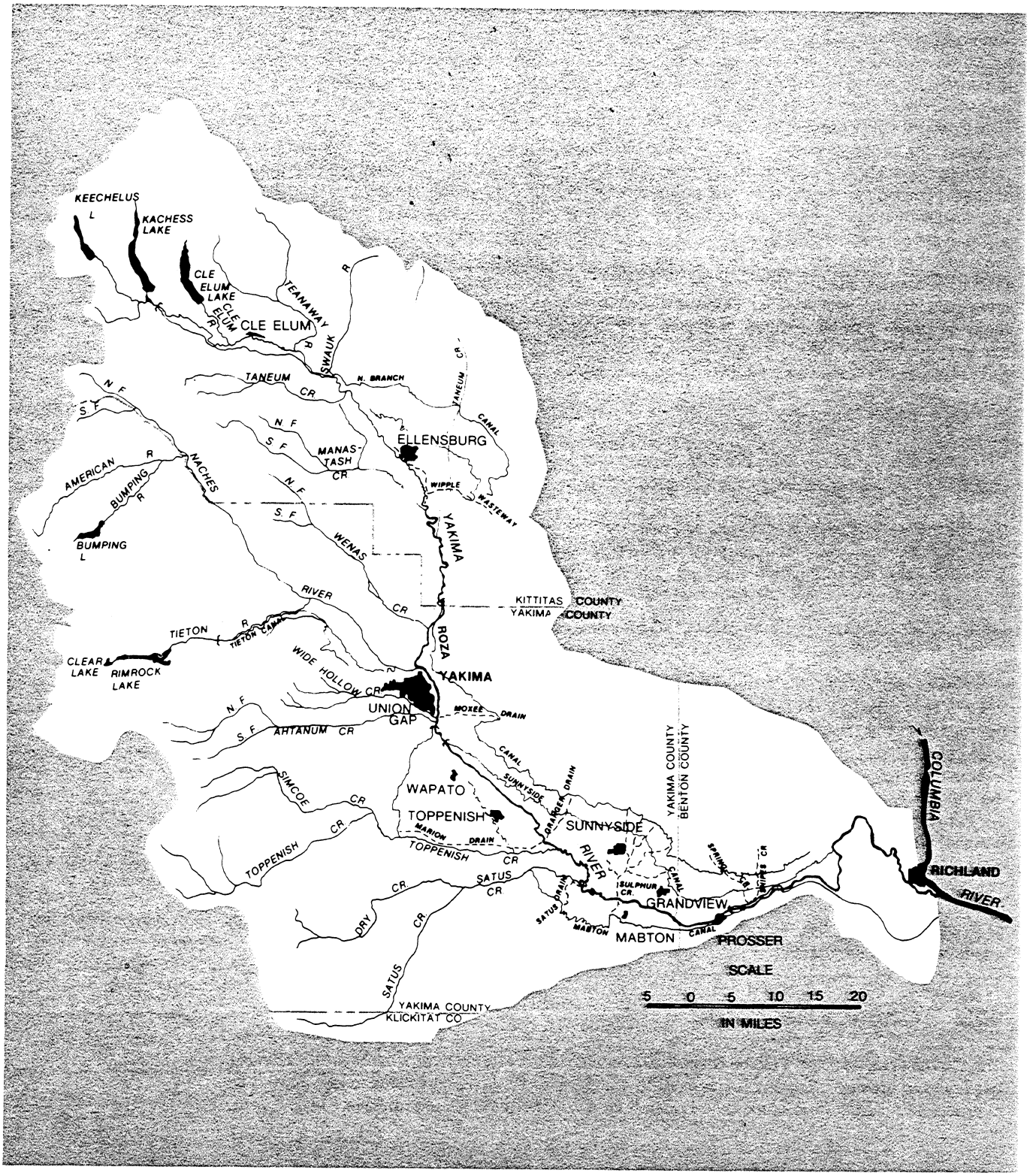
903. Council Response

The Council has adopted Yakima River Basin measures to mitigate hydroelectric impacts in the basin and to provide off-site 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 10.
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 is currently conducting a comprehensive study to determine the flow requirements for anadromous fish. The results of this study, which are expected to be available in late 1983, will provide the Council with better information for the establishment of basinwide flows for anadromous fish protection. Results of the study would 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 has also been used for frost protection of crops, 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 11, 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. The Council will approve program measures as expeditiously as possible consistent with the imposition of adequate controls on ocean and river harvesting of salmon and steelhead stocks, as identified in Section 504. 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 will also

Coordination

Site identification

evaluate the use of reregulating dams to provide maximum flexibility in managing the additional stored water.

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 FERC shall require Pacific Power & Light Company to install by February 15, 1984, the best available fish screening devices and a bypass system at Wapatox Dam. 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 FERC shall require Pacific Power & Light Company to provide such flows at Wapatox Dam. 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. This information and data shall be submitted to the Council by February 15, 1983.

(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) Upon approval by the Council, Bonneville shall fund the Bureau of Reclamation for renovation and repair of adult and juvenile fish passage facilities at Roza Dam. Specific funding shall be provided to:

(A) Provide a gate on the auxiliary water supply air vent;

(B) Convert to a vertical slot fishway (but only after the Council is convinced that such construction is necessary and that a modification of existing operating procedures will not solve the problem);

(C) Repair the overflow gate to allow entrance velocity control;

(D) Extend protective fishway screens;

(E) Improve outdated fish screening and bypass facilities to comply with current design standards; and

(F) Install a self-cleaning bar screen in the wasteway.

