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1994 COLUMBIA RIVER BASIN FISH AND WILDLIFE PROGRAM

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**Please note: A cross reference chart of
program reference numbers will be
distributed as soon as it is prepared.**

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Section 1

INTRODUCTION: COLUMBIA RIVER BASIN FISH AND WILDLIFE AND THE NORTHWEST POWER ACT

“The Council shall promptly develop and adopt...a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries...affected by the development, operation and management of [hydroelectric projects] while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.”

--Pacific Northwest Electric Power Planning and Conservation Act of 1980

1.1 THE NORTHWEST POWER ACT AND THE REGION'S FISH AND WILDLIFE

Ever since the Northwest Power Act was passed in 1980, the Columbia River Basin's fish and wildlife have been the subject of increasing attention, not just from groups that are dependent on the river or its fish, but from the public at large. A major goal of the Act is to address the impacts that the region's hydroelectric dams have had on fish and wildlife. The Act pays particular attention to anadromous fish -- salmon and steelhead -- and the impact of hydroelectric dams on these fish. The Columbia Basin's anadromous fish, the Act says, "...are of particular significance to the social and economic well-being of the Pacific Northwest and the Nation and are dependent on suitable environmental conditions substantially obtainable from the management and operation of the Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries." During the past decade, significant efforts and money have been spent to protect and rebuild the affected populations.

But those efforts have not been enough to rescue some species. Some of the region's salmon and steelhead runs have been declining at alarming rates, so alarming that, since 1990, certain populations have been the focus of national, as well as regional attention. In mid-November 1991, to no one's surprise, the National Marine Fisheries Service officially declared Snake River sockeye salmon an endangered species. In April 1992, the

Fisheries Service designated Snake River spring/summer and fall chinook as threatened species. In August 1994, these fish were reclassified as endangered species. The 1992 declarations triggered a set of actions required under the federal Endangered Species Act of 1973. One of these actions is the development of recovery plans. The National Marine Fisheries Service assembled a team of experts who developed recommendations for a Snake River salmon recovery plan in May 1994. The Fisheries Service plans to prepare its recovery plan in early 1995.

The urgent need for adequate efforts to rebuild the dwindling Snake River salmon populations is underscored by the condition of the runs themselves. These populations are at perilously low numbers. Consider these figures reported by the Oregon and Washington departments of fish and wildlife. In 1975, these agencies estimated the Snake River sockeye population at 255 adult fish returning to the mouth of the Columbia River to begin the journey to spawn. In 1993, the number was 19 fish. In 1986, the departments estimated the Snake River fall chinook population at 2,796 fish returning to the mouth of the Columbia. In 1993, the number was 1,636. After subtracting harvest and an estimate of the losses to other causes, only 742 of these fish are believed to have passed all eight dams on the journey to spawn above Lower Granite Dam. In 1994, the estimate was even lower -- 400 to 500 fish.

Historically, these runs have been declining. River velocities generally have been declining as well during the critical spring migration period for

juvenile salmon, although some of these declines in water velocity have been offset by the water budget called for in this program. Additionally, salmon are cold-water fish that are particularly susceptible to changes in water temperature, yet average water temperatures in the Columbia -- measured at Bonneville Dam -- have been rising steadily since the 1940s, according to the Washington and Oregon fisheries departments (see Figures 1-1 and 1-2).

All of this is bad news for the salmon, and for steelhead as well, which support popular recreational fisheries in the Columbia and Snake. These facts, combined with the Endangered Species Act, send a clear message that the region must redouble its efforts to protect its fish, especially those that spawn naturally in rivers rather than in hatcheries. The Northwest Power Planning Council's concern is not just for those runs that have been placed on the national endangered species list, but for all salmon runs in the Columbia Basin.

The Council was created in part to give the region an opportunity to design and implement a program for protection of all anadromous and resident fish and wildlife in the Columbia Basin, rather than having narrowly focused recovery programs developed in Washington, D.C., or in federal court. The Council believes that if its program is fully implemented, future Endangered Species Act listings could be unnecessary. Full implementation of the program also could help keep contentious fish and energy disputes out of court. An effective fish and wildlife rebuilding effort must go beyond the immediate listed stocks if our region ever is to get off the Endangered Species Act treadmill.

In addition, the region has other legal obligations that must be met regarding fish and wildlife, and which are complemented by the Council's program. These include: tribal treaty fishing rights, Executive Order tribal rights, salmon rebuilding obligations of the Pacific Salmon Treaty with Canada and requirements of the federal Clean Water Act. These necessitate measures beyond those to remove listed salmon stocks from the Endangered Species list.

Fortunately, the Northwest did not lose time debating whether Snake River sockeye and the other listed runs -- spring, summer and fall chinook -- are in fact threatened or endangered. Building on its decades of experience with salmon, the Northwest began developing its own regional plan in 1991 for those species that are most critically depleted, as well as for other salmon and steelhead populations basinwide.

Important groundwork for the salmon rebuilding effort was laid in a Salmon Summit convened in late 1990 by the region's Governors and Oregon Senator Mark Hatfield. The summit, made up of the user, policy and interest groups connected with the Columbia Basin's waterways, came up with critical short-term measures that were implemented in 1991 to stem further decline. Those measures bought the region time.

From there, development of a regional salmon rebuilding plan moved to the arena of the Northwest Power Planning Council, the interstate body that has provided a regional forum for the past 12 years through its Columbia River Basin Fish and Wildlife Program. The Council, whose members are appointed by the Governors of Idaho,

Montana, Oregon and Washington, develops its program under the Northwest Power Act.

Just as the endangered species petitions for Snake River salmon underscored the critical condition of some Columbia Basin salmon runs, the petitions also highlighted the need to address impacts on salmon at every stage of their life cycle. After the Salmon Summit, the Governors asked the Council to expand its focus to address all activities that impact salmon, not just the hydroelectric system.

The Council took up where the Salmon Summit left off in the spring of 1991 by initiating a process to amend its fish and wildlife program. The result was the 1992 Strategy for Salmon.

That strategy was challenged in lawsuits filed by environmental groups, industries and an Indian tribe. In September 1994, the Ninth Circuit Court of Appeals, which has jurisdiction over lawsuits filed against the Council, issued its opinion. In short, the court remanded the Strategy for Salmon to the Council with instructions to make clear findings in the program on recommendations for program measures, while observing that the Council should take bolder actions to protect the fish and give greater deference to the region's fish agencies and Indian tribes when they submit recommendations for program measures.

Earlier in 1994, pursuant to commitments made in the Strategy for Salmon, the Council had begun a process of amending the strategy. Thus, the court's opinion provided valuable assistance in that process.

This document, the 1994 Columbia River Basin Fish and Wildlife Program, resulted from the amendments, which were approved in a 6-2 vote. A minority opinion can be found in Appendix E.

In the 1992 Strategy for Salmon, the Council concluded that additional measures would be needed to enhance salmon survival in the Snake and Columbia rivers, and the Council committed to seek improved information about those measures and consider them in the 1994 amendment process. These additional actions, including a phased strategy for implementing reservoir drawdowns, are detailed in Section 5 of the 1994 program. The Council intends that the elements of this program be adapted as needed and as new information becomes available. Not only has the Council provided flexibility to make

changes as appropriate, it has designed the program to add to the region's knowledge of fish and wildlife.

Such a program, developed with regional input, should prove to be an essential guide for federal agencies in devising recovery plans for fish or wildlife listed under the Endangered Species Act. Without it, the federal government or courts would be left to impose a plan of their own. A regional plan, based on extensive input from all the basin's interest groups as well as Northwest citizens, has the advantage of reflecting the unique values, perspective and interests of the region.

But this document represents much more than a guide to recovery actions. It is the first truly comprehensive strategy for fish and wildlife in the Columbia River Basin. It is a long-range plan to amend river operations, increase productivity, repair habitat and refine harvests. It is designed to balance competing river uses while strengthening and rebuilding fish runs throughout the basin. The Council's aim is to make future Endangered Species Act petitions unnecessary and ultimately to produce healthy and harvestable populations of salmon and steelhead, as well as protect resident fish and wildlife.

Regarding resident fish -- those that don't migrate to the ocean during their lives -- this program recognizes that these fish suffered from many of the same impacts as salmon. In 1994, for example, the Kootenai River white sturgeon was added to the federal endangered species list. The Council's goal for resident fish is to recover and preserve the health of populations that were injured by the hydropower system, where feasible. If it is not feasible to mitigate losses where they occurred, then these losses will be mitigated elsewhere in the basin.

The Council's goal for wildlife is similar. Some flood plain and riparian habitats that are important to wildlife were inundated when reservoirs behind the dams filled with water. A number of other dam-related impacts altered land and streamside areas where wild birds and animals live. The goal for wildlife in this program is to achieve and sustain levels of habitat and species productivity that fully mitigate wildlife losses resulting from the construction of dams.

Funding for resident fish and wildlife mitigation proceeded at low levels in the past, and the Council expects these activities will get a higher percentage of the Bonneville Power

Administration's fish and wildlife program budget in the future. Bonneville, as the region's federal electrical power marketing agency, funds the majority of actions called for in this program, using revenues from the sale of electricity. The Council adopted a level of approximately 15 percent of the fish and wildlife budget for resident fish and 15 percent for wildlife -- leaving 70 percent for salmon -- as an appropriate budget planning target.

1.2 HISTORICAL PERSPECTIVE

1.2A Key Principles from the Northwest Power Act

Mainstem river survival improvements, habitat and production measures, and harvest regulations all must work toward rebuilding healthy fish and wildlife populations. Drawing a blueprint for these changes ultimately requires a judicious consideration of all the standards of the Northwest Power Act. Within this framework, however, several points deserve emphasis:

- **System approach:** In developing the Columbia River Basin Fish and Wildlife Program, the Council must deal with the Columbia River and its tributaries as a system. This system touches a broad range of human activities: hydropower production, navigation, flood control, agriculture, recreation and many other land and water development activities. Opportunities for improved coordination and cooperation, as well as for increased conflict, are enormous. Building a fish and wildlife program that properly accounts for these activities requires the broadest possible involvement of the public and affected interests.
- **Regional power supply:** While the fish and wildlife program must "protect, mitigate and enhance fish and wildlife affected by the development, operation and management" of Columbia River Basin hydropower facilities, it must do so in a way that ensures the region "an adequate, efficient, economical and reliable power supply." This concept is discussed further in Section 1.8. The Council

has called for aggressive exploration of structural changes to the hydropower system, such as reservoir drawdown strategies, as well as non-structural changes, such as innovations in system operations, seasonal power exchanges, water use efficiencies and the like. These non-structural innovations in particular will require careful integration of power system, fish and wildlife, and other water needs.

- **Federal responsibilities:** The Northwest Power Act explicitly gives Bonneville the authority and responsibility to use its legal and financial resources “to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with ... the program adopted by the Council ... and the purposes of this Act.” The Act further requires Bonneville and the federal hydropower project operators and regulators to take the program into account to the fullest extent practicable at each relevant stage of their decision-making processes.
- **Public involvement:** The Council is required to consult with a variety of groups in the Northwest and to maintain comprehensive programs for public participation. This program reflects those requirements.
- **Fishery management:** The region’s fish and wildlife agencies and Indian tribes (often described collectively in this program as the “fishery managers”) play a special role in the program. The program must complement the agencies’ and tribes’ existing and future activities, and also must be consistent with the legal rights of Columbia Basin tribes.
- **Best available scientific knowledge:** In considering fish and wildlife recommendations, the Act requires the Council to rely on the best available scientific knowledge. Because that knowledge often is incomplete, future research, particularly regarding salmon, should focus on critical uncertainties. The region must take pains to monitor actions and make adjustments where advisable.
- **Lowest cost alternatives:** Where equally effective means of achieving the same sound biological objective exist, the Council chooses

the alternative with the lower economic cost. The Council is committed to finding ways to do such analysis. In addition, the Council expects that Bonneville will do additional work on cost-effectiveness in its implementation of habitat measures.

- **River flows:** The Act specifically recognizes that salmon depend on “suitable environmental conditions substantially obtainable from the management and operation” of power generating facilities of the Columbia River Basin. The Council is directed to adopt measures to “provide flows of sufficient quality and quantity between such facilities to improve production, migration and survival of such fish as necessary to meet sound biological objectives.”
- **Equitable treatment:** The Act requires federal implementing agencies to manage and operate hydropower facilities to provide “equitable treatment for fish and wildlife with the other purposes for which such system and facilities are managed and operated.” Therefore, the Council’s determinations regarding salmon and fish and wildlife survival in the main bodies of the Columbia and Snake rivers, where the major federal dams are located, aim to meet the needs of salmon with a level of certainty comparable to that accorded the other operational purposes.

1.2B Program Development

The Council adopted its first Columbia River Basin Fish and Wildlife Program in 1982. The program was amended in 1984, 1987, 1991-1993 and 1994. The 1994 Columbia River Basin Fish and Wildlife Program supersedes previous versions of the program and includes some measures from previous programs that were not completed, but remain relevant.

The Northwest Power Act directed the Council to develop this program and make periodic major revisions by first requesting recommendations from the region’s federal and state fish and wildlife agencies, appropriate Indian tribes (those within the basin) and other interested parties. These recommendations are to include measures that Bonneville and other federal agencies can implement to protect, mitigate and enhance fish and wildlife affected by hydroelectric

dams; objectives for developing and operating hydroelectric dams in a way designed to protect, mitigate and enhance fish and wildlife; and coordination of fish and wildlife management, research and development (including funding).

From the beginning, the level of public participation has far exceeded the Council's expectations. The quantity and quality of the comments are evidence that the Council, the fish and wildlife agencies, Indian tribes, Bonneville, federal project operators and regulators, utilities and the public are committed to solving the basin's fish and wildlife problems permanently. The interest in this program and the amount of thought, time and effort put into this process have been exceptional.

1.2C Role of the Council and Other Agencies

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

The Council is a planning, policy-making and reviewing body. It develops and monitors implementation of this fish and wildlife program, which is implemented by the Bonneville Power Administration, the Corps of Engineers, the Bureau of Reclamation and the Federal Energy Regulatory Commission and its licensees.

In the case of program measures involving non-federal projects, the processes of the Federal Energy Regulatory Commission must be respected. Under the Federal Power Act, the Federal Energy Regulatory Commission must review a program measure and the license of the affected hydroelectric project to determine if the license can and should be amended.

In developing and amending the fish and wildlife program, the Council incorporates into a draft amendment document qualifying recommendations or modifications of

recommendations received from outside parties, along with proposals the Council initiates on its own.

When the Council issues draft amendments, an extensive public comment period is initiated, which includes public hearings in each of the four states and consultations with interested parties. During the development of the initial program and the subsequent amendment proceedings, public comments resulted in thousands of pages of testimony from groups and individuals. After closing the comment period and following a review and deliberation period, the Council adopts final program measures.

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

The Council is calling on the parties identified as program implementors to report to the Council on their progress. If the measures are not being implemented, the parties should explain why. For its part, the Council is committed to monitoring and evaluating implementation of this program much more aggressively than in the past. It will do so through audits -- shared regionally and with the National Marine Fisheries Service -- and through oversight activities associated with Council meetings.

The Council has not attempted to distinguish between those measures where the Council believes it has direct authority and those measures where that authority belongs to others. Ultimately, the successful recovery of salmon, steelhead, resident fish and wildlife populations depends less on legal authority than on cooperation. Only through the committed and enthusiastic participation of all affected parties will a full recovery be achieved.

Bonneville

- 1.2C.1 As part of the effort to remain competitive and avoid conflicts of interest, and to minimize duplicative implementation efforts under the fish and wildlife

program, explore the potential for improving program implementation through an agreement transferring the administration of Bonneville's fish and wildlife program funding functions to an entity created by the Columbia Basin's federal and state fish and wildlife agencies and Indian tribes, or in the absence of such an entity, to the U.S. Fish and Wildlife Service. In these discussions, consider the need for rebuilding targets, and the means to secure a commitment on the part of the implementing entity to carry out the Council's fish and wildlife program. The discussions should also consider mechanisms to hold the implementing entity or agency accountable for results, perhaps through the use of independent audits. The discussions should also explore an implementation work plan development process, which identifies measures to be funded, and an implementation budget and planning target covering a three-to five-year period. Report to the Council by December 31, 1995, on the status of the discussions and the provisions of any tentative agreement that may be reached. If approved by the Council, implement the agreement. If an agreement has not been reached, report on the status of negotiations and the issues under discussion.