Prosser Dam

(2) Upon approval by the Council, Bonneville shall provide funds to the Bureau of Reclamation for construction of a third vertical slot fishway located midstream on Prosser Dam, and for improvement of the fish screening and bypass facilities to meet current design standards. To obtain Council approval of the new fishway, the fish agencies and tribes shall provide evidence that the two existing fishways are inadequate. If approved, the fish ladder shall be a double-slot structure with entrances on each side and a dual auxiliary water supply system.

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 6. All fish screening facilities shall meet current screening design standards.

(5) Upon approval by the Council, Bonneville shall fund a study to evaluate the relocation of juvenile fish screens at Ellensburg Town Diversion Dam. If the study indicates that screening at a new location would protect juveniles, Bonneville shall fund the construction of a vertical slot fishway on the right bank of the 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) Upon approval by the Council of siting, design and operation plans, and release methods, Bonneville shall fund construction by the Yakima Indian Nation of a hatchery for the enhancement of the Yakima River Basin in compliance with the requirements of Section 504 and in accordance with the appropriate measures in Section 704.

Table 6.
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	Fish passage facility
(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

Section

1000

Wildlife

1001. The Problem

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 harrassment of wildlife, and added to increased erosion and sedimentation in the Columbia River and its tributaries.

Habitat loss

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.

Beneficial effects

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 off-site 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.

Off-site enhancement

The Council also has included a number of measures for off-site 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. This shall be done prior to November 15, 1983.

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.

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 by November 15, 1983. This report 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 approval by the Council, after consultation with the wildlife agencies, tribes, federal project operators and regulators, and Bonneville customers, Bonneville shall fund studies to measure the losses of wildlife and wildlife habitat and establish mitigation levels at the projects listed in Table 7. An analysis of existing data, including photographic records, will be used to document the existence and extent of wildlife habitat before and after construction of each project and to determine suitable sites for island protection, subimpoundments, islands, nesting areas, and other mitigation and enhancement methods. A mitigation and enhancement plan for each facility detailing specific recommendations shall be submitted to the Council by the date indicated in Table 7.

(3) Should it be determined from either consultation or the mitigation status report prepared in Section 1004(b)(1) that satisfactory mitigation has been achieved or that a level of mitigation can be agreed upon by all parties for a particular project, then the Council will eliminate that project from the list in Table 7.

(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 by November 15, 1983.

(d) Acquisition of Off-Site Wildlife Habitat

Criteria for acquisition

(1) The Council will develop criteria for acquisition of land to mitigate the effects of the hydroelectric system on wildlife and its habitat in the Columbia River Basin if such land acquisition appears necessary pursuant to Section 1004(b)(1) and (2). The Council will establish and publish such criteria by June 1, 1983. The Council will then consider acquisition proposals for specifically identified land, including whether the operation and maintenance of such land would also be funded.

(2) The Council will consider approval of funding the acquisition of suitable off-site wildlife range for the projects listed in Table 8. The acquisition of range for these projects will be based upon the criteria established in Section 1004(d)(1).

Table 7.
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1004(b)(2)

PROJECT	COUNCIL CONCERNS
Bonneville Dam[1]	Emphasis should be placed on identifying losses of wildlife habitat from inundation 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.
John Day Dam[2]	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 affects on wildlife.
McNary Dam and McNary #2 Powerhouse[1]	The Corps of Engineers and the U.S. Fish and Wildlife Service are currently evaluating the mitigation needs for the McNary #2 Powerhouse. A revised report under the Fish and Wildlife Coordination Act will be completed in October, 1983. These reports should be the base for determining future mitigation needs.
Hells Canyon Complex[1]	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.
Hanford Reach[2]	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 on particular dams.
Grand Coulee Dam[2]	Impacts to wildlife from the initial inundation and current water level fluctuations should be thoroughly analyzed.
Hungry Horse Dam[4]	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[3]	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 need 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.

Table 7.
Hydroelectric Projects at which Mitigation and Enhancement Plans will be Developed Pursuant to Section 1004(b)(2) (Continued)

PROJECT	COUNCIL CONCERNS
Kerr Dam[3] (Continued)	**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). Proposed interim measures shall be submitted to the Council by November 15, 1983, and shall include a scope of work, schedule, alternatives, and costs.
Clark Fork Projects[4]	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.
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, and Black Canyon Projects[3]	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).

Mitigation plan to be submitted to Council by:

[1]November 15, 1984

[2]November 15, 1985

[3]November 15, 1986

[4]November 15, 1987

Table 8.
Acquisition of Off-Site Wildlife Habitat

PROJECT	
Hells Canyon Complex	Acquisition of suitable off-site wildlife range in the states of Idaho and Oregon near the Hells Canyon hydroelectric complex.
Libby Dam	Acquisition of suitable off-site wildlife range as mitigation for the remaining balance of 9500 acres of an amount previously authorized by Congress.
Grand Coulee Dam	Acquisition of suitable off-site 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 on- or off-site 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).

Establishment of Fish and Wildlife Committee

Section
1100

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 has often 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 is also 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 sufficiently coordinated and integrated 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' interest 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) On November 15, 1982, 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) After November 15, 1982, pursuant to the requirements of section 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) Salmon and Steelhead Advisory Commission;

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

(E) Bonneville customers;

(F) State water management agencies;

(G) Irrigation districts;