1.2D Lessons of the Past Decade

Today, the Columbia River Basin Fish and Wildlife Program is not quite 13 years old, about the age of three generations of salmon. Unfortunately, the problems for the basin's fish have been more than a century in the making. Human activities ranging from fishing to agriculture to power production took a toll, and so did natural events such as drought, floods and ocean conditions.

If 13 years have not been enough time to arrest the salmon's decline, it has been time to teach the region some important lessons. Any approach to fisheries recovery will require contributions from all who benefit from the river. And a rebuilding plan must be comprehensive. Piecemeal efforts simply have not been effective.

The challenge is best illustrated by the salmon's extensive environment, an environment defined by migratory habits that recognize no governmental boundaries. Salmon hatch in inland headwaters and travel downstream to mature in the ocean. Depending on the species, after one to five years, usually three to five, they return to the river. Thanks to an extraordinary homing instinct, they make their way to their home tributary where they will spawn and die. This wide-ranging environment, sometimes encompassing thousands of miles, became the arena for salmon recovery efforts in the 1980s.

During that decade, for the first time, the region looked at a coordinated approach involving the salmon's habitat; their passage down the rivers, particularly the mainstems of the Columbia and Snake; their harvest; and their production (both natural and artificially aided). This coordination echoes pleas to take an ecosystem approach to recovery under the Endangered Species Act, and it remains the foundation for a recovery plan in the 1990s.

While the foundation laid in the past decade for a systemwide approach was sound, the focus of the 1980s proved too narrow. The fish and wildlife program's interim goal was to double runs, but not at the expense of genetic diversity. Overall runs ranged between about 1.5 million and 4 million in the 1980s. However, some weaker runs continued to decline, thereby threatening genetic diversity and fitness. It became more apparent that the diversity of the runs, not just the number of fish, was an important consideration.

Despite some gains made in the early 1980s, overall salmon and steelhead populations are about a fifth of their pre-development run size, and only about 20 percent of the remaining fish spawn in the rivers. (See Figure 1-3.) Most wild and naturally spawning stocks are declining. (See Figures 1-4, 1-5 and 1-6.)

The Council is concerned about all weak stocks of fish and wildlife in the basin. The program gives highest priority to ratepayer-financed mitigation for weak, but recoverable, native fish populations injured by the hydropower system. The Council prefers to rebuild native species in native habitats, where feasible, but recognizes that this must be done carefully to avoid impacts on existing populations.

The Council continues to support increasing resident fish populations where salmon runs cannot be rebuilt. Such substitutions have been part of the fish and wildlife program since the early 1980s. Under the program's direction, and in consultation with state agencies and Indian tribes, hatcheries have been built to raise and release resident fish.

1.2E Expanded Focus

The endangered species listings for Snake River salmon dramatically underscored the need to make preserving diversity of salmon runs a higher priority. This renewed focus also affected the Council's own role. Previously, the Council's fish and wildlife program had addressed primarily the effects of the hydropower system on salmon and steelhead.

With the endangered species listings, it became clear that a realistic recovery effort had to be broader, involving all river uses: power production, flood control, agriculture, navigation, water supply, recreation, land development practices and fishing. When the Northwest Governors, Congressional delegation and the National Marine Fisheries Service looked to the Council to produce a comprehensive recovery plan, they also asked the Council to assume this broader role. The Council has done so. It developed an integrated plan that seeks contributions from all river users.

1.3 COSTS AND RESPONSIBILITIES

1.3A Principles Governing Costs

Congress established three major principles in the Northwest Power Act to govern the economic

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

- **Salmon and steelhead losses and goal:** As part of the 1987 Fish and Wildlife Program, the Council conducted an extensive analysis to estimate the scope of losses of salmon and steelhead related to hydropower development and operations. It concluded that from 5 million to 11 million fish have been lost due to the effects of hydropower. As a result, the program's goal of doubling the current run size of 2.5 million salmon and steelhead is well within the scope of hydropower-related losses. (See Section 4.1: Salmon and Steelhead Goal.)
- **Salmon and steelhead policies:** The policies that will guide efforts toward the doubling goal are designed to help promote sound ratepayer investments. For example, the program calls for assessing the genetic risks of proposals related to producing more fish. Genetic diversity among fish is essential to the long-term productivity of salmon and steelhead stocks in the basin. The program also emphasizes the crucial need for passage at the dams and adequate river flows between the dams on the mainstem Columbia and Snake rivers if fish produced with ratepayer funding in the tributaries and in hatcheries are to survive. The program's salmon and steelhead production policy calls for developing "master plans" to resolve potential conflicts among increased production, mixed-stock harvest and other objectives, such as gene conservation, before the Council approves ratepayer funding of new artificial production facilities. In its harvest management policy, the program calls on harvest managers to regulate catch,

including mixed-stock harvest, to support ratepayer-funded production and passage efforts. The program's adaptive management policy encourages projects to be designed to produce information that will reduce biological uncertainty and aid future decision-making.

- **Cost estimates for program measures:** The Council has reasonably accurate cost estimates for measures in the program. These estimates either were provided to the Council or were developed by Council staff. There is a problem, however, in that Bonneville is understandably reluctant to provide cost estimates for projects it later will negotiate with contractors. The Council expects to resolve this problem in the future so that the cost of specific measures can be estimated with more precision.
- **Research priorities:** The program focuses ratepayer-funded salmon and steelhead research into six areas of emphasis, each aimed at improving the effectiveness of existing production and passage facilities and techniques.
- **Monitoring and evaluation:** The Council is committed to a monitoring and evaluation program to promote sound ratepayer investments in salmon and steelhead projects. Changes in salmon and steelhead run sizes will be evaluated to determine whether those changes are due to ratepayer-funded efforts or to other causes. Monitoring and evaluation also will provide feedback so that ineffective actions can be identified and changed.
- **Water budget evaluation:** The program reflects the need to examine the effectiveness of the water budget and to explore alternative proposals to provide river flow benefits to fish while minimizing impacts on the power system or to resident fisheries.
- **Dam passage:** The program emphasizes installation of bypass systems and use of fish transportation, while also calling for investigation of the use of surface bypass and limited spill, as the long-term method to improve fish passage around mainstem dams.
- **Resident fish and wildlife criteria:** The program includes criteria that specifically tie resident fish and wildlife mitigation projects to

hydropower-related losses of those species and their habitat.

- **New hydropower development:** Measures calling for conditions on new hydropower development should help protect against new hydropower generation that would undermine ratepayer-funded enhancement of salmon and steelhead, resident fish and wildlife.
- **Contributions from others:** Throughout the program, the Council recognizes that non-hydropower factors also have contributed significantly to declines in fish and wildlife in the basin. Flood control operations, irrigated farming, overfishing, logging and mining are among them. As a result, the program notes the need for complementary funding or other efforts from sources other than hydropower ratepayers.

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

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

1.3B Three Types of Costs

There are three significant categories of fish and wildlife costs that affect the Bonneville Power Administration's rates:

Project Costs

Bonneville funds construction of hatcheries, habitat projects, research and other fish and wildlife initiatives in the Council's program. The budget for these projects currently amounts to between \$80 million and \$90 million each year. The Council estimates that the new projects adopted in this program could add about \$25 million to Bonneville's project budget. The average annual budget would therefore total \$115 million a year. The Council expects that some of the additional activities described in these measures can be funded through modifications of existing projects.

Repayment Obligations

Bonneville repays the U. S. Treasury for most of the costs of passage facilities at the Columbia and Snake river federal dams. These are the original fish ladders, the screens and bypass systems whose installation at the dams began in the 1980s, and the juvenile salmon transportation facilities. The annual payment for these existing facilities was about \$60 million in 1994. The Council estimates that it will cost an additional \$95 million a year, beginning in 1998, to repay the cost of the additional investments for dam modifications in this program. Bonneville's total fish and wildlife repayment obligation would then average about \$155 million each year.

Foregone Hydropower Revenues

When the Council adopts measures to change river operations to provide improved flows for salmon, Bonneville is not able to make as much money from power sales as it could before. In many winters, Bonneville must buy power from other suppliers to allow the reservoirs to store water for spring and summer salmon flow releases. Spill and lowered mainstem reservoir levels also reduce the ability of individual dams to generate electricity.