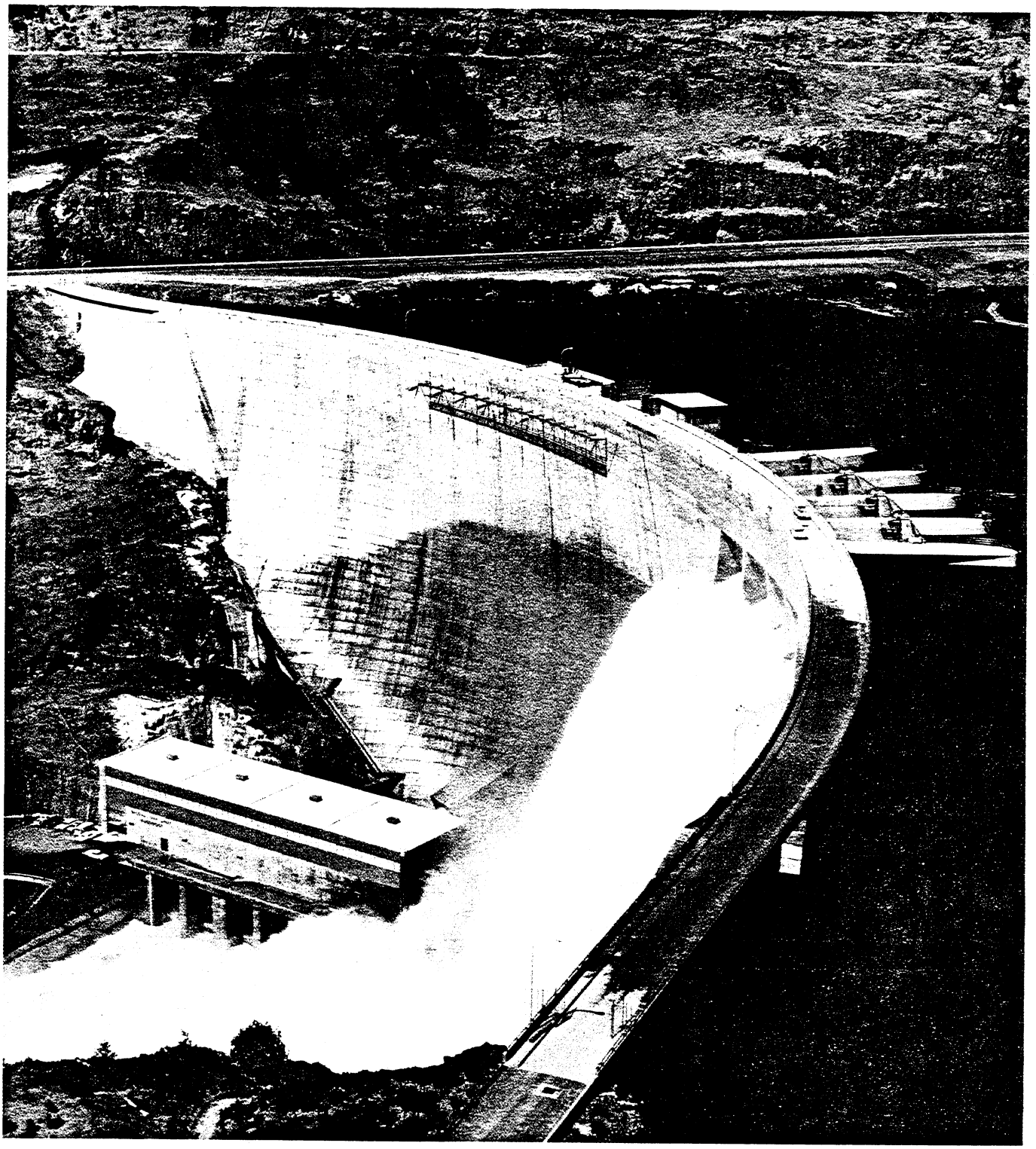
(H) Federal land management agencies;

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

(J) Interested citizen groups.

Future Hydroelectric Development

Section
1200



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.

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 1004;

(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.

(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. Explanation

(b) Cumulative Effects

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

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 shall also 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) 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

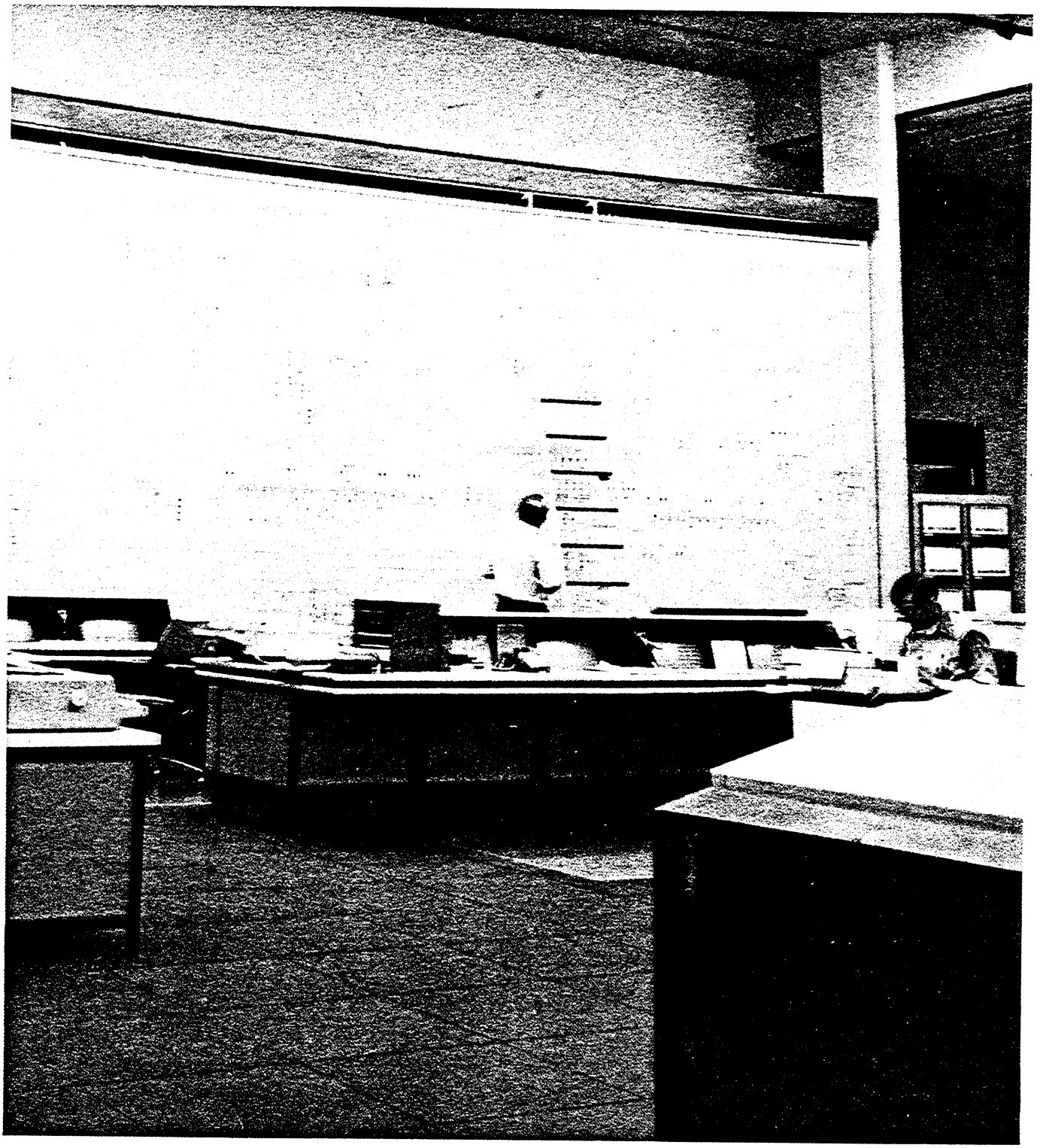
(3) The Council expects the federal and state fish and wildlife agencies to incorporate pertinent elements of this program in the terms and conditions which they apply to projects exempted from licensing under FERC exemption procedures. The Council also requests the federal land managers to incorporate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

Section
1300



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 decisionmaking 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 were also 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.

FERC licensing

(4) Section 1304(a)(1) and (2) shall be interpreted to mean that the FERC shall initiate proceedings by January 15, 1983 to supplement license conditions or to take other actions as necessary to implement the Council's program.

Compliance

(5) 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 prior to November 15, 1983. Prior to this date, each entity shall make its best effort to coordinate and consult to the fullest extent possible in order to carry out program measures.

(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. Such plans shall be developed and presented to the Council by November 15, 1983. 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.

Section

1400

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. Therefore, the Council will wait until November 15, 1983, before considering recommendations for amendments. It will consider recommendations for amendments once every two years thereafter. 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.

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 beginning on November 15, 1983, and on November 15 every two years thereafter. 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. These forms will be available prior to November 15, 1983. 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.

Threshold review

(3) The Fish and Wildlife Committee will conduct a review of each application and, by December 15, it will do one of the following:

(A) Accept the application for Council consideration;

(B) Return the application to the applicant for minor modifications and refiling with the Council by January 15; or

(C) Return the application for substantial failure to meet the requirements described in Section 1404(b)(2) and in the application form.

Council action

(4) 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.

(5) 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.

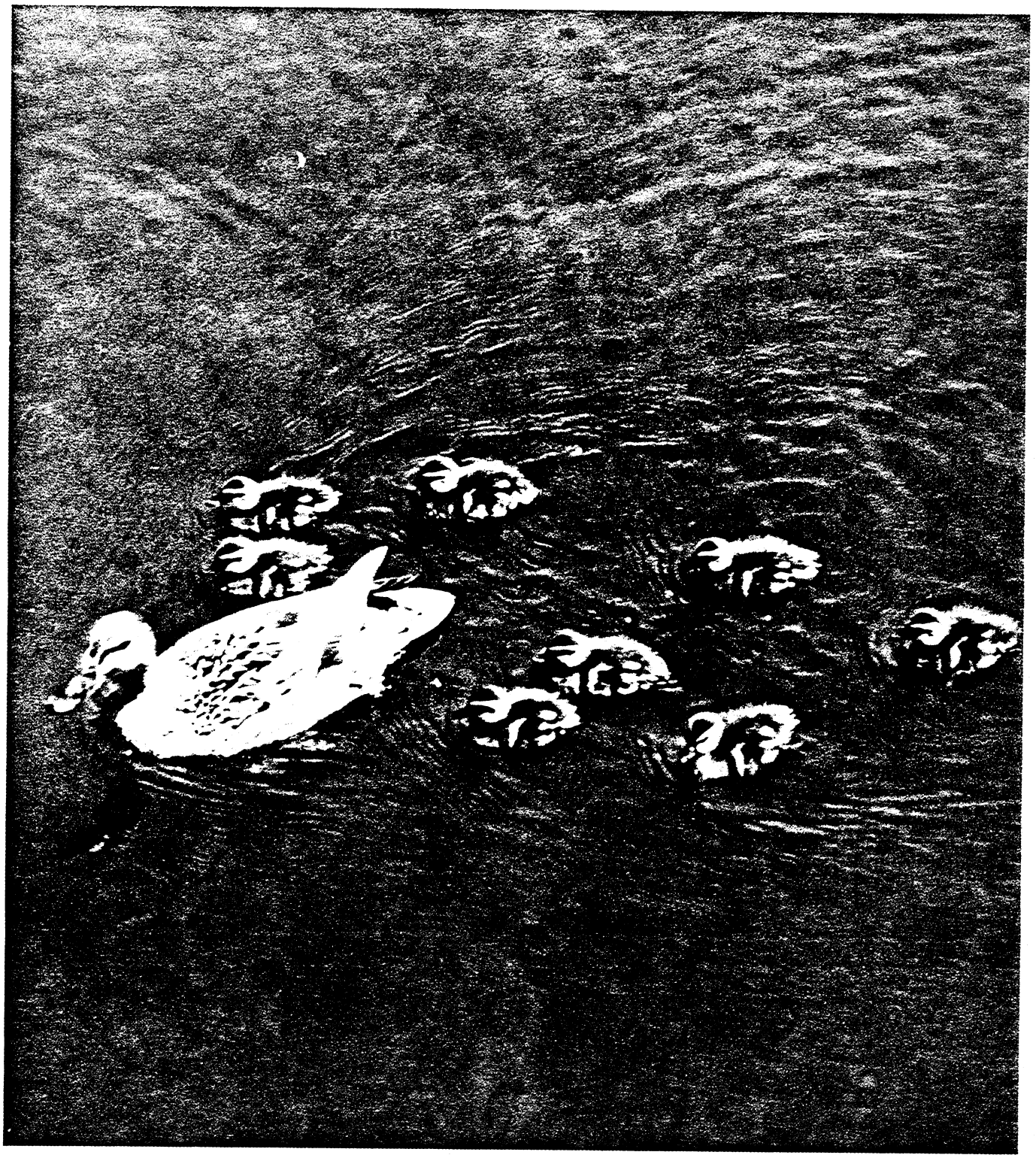
(6) The Council will act on each recommended amendment within one year after its receipt.