In 1984, the Council adopted its first "water budget" and in 1989, adopted a spill agreement. These measures reduce Bonneville's power sale revenues by an average \$55 million a year. The interim flow operations of the 1992 Strategy for Salmon added approximately \$45 million in average annual revenue impacts to Bonneville. Together, those earlier measures resulted in a net revenue impact to Bonneville averaging about \$100 million annually. The Council estimates that the impact to Bonneville from the foregone revenue and additional energy purchases necessary to implement the measures in this program will average an estimated \$57 million annually, beginning in 1995. This average annual cost will rise to nearly \$80 million in 1999. Thus, the total revenue impact to Bonneville from foregone revenue and replacement power purchases for salmon operations will average approximately \$157 million, beginning in 1995, and increase to \$180 million in 1999.

These additional costs are significant. Together with the cost of the current program, total program costs will amount to approximately \$450 million per year on average. Elsewhere in this document, the Council discusses the impact of these costs on Bonneville's continued ability to be an economic supplier of electricity. The Council believes there is a need for the federal government to assist Bonneville with and share in these costs through adjustment of Bonneville's Treasury repayment obligations, general appropriations or other mechanisms.

Potential Rate Increases

To evaluate these costs in terms of their effect on Bonneville's rates, the Council looked at possible rate impacts, assuming that no federal assistance is provided. When incorporated into Bonneville's total budget, the Council estimates that these costs could translate into about a 6 percent wholesale rate increase by 1997, rising to about a total of 9 percent by 2015, as these additional measures are implemented. This is the increase to Bonneville's wholesale customers. The Council estimates that the cost to a typical residential ratepayer would be about a 4 percent increase in the home electricity bill in 1997, rising to 6 percent by 2015. Stated another way, these estimates predict that typical Northwest monthly

electricity bills will increase by about \$2 a month by 1997 and a total of \$3 a month in 2015, to pay for the additional salmon measures called for in this program.

Additional cost analysis is included in Appendix B. Those costs are reported in levelized dollars.

1.3C Regional Funding and Staffing

Because it is a regional program to rebuild weak salmon stocks, the Council's program calls for participation and funding by state and federal entities and others.

All levels of government must bear responsibility for adequately funding and staffing salmon rebuilding measures, or run the almost certain risk that the recovery effort will be delayed, with potentially disastrous results.

Until now, most salmon rebuilding costs have been borne by electric power consumers through the Bonneville Power Administration pursuant to the provisions of the Northwest Power Act. To the extent that measures -- including off-site measures and programs -- respond to the impacts on salmon by the region's hydroelectric system, these costs are appropriate. But salmon runs were diminished, and rebuilding measures are required, because of a variety of other causes. The costs of responding to these other causes should be shared by all responsible parties. The Council will work with the states, Bonneville and other federal agencies to clarify funding responsibilities.

The Council intends to make cost-effectiveness an important part of the program. A successful program is one that provides permanent restoration of salmon runs at the lowest cost. Such a program cannot be restricted to any one life stage, but must comprehensively include all stages. Short-term, least-cost calculations are not part of this plan, but aiming for long-run success is.

1.4 COUNCIL COMMITMENTS

The Council finds this program to be consistent with the purposes of the Northwest Power Act. The Council has evaluated the measures included in this program on the basis of the recommendations, supporting documents, consultations and public comment contained in its

record. It has determined that the measures will protect, mitigate and enhance fish and wildlife affected by the development, operation and management of hydroelectric facilities located on the Columbia River and its tributaries, while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply. The Council also has determined that these measures meet the list of program requirements contained in Section 4(h)(6) of the Act.

The Council is committed to a stringent program of monitoring and evaluating progress to ensure that the region's investment in fish and wildlife pays off. Rebuilding targets and performance standards are being instituted to provide explicit means of measuring progress. The Council will modify or eliminate activities that do not provide sufficient progress toward stated goals and objectives, and will consider other actions.

In comments on drafts of this plan, several parties have raised concerns about the effects that drafting upriver storage reservoirs for salmon flows could have on resident fish and wildlife in headwater areas. The Council does not intend to address the environmental problems of salmon by indiscriminately shifting environmental problems to upriver areas. It is committed to avoiding such impacts as much as possible, and to monitoring and evaluating them should they occur. Section 903(b)(1) of the 1987 Fish and Wildlife Program has been included in the revised program. See Section 10.3A.

Other comment received in public review of this program made it clear that the region is divided over the scientific merits of some major measures to rebuild fish populations. Three issues that remain intensely debated are the relationship of increased flows to fish survival, transportation and the proper role of supplementing wild and naturally spawning fish populations with hatchery-reared fish. These will be examined closely under the Council's program.

The Council also strongly believes that the region must work to improve its understanding of the interdependence among fish, wildlife and human activities, such as power system operations, harvest, water use and land management. Relatively minor changes in any one of these can appear to have minor impacts on salmon. Taken together, they can have significant cumulative impacts.

The Council is obligated to base its decisions on the best available scientific knowledge. But in some cases, even the best data are sketchy. The Northwest Power Act and the Endangered Species Act processes make it clear that salmon stocks cannot wait for complete resolution of the debate. The Council has chosen to act now, recognizing that the actions can be modified as new information is available.

1.5 OTHER RESPONSIBILITIES

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

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

The Council is an interstate compact. Its members are appointed by the Governors of the Northwest states. The Council is not a federal agency. Its program is developed under the Northwest Power Act, not the National Environmental Policy Act nor the Endangered Species Act. However, most of the program's specific measures are implemented by federal agencies.

To facilitate federal implementation, the Council explores environmental impacts of its proposals as fully as possible within its amendment process. Federal agencies are encouraged to make use of the Council's evaluation so that the region can act promptly to protect salmon and steelhead while complying fully with National Environmental Policy Act and Endangered Species Act requirements. The Council commits itself to working with the federal agencies to integrate the Council's processes with the National Environmental Policy Act and Endangered Species Act processes.

In determining the sources of water for fish and power flows as well as protecting fish in and around storage reservoirs, the use of Columbia River Basin water stored in Canadian reservoirs, as well as such water stored in reservoirs in the United States, must be considered. In general, fish flows, as well as reservoir levels and nutrient retention times required to protect resident fish in and around storage reservoirs, should be accommodated in all planning, management and operations conducted under the Columbia River Treaty between the United States and Canada.

1.6 INDIAN RIGHTS

In writing the Northwest Power Act, Congress stressed the importance of recognizing the legal rights of Indian tribes in this program. Section 4(h)(6)(D) of the Act requires program measures to be consistent with the legal rights of Indian tribes. Section 10(e) emphasizes that nothing in the Act affects or modifies Indian rights. Section 10(h) confirms that the Act does not limit Indian water rights. The full scope of Indian rights and their application in specific situations remains unclear. In some cases, those rights are being litigated. The Council is not in a position to adjudicate those rights and does not purport to do so in this program (see Section 14).

Nonetheless, the Council recognizes that the decline of fish and wildlife, particularly listed salmon and resident fish populations, poses problems for Indian tribes to whom the U.S. government has special responsibilities. The Council's program must be consistent with the rights of these tribes. The Council is committed to meeting its own responsibilities and to helping the

federal agencies meet theirs, while addressing the needs of the region's fish and wildlife.

1.7 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 of this program, nothing in this program authorizes appropriation of water, affects rights to water or jurisdictions over water, or establishes the respective rights to water of the federal government, individual states, Indian tribes or individuals. The Council assumes that the federal implementing agencies will work hard to develop cooperative and creative ways to implement the program's water flow measures with those requirements in mind.

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

1.8 ASSURING THE REGION AN ADEQUATE, EFFICIENT, ECONOMICAL AND RELIABLE POWER SUPPLY

The Ninth Circuit Court of Appeals in *NRIC v. Northwest Power Planning Council* characterized the fish and wildlife provisions of the Northwest Power Act as “[a]ttempting to balance environmental and energy considerations.”¹ The Council's fish and wildlife program must consist of measures to “protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of [hydropower] facilities while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power

supply.”² The measures in the remainder of this program address the first part of this requirement. The findings below address the second part of the requirement.