(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.

Section
1500

Disclaimers



1501. 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.

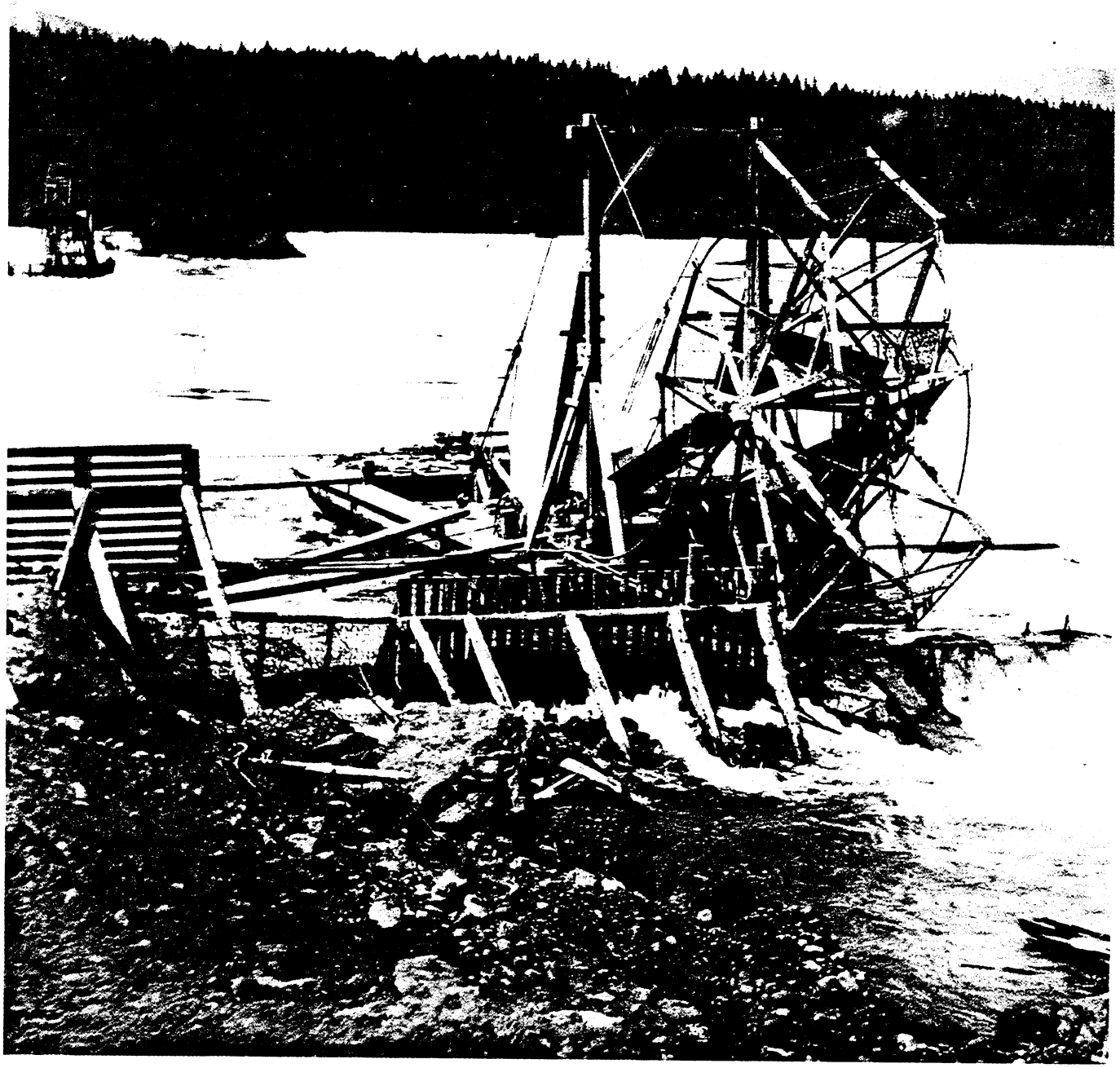
1502. This program applies solely to fish and wildlife, including related spawning grounds and habitat, located on the Columbia River and its tributaries. Nothing in this program alters, modifies, or affects in any way the laws applicable to rivers or river systems, including electric power facilities 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**

1503. 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

Section

1600

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.

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.

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.

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.

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.

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

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

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.

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

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

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.

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.

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.

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

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, meterological, 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.

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.

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.

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.

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.

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.

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

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

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

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.

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

Scientific and Statistical Advisory Committee (Fish and Wildlife Subcommittee) — The voluntary advisory committee which served as a "sounding board" for ideas and information germane to the development of the Council's fish and wildlife program. The subcommittee includes the following members:

John Hough, Chairman, Regional Manager, Corporate Relations, I.T.T.; Rollie Rousseau, Vice Chairman, Biologist, Oregon Department of Fish and Wildlife; Michael Blumm, Assistant Professor of Law, Natural Resources Law Institute, Lewis and Clark Law School; Ed Chaney, Private Consultant, Natural Resources; Wesley Ebel, Fishery Biologist and Director of Coastal Zone and Estuarian Studies Division, National Marine Fisheries Service; Ron Eggers, Aquatic Biologist, Columbia River Inter-Tribal Fish Commission; Bill Frank, Jr., Chairman, Northwest Indian Fisheries Commission; Patrick J. Graham, Research Biologist, Montana Department of Fish, Wildlife and Parks; Larry G. Hittle, Attorney at Law - Lindsay, Hart, Neil and Weigler; Bruce Rettig, Associate Professor, Department of Agricultural and Resource Economics, Oregon State University; Monte Richards, Chief, Bureau of Program Coordination, Idaho Department of Fish and Game; William Wilkerson, Deputy Director, Washington Department of Fisheries; Albert E. Wright, Environmental Supervisor, Grant County P.U.D. No. 1; William F. Yallup, Chairman, Fish and Wildlife and Law and Order Committees, Yakima Tribal Council.

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.

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.

Stream Reach — A section or segment of a river or stream.

Subimpoundment — An isolated body of water within a reservoir or lake created by diking or berm construction.

Substrate — River, stream, or lake bottom materials.

Transpiration — The passage of water vapor from plants through pores in the leaves.

Traveling Screen — A device for preventing fish from being entrained in water intakes.

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.

LIST OF THOSE COMMENTING AND TESTIFYING

A. A. Western
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David Allen
Frank W. Amato
Gary Amos, Yakima Basin Joint Board
John Amos
Malcolm Anders
C. C. Anderson
Lawrence R. Anderson, Federal Energy Regulatory Commission
Steven S. Anderson, Colville Confederated Tribes
Wilbur Anderson, Northwest Public Power Association
William E. Anderson, Oregon Wildlife Federation
Anglers Club of Portland
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Audubon Society of Portland
Glen Aurdahl
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Dennis Baird
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Stuart Barclay, Eastern Oregon Flyfishing and Fiction Society
LeRoy W. Bauer
Bill Beery
Richard Beightol
Lisa Beinecke
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Dennis W. Bickford
Bill Bishop, Montana Wildlife Federation
Gael Bissell, Montana Audubon Council
William M. Bitsas
Jim Blomquist, Sierra Club
Marshal Bloom, Bitterroot Chapter of Trout Unlimited
Sheldon Bluestein
Michael C. Blumm
Bruce Boccard, Committee for Idaho's High Desert
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Peter A. Bowler
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Dennis G. Buechler, Montana Wildlife Federation
Hans Buehler
Darryl Bullington
Linda L. Burgel, League of Women Voters of Pocatello
John H. Burger
Keith A. Burkhart, Federation of Fly Fishers
David C. Burns
Gary B. and Mary A. Busch
James Butler, Intermountain Region of U. S. Forest Service
Kenneth I. Cameron
Mike Campbell
Tom Campbell, Northwest Public Power Association
Lorna Campion, Seattle Audubon Society
Dick Canfield
Andy Carlson, Ravalli County Fish and Wildlife Association
Lola Caryl
Sherl Chapman, Idaho Water Users Association
Ray Chesbrough
David Childs, Association of Soil and Water Conservation Districts
Fred Christensen, Idaho Fish and Game Commission
Ted Chu
Charles Ciecko, Multnomah County
Diane Civic, National Coalition to Support Indian Treaties
Don Clark, Portland General Electric Company
Phyllis Clausen, White Salmon River Fish Enhancement Program
Dave Clopton
Charles V. Coffey
Robert L. Cole
Gerald Copp
Jennifer Cote, Western Montana Fish and Wildlife Association
Tom Cotton, Quincy-Columbia Basin Irrigation District
Arthur B. Crawford
Don L. Crawford
Tim Crawford, Idaho Conservation League
P. Y. Cree, Portland General Electric Company
Jeffrey Crook
Christine Cutz
Larry Daniels, Salmon River Breaks Resource Association
Ernest Day
Larry Dean, Bonneville Power Administration
Fran Dew, League of Women Voters
Dr. Arch Diack
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Doug Dompier, Columbia River Inter-Tribal Fish Commission
Jack Donaldson, Oregon Dept. of Fish and Wildlife
Brenda Dreelieck
Ken Dunn, Idaho Dept. of Water Resources
Polly Dyer, Columbia River Citizens Compact
Alan Easom, Concerned Citizens of Stanley
Kathleen Eastman
Hal M. Ebel
Wesley J. Ebel
John W. Ellis, Puget Sound Power & Light Company
Bobbie Engle
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Ken Enochs
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Alan Hausrath, Idaho Environmental League
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Mari Hoffman
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Idaho Power Company
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Bryan Johnson
Peter T. Johnson, Bonneville Power Administration
Roy Johnson, American Small Farm Institute
Ward Johnson
Jim Johnston, Washington Dept. of Game
Robert Jones, Washington State Farm Bureau
Walter Kandoll
Mal Karr, Columbia River Inter-Tribal Fish Commission
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M. Keller
Fenton C. Kelley
Herbert Kennon, U. S. Army Corps of Engineers
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Ronald Kerr
J. A. Kittrick
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Ramona Lehman
Charles F. Lemon, USDA, Soil Conservation Service
Gene Lenmer
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Steve Lindstrom, Pacific Northwest Waterways Association
L. W. Lloyd, Bureau of Reclamation
Harry Loupas
Glen A. Love, McKenzie Flyfishers