Attached as an appendix to this program are two analyses that are relevant to these findings. The first is Part I of Appendix B, which is a power system/rate analysis of the adopted mainstem measures (and alternative proposed measures), which estimates the power impacts, costs (including capital costs) and rate impacts of these measures. The second, Appendix C, is a broader analysis, “Assuring an Adequate, Efficient, Economical and Reliable Power Supply and the Ability to Carry Out Other Purposes of the Power Act.” This report examines the elements of the Act's power supply standard from a number of angles, and, most important for these findings, analyzes whether and how the cost, rate and power impacts of the Council's anadromous fish measures can be accommodated by changes in the power system and still assure the region an adequate, efficient, economical and reliable power supply. The following findings are distilled from those analyses:

- The Council has not departed from utility industry standards for an adequate and reliable power supply. If fish recovery measures do not allow enough time or flexibility for the power system to be adapted, they could violate the conditions necessary for an adequate and reliable power supply. The Council's analysis indicates that there are sufficient resources under development, available for purchase on West Coast electricity markets, or that could be developed with relatively short lead time to ensure the region an adequate power supply. Although the reliance on purchased power is a departure from traditional regional planning practices, the Council believes this is becoming common practice in the emerging competitive power market. The costs of those resources have to be considered in the context of the economics of the power system.

¹ *NRIC v. Northwest Power Planning Council* slip opinion at p. 10879 (9th Cir. 1994).

² 16 U.S.C. § 839b(h)(5).

- To ensure the reliability of the power supply, power system operators need the ability to draft storage projects notwithstanding fish needs in emergency circumstances that threaten firm loads (e.g., major temperature drops like those experienced in 1989 and 1990; loss of a major resource like Washington Nuclear Project 2 or a large Grand Coulee unit; or loss of the Northern or Southern intertie). System operators need some discretion to begin drafting in anticipation of severe weather events, in order that the water can reach the lower river projects at the time it is needed. Bonneville also has the responsibility under the Pacific Northwest Coordination Agreement, the Northwest Power Pool and the Western Systems Coordinating Council to maintain reliability standards for voltage and transmission stability. Instability could result in local or regional blackouts. Accordingly, during the time of year that water is being stored for fish at the federal projects (Hungry Horse, Libby, Dworshak, Albeni Falls and Grand Coulee), such storage may be temporarily drafted to avoid: 1) threatened inability to meet firm loads due to emergency circumstances (see above); or 2) voltage and transmission instability. Such drafts should be temporary and should strike an equitable balance between impacts to resident fish and anadromous species. System operators are expected to make purchases to minimize the risk that there will be less water stored for anadromous and resident fish than would otherwise have been stored. The role of financial considerations in Bonneville's purchase decisions is discussed in Appendix C.
- Fish recovery measures may require actions that are not as efficient from the standpoint of the objective of power operations as actions that are devoted solely to that objective. However, the Northwest Power Act clearly expected that operations would be balanced among fish, power and other objectives. The changes

in power operations efficiency will have impacts on the economics of the power system.

- From the standpoint of the region's economy and power system as a whole, it is unlikely that fish recovery measures would result in an uneconomical power supply. The total costs are small relative to regional income. Even if Bonneville's customers were to turn to other sources of supply, the resulting power supply would still be relatively economical in relation to the rates paid in other parts of the nation. The advantage the Northwest currently enjoys would, however, be expected to diminish as a result of increased costs in this region and decreased costs brought on by competition elsewhere.
- The picture may change for specific parts of the region or consumer groups: costs could prove to be burdensome to some, and if so, ways to avoid unreasonable burdens on specific customer groups should be explored.
- With these qualifications, and apart from financial impacts to Bonneville itself, the Council can provide reasonable assurance that the region's power supply will be adequate, efficient, economical and reliable while implementing the fish and wildlife program.

Financial effects on Bonneville

The Council also must determine whether the fish and wildlife program is consistent with other purposes of the Northwest Power Act.³ One of the purposes of the Act is to ensure that Bonneville's customers and consumers pay the full cost of power, including repayment of the U. S. Treasury.⁴ Care must be taken to ensure that Bonneville's financial obligations, including the

³16 U.S.C. § 839b(h)(7)

⁴16 U.S.C. § 839(4).

cost of protecting fish and wildlife from the adverse effects of the hydropower system, do not make Bonneville uneconomic and unable to carry out the purposes of the Northwest Power Act. The Bonneville Power Administration is an integral part of the region's power supply, and the principal means for financing energy conservation and fish and wildlife initiatives under the Northwest Power Act. It is possible for fish recovery measures and other costs to cause Bonneville's power supply to be perceived as no longer economical in relation to competing supplies. If a significant number of utilities decided to seek other supplies of electricity, Bonneville might no longer be able to collect sufficient revenue to fund the fish and wildlife recovery and other purposes of the Act, including repayment of its debt to the federal Treasury.

The factors affecting Bonneville's financial position obviously are not limited to the costs of the fish and wildlife program. The federal hydropower system must repay the substantial debt remaining from past regional investments in thermal generation, for example. In addition, federal legislation affords unique advantages to Bonneville's regional customers that may impair Bonneville's competitive position. The Council's analysis suggests that Bonneville probably can absorb some additional fish recovery costs and still be able to carry out the Act's purposes. However, this conclusion is quite uncertain, particularly in the short term, and the Council believes that additional means should be explored to pay these costs.

The Council has identified the actions that are necessary to protect, mitigate and enhance fish and wildlife affected by the development, operation, and management of hydropower facilities. To successfully implement these actions, assure an adequate, efficient, economical and reliable power supply and not subvert the other power purposes of the Act, the region will need to work with the federal government on the allocation of costs. There is a need to implement the fish recovery measures and maintain the Bonneville Power Administration's financial health.

Four means of spreading the costs of implementing the program suggest themselves: One is to seek federal appropriations or other sources of funding for fish recovery measures. A second is to share as much of the cost of fish and wildlife costs as are attributable to the non-power

uses of the Columbia River system as allowed under Section 4(h)(10)(c) of the Act. A third recognizes the parallel between fish recovery measures and utility investment that is stranded by competitive pressures. Much of the policy debate surrounding the ongoing restructuring of the electricity industry nationwide is focused on the question of stranded investment. A charge for use of transmission and/or distribution systems is the mechanism that is most frequently mentioned. The potential for recovering part of the fish recovery costs through a transmission charge should be investigated. Fourth, a number of suggestions were made in the Bonneville Power Administration Congressional Task Force Report for reforms that could save money for Bonneville. These suggestions should be explored.

In addition, the Council believes that arrangements should be developed to ensure that in years when Bonneville's revenues are healthier, Bonneville pays a greater portion of fish and wildlife costs than in years when revenues are strained. In healthier years, the region should have less need to call on the alternatives discussed above.

Finally, while the Council has done considerable analysis in connection with these findings, it is important to recognize that the adequacy, efficiency, affordability, and reliability of the region's power supply, and the impact of these measures on Bonneville's ability to carry out the purposes of the Act, can be more fully gauged as the Council revises its regional power plan. The fish and wildlife program is part of the power plan, and the mutual impacts of fish and power measures are intended to be examined together.⁵ Some recommendations submitted in the fish and wildlife amendment process, for example, the Columbia River Inter-Tribal Fish Commission's proposal to establish ramping rates for flow fluctuations at mainstem dams, raise issues of adequacy and reliability that could not be addressed in the fish and wildlife process. The potential impacts of these and other fish and wildlife measures deserve further consideration in the context of a full revision of the power plan.

1.9 SUMMARY

⁵ 16 U.S.C. § 839b(e)(3)(F).

Those participating in the development of this program included federal and state fish and wildlife agencies, Indian tribes, utilities, federal program implementors (Bonneville, the Corps of Engineers, the Bureau of Reclamation and the Federal Energy Regulatory Commission), state and local governments, federal and state land and water managers, environmental groups and other interested parties, including private citizens. Through this program, the citizens of Idaho, Montana, Oregon and Washington have an opportunity to share in the decision to protect the Columbia Basin's fish and wildlife resources and to counter the harm caused by decades of hydroelectric development and operations while assuring the region an adequate, efficient, economical and reliable power supply.

If the language of this program is more subdued than the rhetoric of the 1980s' programs, it is at least more clear-eyed. The region knows a lot more. It understands more. It has better tools and, despite continuing controversy, broader cooperation. The enormous scope of the recovery effort is clearer. It will take a lot longer and a lot more effort to rebuild healthy and diverse populations of salmon, steelhead and other fish and wildlife throughout the Columbia Basin. In fact, it will take a persistent effort into the next century just to save some of the fish runs.