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Boyce Lundstrom
Richard Mace, Anglers Club of Portland
Lenn Magill
Ed Mains, U. S. Army Corps of Engineers
Paul S. Majkut, Washington Office of the Attorney General
Hudson Mann
Mildred Marchesseau, Tonasket Senior Citizens, Inc.
Tom Marlin, Coalition for Anadromous Salmon & Steelhead Habitat
Eileen Martin
Irene Martin, Northwest Fishermen's Wives
Jonathan Marvel
David J. Matheson, Coeur d'Alene Tribal Council
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Herschel Mays, Confederated Salish-Kootenai Tribes
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Julie Meissner
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Mel Metcalf, Northwest Steelheaders
Forrest Meuret, State of Oregon Resources Today, Inc.
Harold Miles, Idaho Cosumer Affairs, Inc.
Marlene Miller
Doris Milner, League of Women Voters
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Milo Moore
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Ray Nelson, Seattle City Light
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John R. Swanson
Norman Tague, Capital Conservation Club
R. F. Taplett
Gordon Tate, Idaho State Grange
Glen Taylor
Terri Taylor
Terence L. Thatcher, National, Idaho and Oregon Wildlife Federations
Beverly Thiele
Jim Thomas, Northwest Steelhead and Salmon Council of Trout Unlimited
Kermit J. Thompson
J. S. Tixier, USDA, Forest Service
Nelle Tobias
Lynn Tominaga
Bob Tuck, Yakima Tribe
Ron Van Gundy, Roza Irrigation District
Brig. General James W. Van Loden Sels, U. S. Army Corps of Engineers
Susan Virnig
Harry B. Wagner
John M. Waite
James C. Waldo
Les Walker, Eastern Idaho Council on Industry and Energy
Norm Walton
Ernie Wampler
Timothy Wapato, Columbia River Inter-Tribal Fish Commission
Denny and Renee Ward
Ed Wardwell
Harlan Wanrer, Okanogan County PUD
Sue Watkins, Port of Kennewick
Ron Watters
Myrna Weatherly
James C. Weaver
Tim Weaver, Yakima Tribe
Sam Webster
Larry Werkema, Washington State Sportsmen's Council
Roland G. Wetteroth, CREST
Dolores Wheldon
Wayne and Lois Whitaker
Matt Whitman
Calvin Wickham, Idaho Cooperative Utilities Association
Linda Wicks
Bill Wilkerson, Washington Dept. of Fisheries
Marian Wilkie
Chuck Williams, Columbia Gorge Coalition
Ray Willms
Katherine E. Wilson, Confederated Tribes of the Umatilla Indian Reservation
E. Robert Winter
Wesley and Joanne Woodgerd
Charles F. Woods
Roger Woodworth, Washington Water Power
Al Wright, Grant County PUD and Pacific Northwest Utilities Conference Committee
Mark L. Wysong
Bill Yallup, Yakima Tribe
John H. Yearout
Wayne Yenne
Chris Yoder, Sierra Club
Frank Young, Oregon Dept. of Fish and Wildlife
E. Zahn
Mike Zakofnit, Jr.

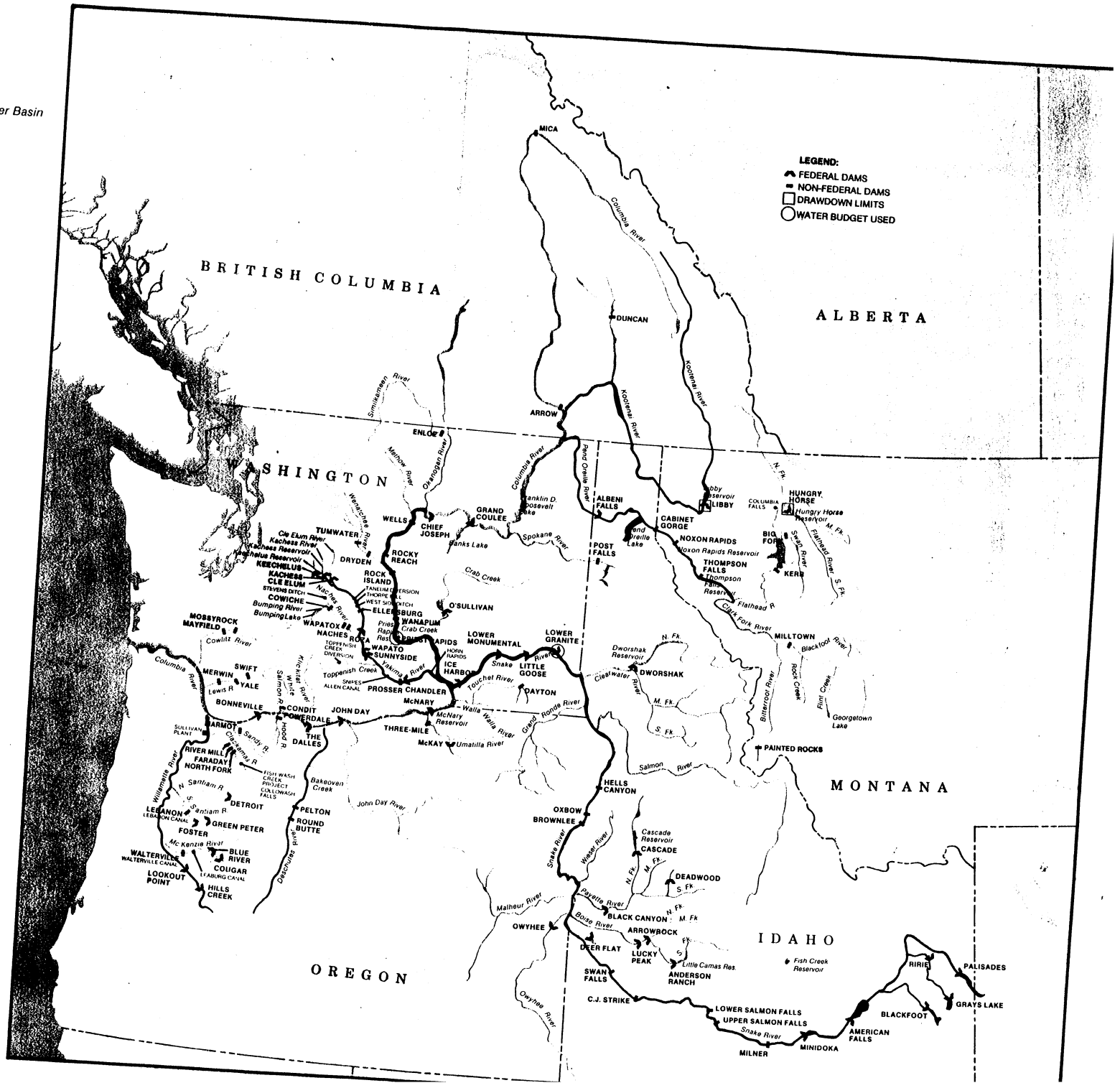

Figure 1.
Columbia River Basin

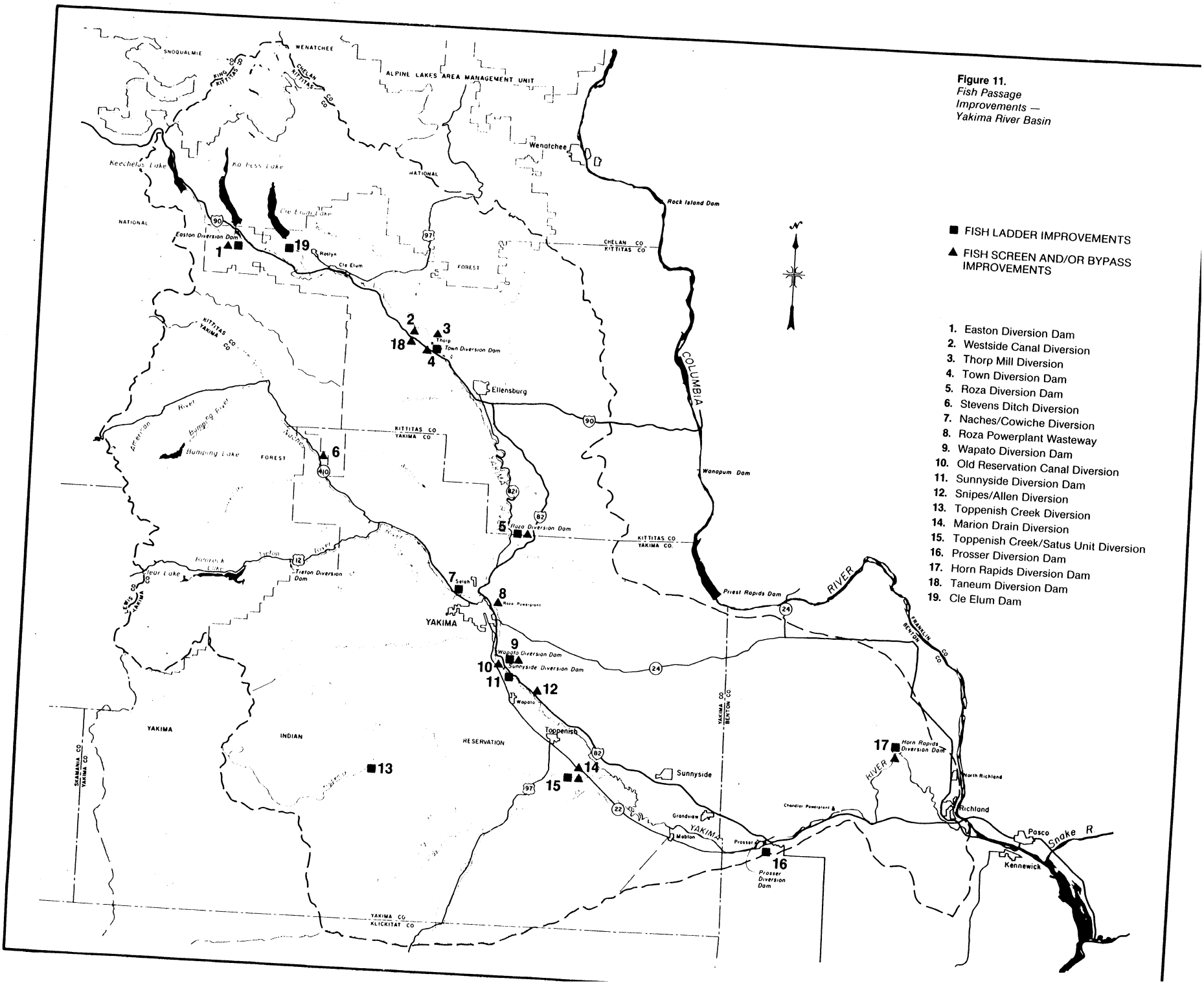

Figure 11.
Fish Passage Improvements — Yakima River Basin

■ 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