This is not a grim assessment. It is a realistic one. The program is not a panacea, but a valuable foundation for the effort that is yet to be completed. At the same time, the region cannot lose sight of the fact that multipurpose development of the Columbia River system has produced huge benefits. These benefits need not be lost if all beneficiaries of the basin's waterways approach this rebuilding effort with a willingness to contribute. Balance is a key word. The Council's overall intent is to have balance so that all uses of the river remain viable.

Table 1-1 lists shorthand terms that are used throughout this program for various government agencies, Indian tribes and other entities. See the Glossary for definitions of other terms used in the program.

Table 1-1
Terms Used in the Program

Abbreviations	Full Name
Bonneville	Bonneville Power Administration, U.S. Department of Energy
Bureau of Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Corps	U.S. Department of the Army, Corps of Engineers
Federal land managers	<ul style="list-style-type: none"> • Bureau of Indian Affairs • Bureau of Land Management • National Park Service • U.S. Forest Service
Federal project regulators	<ul style="list-style-type: none"> • Bonneville • Bureau of Indian Affairs • Bureau of Reclamation • Corps of Engineers • Federal Energy Regulatory Commission
FERC	Federal Energy Regulatory Commission, U.S. Department of Energy
Fish and wildlife management agencies	<ul style="list-style-type: none"> • Fish and Wildlife Service, U.S. Department of the Interior • National Marine Fisheries Service, U.S. Department of Commerce • Oregon Department of Fish and Wildlife • Idaho Department of Fish and Game • Montana Department of Fish, Wildlife and Parks • Washington Department of Fish and Wildlife

**Table 1-1 (cont.)
Terms Used in the Program**

Abbreviations	Full Name
State land managers	<ul style="list-style-type: none"> • Idaho Department of Lands • Oregon Division of State Lands • Montana Department of Natural Resources and Conservation • Montana Department of State Lands • Washington Department of Natural Resources
State water managers	<ul style="list-style-type: none"> • Idaho Department of Water Resources • Montana Department of Natural Resources and Conservation • Oregon Department of Water Resources • Washington Department of Ecology
Columbia Basin Indian Tribes	<ul style="list-style-type: none"> • Burns-Paiute Indian Colony • Coeur d' Alene Tribes • Confederated Tribes of the Colville Reservation • Confederated Salish-Kootenai Tribes of the Flathead Reservation • Confederated Tribes of the Umatilla Reservation of Oregon • Confederated Tribes of the Warm Springs Reservation of Oregon • Confederated Tribes and Bands of the Yakama Indian Nation • Kalispel Indian Community • Kootenai Tribe of Idaho • Nez Perce Tribe of Idaho • Northwestern Band of the Shoshone Nation • Shoshone-Paiute Tribes of the Duck Valley Reservation • Shoshone-Bannock Tribes of the Fort Hall Reservation • Spokane Tribe of Indians

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Section 2

SYSTEMWIDE GOAL AND FRAMEWORK

The Northwest Power Act calls upon the Council to develop a fish and wildlife program designed to deal with the Columbia Basin as a system (see P.L. 96-501, Section 4(h)(1)(A)). The need for this approach was apparent in 1980 when Congress passed the Act. This need has become more urgent and increasingly complex with continually growing regional demands to provide more electricity, meet more out-of-stream uses of water, increase recreational opportunities, as well as provide sufficient quantity and quality of habitat for fish and wildlife.

The Columbia River Basin is a diverse set of local ecosystems interconnected by the rivers, streams and creeks that flow through the system. These local ecosystems are interdependent and made up of living and non-living components. They include plant and animal communities linked by predation, competition and other life cycle processes. These communities are the basis of diversity -- not only the diversity of species found in a system, but also the diversity or variation within each species in the system. This diversity is critical to short-term and long-term productivity in the system.

Managing the basin effectively requires a systemwide approach that recognizes the importance of the health of the natural system. It must take into account and balance human needs with limitations inherent in the natural system. This requires acknowledging short-term and long-term consequences or trade-offs in decision-making. It includes considering trade-offs between fish and wildlife resources and other uses of the basin as well as trade-offs between and among anadromous fish, resident fish and wildlife.

The Council recognizes that the Northwest Power Act provides it with limited authority in regard to implementing an ecosystem approach. Simply stated, the Council cannot mandate a system approach to all resource users and managers in the Columbia River Basin. Even if it

could, this approach would not succeed without the cooperation and participation of all of the basin's natural resource owners, users and managers. The success of a comprehensive ecosystem approach will hinge on extensive cooperation and initiative.

It is important to bring to this effort the best scientific insights on the health of the system. A periodic assessment of the ecological health of the basin is integral to this approach. This assessment should not be made unnecessarily complex. It should identify measures of ecosystem health to be analyzed as part of the system approach. It is important to monitor the system to ensure that negative impacts on resident or anadromous fish caused by efforts to protect one or the other are minimized.

2.1 SYSTEMWIDE GOAL: A HEALTHY COLUMBIA RIVER BASIN

The Council system goal is a healthy Columbia Basin, one that supports both human settlement and the long-term sustainability of native fish and wildlife species in native habitats where possible, while recognizing that where impacts have irrevocably changed the ecosystem, we must protect and enhance the ecosystem that remains. To implement this goal, the program will deal with the Columbia Basin as a system; will protect, mitigate and enhance fish and wildlife while assuring an adequate, efficient, economical and reliable power supply; and will be consistent with the activities of the fish and wildlife agencies and tribes.

2.1A Assess Ecological Health of Columbia River Basin

Council

- 2.1A.1 Explore methods to assess trends in system health. These methods should evaluate a reasonable number of factors for which ecosystem health information is readily available, but might include factors for which new information would be needed. If found feasible, this assessment will result in a periodic report on the ecological health of the Columbia River Basin.

2.2 SYSTEMWIDE POLICIES

2.2A Support Native Species in Native Habitat

The program preference is to support and rebuild native species in native habitats, where feasible. This means that remaining fish and wildlife habitat should be protected and restored to promote production of native species, especially habitat that supports weak populations of fish and wildlife. The Council also recognizes that in certain instances, such as the mainstem Columbia and Snake river corridors, fish and wildlife habitat has been altered so that some native species are ill adapted. In these instances, projects that enhance species adapted to the altered habitat may be appropriate and may in fact be the only available form of mitigation. However, any such action must follow a thorough evaluation of the consequences, if any, to existing native species or the practicality of restoration of native species.

2.2B Assess Program Measures

In order to promote a system approach, the Council will periodically assess program measures to identify conflicts and assess trade-offs in the basin. This will include trade-offs between and among fish and wildlife populations as well as with hydropower, irrigation, transportation, flood control, recreation and other human activities in

the basin. It also includes comparison of the costs of alternative means to achieve biological objectives and relative effectiveness of the proposed alternatives.

Council

- 2.2B.1 In consultation with the program implementors, develop a method to identify conflicts and assess trade-offs between and among program measures and basin activities by December 31, 1995.
- 2.2B.2 Continue to review program measures for purposes of prioritization, cost-effectiveness and biological effectiveness. Incorporate in this review the method to identify conflicts and assess trade-offs.

2.2C Share Costs

Relevant Parties

- 2.2C.1 The Council expects that relevant parties will use cost sharing, where pertinent, to fund measures called for in this program. Projects that mitigate the effects of non-hydropower caused problems (e.g., man-caused passage barriers in reservoir tributaries, fencing of overgrazed riparian areas and sediment control projects) are considered to be particularly appropriate for cost sharing.

2.2D Avoid Passage at Natural Barriers

Natural barriers block migration of fish populations in many parts of the basin. The most common barrier is a waterfall. Populations blocked include migrating anadromous (salmon and steelhead) and resident (trout, kokanee and sturgeon) fish species. Over the past several years, the desirability of providing passage at natural barriers has been called into question. Introduction of new species into established systems can cause severe disruptions. Indigenous species can be eliminated or greatly compromised. Naturally

blocked areas frequently provide genetic refuges and angling opportunities.

Relevant Parties

2.2D.1 Avoid further actions to provide fish passage over natural barriers.

2.2E Columbia River Basin Reservoir Operation and Accounting Procedure

Reservoirs in the Columbia River system are operated to benefit numerous purposes. These purposes can include hydropower production, flood control, recreation, irrigation, transportation, fish and wildlife and others. Currently it is not possible to easily determine the purpose of storage and release actions undertaken by river operators (see Section 2.2B). This creates considerable uncertainty and controversy. The basin needs a comprehensive, agreed-to accounting system for water storage and releases from basin reservoirs.

The final accounting system should provide information on which storage projects provided flow augmentation water, when it was provided, what volume was provided and what race(s) of fish the releases were intended to benefit. The design of the accounting system should include provisions to allow monitoring and evaluation studies. Structure of the accounting system should allow fish life-cycle models to be used to determine or estimate the biological benefit of flow augmentation. It should also accommodate the use of other biological models or mechanisms to determine the impact of flow augmentation releases on reservoir or river populations of resident fish. The accounting system should recognize and numerically account for each, including concurrent, use for which water is released, such as power sales, power exchanges, flood control, irrigation diversions and others. Existing mechanisms used in water management should be reviewed for contribution to the water accounting system. These include, but are not limited to, computer planning models, mechanisms used to calculate headwaters benefit payments, procedures used to calculate the cost of water

budget flows, or reviews of operations resulting from historic water budgets.

Bonneville, Corps of Engineers and Bureau of Reclamation

2.2E.1 Develop, in cooperation with other appropriate parties, an accounting system that will clearly identify the purpose and quantity of any release of water from any Columbia Basin storage reservoir by December 31, 1995. Thereafter, ensure that the accounting system is readily accessible to all interested parties on a real-time basis. Submit the accounting system to the Council for review and approval.

Bonneville

2.2E.2 Fund the accounting system after approval by the Council.

2.2E.3 Fund the activities in Section 2.2E.4 for all storage projects in the Columbia River Basin.

Fishery Managers, Bonneville, Bureau of Reclamation and Corps of Engineers

2.2E.4 Complete the following activities and submit reports to the Council by December 31, 1996:

- identify reservoir levels necessary to maintain or enhance fish and wildlife;
- analyze the relationship between drawdown limits and fish flow measures set for resident and anadromous fish in this program, including the water budget;
- develop alternative means to resolve any conflicts between drawdown limits and requirements for fish flows; and

- determine and analyze the probable effects of drawdown limits on the power system and flood control.

Relevant Parties

- 2.2E.5 Fund, as a high priority, all measures in the program that address reservoir operations, such as development of biological rule curves and determination of operational mitigation actions. These measures should be completed by December 31, 1996.
- 2.2E.6 In determining whether to establish biologically-based constraints on hydroproject operations, and in determining whether to adopt any proposed project-specific constraints, the Council will review proposals and documentation against the following criteria:
- Protection and rebuilding of weak native fish stocks and those stocks that are resident fish substitutions under this program.
 - Protection of tribal rights to fish at usual and accustomed fishing places and ceded areas.
 - Integration with power and flood control rule curves to share the consequences of low water years.
 - Availability of satisfactory peer-reviewed science substantiating the linkages between such project constraints and protection of the stocks at risk.
 - Effects elsewhere in the Columbia River system, including but not limited to effects on other biological species, on hydropower and on other uses of the river.

Fishery Managers

- 2.2E.7 Address biological trade-offs between resident fish and wildlife species affected by upriver reservoir releases and anadromous species affected by flow augmentation. Report to the Council in April 1995.

2.2F Budget Planning Target for Resident Fish and Wildlife

Funding for resident fish and wildlife mitigation, having proceeded at low levels in the past, will be accorded a higher percentage of budget outlay in the future.

Council and Bonneville

- 2.2F.1 The resident fish section of the program contains specific projects that should be implemented. These projects should be completed in rank order over the next nine years as outlined in the measures -- by the end of the year 2003. Each year, the Council will review the annual implementation plan and work with Bonneville in its budget planning process to ensure implementation of the Council's program.

The Council believes that a level of approximately 15 percent for resident fish and 15 percent for wildlife (i.e., 15 percent of Bonneville's fish and wildlife project budget) reflects an appropriate budget planning target. These figures are approximations; year-to-year variations may occur. If there are not enough Council-approved projects ready for implementation in a given year, the 15-percent planning targets should not apply. The Council will review these targets in 1996, after the resident fish loss assessments are completed.

In setting these budget planning targets, the Council does not encourage selective or slowed implementation of anadromous fish measures, nor does it expect unilateral decisions to amend or materially alter such measures. Full and

efficient program implementation remains critical if the region is to do more than react to the Endangered Species Act.

2.2G Funding for Actions that Address Transboundary Species

In general, where mitigation measures are designed to benefit U.S. and Canadian populations, U.S. ratepayer funding should be in proportion to U.S. benefits.

Relevant Parties

2.2G.1 The Council calls for the development, funding and implementation of agreements between the fish and wildlife managers on both sides of the U.S./Canada border that recognize the mutual benefit of protection, mitigation and enhancement for transboundary species. Bonneville and the U.S. fish and wildlife managers should negotiate with Canadian entities through the appropriate channels to determine the U.S. share of funding on a per-project basis. Protection, mitigation and enhancement of transboundary stocks includes, but is not limited to, agreements about the management of water quantity and quality, such as reservoir operations, storage activities, instream flows and pollution control/abatement.

2.2H The Need to Learn from Implementation

In forging a program to address the needs of fish and wildlife in the Columbia Basin, the region faces the problem of resolving these facts: 1) prompt action must be taken to arrest the declines in many populations; and 2) the scientific basis for many actions is limited and often conflicting. This conflict is recognized in the Power Act. Congress directed the Council to use the best *available* scientific information and not to await scientific certainty prior to acting.

Reflecting this charge, the Council has taken, and will continue to take, a number of significant actions on the basis of the available, and often limited, scientific information. The Council continues to recognize the need for prompt action despite scientific uncertainty. However, the region has made unsatisfactory progress on coupling these actions with evaluation to allow us to learn from their implementation. The Council emphasizes the need to improve the scientific basis for the program and to *learn* from the implementation of the program. This is reflected in the incorporation of the principle of adaptive management as a part of the 1987 Fish and Wildlife Program. The Council continues to find that this technique is the only rational way to deal with the conflict described above. Further, the Council expects that monitoring, evaluation and learning protocols will be in place and must be an integral part of planned actions about which there is significant scientific uncertainty.

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Section 3

COORDINATED IMPLEMENTATION, RESEARCH, MONITORING AND EVALUATION

The Council recognizes the need to employ a systemwide approach to address the needs of Columbia River Basin fish and wildlife. To accomplish this, a coordinated implementation, research, monitoring and evaluation process is essential. This process should be flexible enough to evolve over time. It should facilitate identification of priorities. It should provide coordination at levels needed to accomplish basinwide as well as local watershed objectives. Coordination also must encompass all programs, plans, policies and statutes that affect fish and wildlife produced in the Columbia River Basin. It must allow all affected parties meaningful participation, encourage local implementation and guidance and provide needed regional coordination. The approach should also provide a mechanism for accountability.

Considering all the functions that need to be addressed by coordinated implementation, research, monitoring, and evaluation at both the regional and local level, it is easy to envision a complicated system of committees with frequent meetings and numerous assignments. The intent of the Council is to avoid this approach as much as possible. Coordinated implementation, research, monitoring and evaluation should be lean on process and heavy on implementation of on-the-ground actions for fish and wildlife. Standing committees and meetings should be kept to a minimum. When meetings are needed, existing groups and committee structures should be used. If existing committees are not appropriate for topics that need to be addressed, informal gatherings or ad-hoc approaches should be used. The processes and committees that are created should be reviewed frequently to ensure they are still needed. In short, the Council intends that coordinated implementation, research, monitoring and evaluation should expedite, not burden, actions for fish and wildlife.

3.1 COORDINATE IMPLEMENTATION OF FISH AND WILDLIFE PROGRAM

Development and implementation of the Council's fish and wildlife program are complex and expensive undertakings central to the survival of the region's fish and wildlife populations. The Northwest Power Act requires that the Columbia River Basin be treated as a system. This, in turn, necessitates close coordination between planners and implementors of the program. In addition, the Act recognizes the expertise of the fishery managing agencies and tribes, accords due weight to their views and requires that this program complement their activities. Program success depends on Council recognition of the fishery agencies' and tribes' priorities and their prompt inclusion in the plan. At the same time, the success of the program depends on prompt implementation of program measures by all implementors, including the fishery managing agencies and tribes.

3.1A Basin Oversight Group

Council

- 3.1A.1 Organize and convene a Basin Oversight Group, consisting of policy-makers from the state and federal implementing entities and other interested parties, to aggressively pursue implementation of this program. The Basin Oversight Group will meet at least annually to address progress, problems and issues regarding program implementation. This

group will review the annual implementation work plan and the annual program monitoring report. It will make recommendations to the Council by July 31 of each year. Meetings of the Basin Oversight Group will focus on needed actions and implementation problems, not routine reporting. All other committees identified in this program will coordinate with the Basin Oversight Group.

- 3.1A.2 Consult as a full Council on a quarterly basis with the directors of the fishery managing agencies, and on a government-to-government basis with the leadership of the Columbia River Basin tribes. The Council expects the consultations will focus on program development, modification and implementation. In particular, efforts will be directed at expediting measures to improve the survival of the basin's anadromous fish, resident fish and wildlife populations and resolving any disputes that are hampering expeditious program implementation. As part of the consultations, the Council will also encourage the agencies and tribes to identify and resolve differences in their respective positions on Columbia River Basin fish and wildlife issues. The Council further expects regular contact will be maintained between the staffs of the Council and the agencies and tribes.

3.1B Implementation and Monitoring

As the region moves forward to realize the ambitious goals of the fish and wildlife program it will pursue two closely related parallel paths. One is the implementation path -- that is, taking specific actions identified in the annual implementation work plan. This path will include steps to address uncertainties and refine actions over time. The second path is evaluation. The evaluation path will monitor overall program implementation, evaluate the

effectiveness of actions taken, and judge their scientific merits. One outcome will be an annual assessment of the program's performance -- the annual program monitoring report. This report can be used to determine the need, if any, for mid-course corrections.

A key component of program implementation is feedback, through implementation of actions and program monitoring, to facilitate the refinement of the program over time. For this, the program framework (described in Section 4) will act as a yardstick for evaluating the performance of the program.

There are many areas where current information is incomplete because we are unable to measure some key variables and because of the possibility of unforeseen events. The Council expects to revisit the schedules and targets, as necessary, based on information gathered by the monitoring program and evaluation of implemented actions. If progress toward the performance standards or meeting rebuilding schedules falls significantly short, the Council will revisit all or part of the program.

Bonneville's implementation of this program to date has been guided by an implementation planning process negotiated with the fish and wildlife agencies and tribes. Bonneville created a policy review group and a scientific review group to review implementation questions. Coordination and prioritization of actions occur in technical scoping groups that focus on different aspects of the program. In this section, the Council calls for this implementation process to be broadened to include land and water managers and other interested parties, to produce an annual implementation work plan and a monitoring report, and to provide for independent scientific review of the program and its implementation. The annual implementation work plan should reflect program goals and principles and any prioritization of measures developed by the Council.

Bonneville, Fishery Managers and Others

3.1B.1 Expand the implementation planning process so that participants prioritize and coordinate implementation of all program measures, including research. Participants should include the Council, the National Marine Fisheries Service, fish and wildlife agencies, Indian tribes, Bonneville, river operators, land and water managers, utilities, citizen groups and others.

3.1B.2 Participants in this expanded process should prepare an annual implementation work plan that:

- details actions by all parties to implement program measures;
- prioritizes actions, using the six principles described in Section 4.1A and any other prioritization developed by the Council;
- identifies criteria used to select habitat actions;
- identifies and explains any conflicts with dates or schedules in the Council's program and suggests modifications;
- describes actions to deal with uncertainties identified by the independent scientific group; and
- estimates costs of implementing measures.

3.1B.3 The annual implementation work plan should include (but not be limited to) actions to address key scientific uncertainties associated with the program and its measures (see Section 3.2C).

3.1B.4 The annual implementation work plan should be submitted to the Council by June 15 of each year. In the course of its review, the Council will review the list of key uncertainties (see Section 3.2C) and the manner in which the work plan proposes to address these uncertainties. Unless the Council provides otherwise, responsible parties should proceed with

implementation within 45 days of submitting the work plan to the Council.

Federal Government, States and Tribes

3.1B.5 Review measures in this program that call for collective action by the states, tribes and other entities. Designate the appropriate entity to coordinate implementation of each measure. The designated entity should be responsible for preparing work plans and reporting progress. By June 30, 1995, report to the Council these designations. Where sources of funding are not identified, discuss the capabilities of the states, tribes and other entities to implement the measures with available resources. For each measure that cannot be met with available resources, and there is clearly no obligation of the Bonneville Power Administration under the Northwest Power Act, propose:

- an alternative funding source;
- the estimated cost for implementation; and
- the legal authority for allocating the necessary funds from the proposed source.

Federal Energy Regulatory Commission

3.1B.6 For measures addressed directly to Federal Energy Regulatory Commission licensees, or that are otherwise relevant to Commission decision-making, take measures into account to the fullest extent practicable.

3.1C Management and Coordination

Under the Northwest Power Act, the Council's role is to develop a regional fish and wildlife program. Implementation of this program is placed in the hands of others. The success of this program depends primarily on the willingness and ability of those implementing it.

The Council recognizes that implementation of this program will be a major challenge to the region. It is a program undertaken with great urgency and at great expense, and its successful implementation depends on the coordinated efforts of many separate groups.

To get major pieces of work under way quickly, this program establishes a large number of committees and working groups. The Council is especially concerned that these groups work closely together to achieve the primary goal of this program -- the successful recovery of the salmon and steelhead populations in the Columbia River Basin in a manner that is as fast, efficient and cost-effective as possible.

Effective management and coordination of this program is essential. The Council believes two measures will contribute significantly to management and coordination.

First, the Council urges Bonneville, as primary funding agency, to work with the agencies, tribes and other implementors to establish an appropriate management structure with clear responsibility and accountability for the implementation of this program. While the decision on exactly what this structure should be is one best made by the implementors, the ability to make prompt and effective implementation decisions is critical. In particular, the management structure should include an executive, whether an individual or a small team, who is responsible for results, can determine priorities, make final decisions, resolve disputes and avoid deadlocks.

Second, the Council agrees to take all steps possible to further implement this program. The Council recognizes that even the most carefully developed plans can be improved with experience and will need adjustments and corrections as they are carried out. The Council intends to promptly take up and act upon any

suggestions from implementors for changes in program measures that will improve implementation.

The Council also will use the extent of its powers, including both the legal authority given to the Council under the Act and its persuasive power with Congress, the states and the public, to encourage the full participation of implementing agencies. In the event that an agency is unwilling to cooperate in carrying out this regional program, the Council wishes to be advised immediately so that appropriate steps can be taken.

Bonneville

- 3.1C.1 Pursuant to the requirements of Sections 4(h)(5)(A) through 4(h)(11) of the Act, fund those program measures that have been approved for funding by the Council. To promote coordination and efficiency, and eliminate duplication, submit the following to the Council: notices of program interest, requests for proposals, proposed contracts and a statement explaining how each proposed contract will implement a particular program measure. Bonneville should inform the Council of any other fish-and-wildlife-related activities it plans to conduct, and should provide the Council an opportunity to comment on the design of such projects.
- 3.1C.2 The Council will continue to use its intergovernmental agreement with Bonneville to ensure an expedited review of all funding proposals in accordance with Section 3.1C.4, below.
- 3.1C.3 Where the Council calls on Bonneville to fund program measures at federal projects, the Council's intention is that Bonneville immediately initiate discussions with the appropriate federal project operator and the Council to determine the most expeditious means for funding those measures. As provided by the Northwest Power Act, the amounts expended by Bonneville

pursuant to this program should be allocated as appropriate by Bonneville, in consultation with the Corps of Engineers and the Bureau of Reclamation, among the various hydroelectric projects of the Federal Columbia River Power System. Those funds should be allocated to the various project purposes in accordance with existing accounting procedures for the Federal Columbia River Power System.

- 3.1C.4 Where the Council calls on Bonneville to fund a program measure upon Council approval, the Council's intention is that Bonneville fund that measure when the Council approves it for funding purposes. A program amendment will not be required prior to such funding.
- 3.1C.5 In selecting among alternative means for funding program activities on Indian reservations, choose a means that fully complements the activities of the affected Indian tribe and recognizes the unique rights and concerns of Indian tribes with respect to reserved Indian lands.
- 3.1C.6 Monetary costs and electric power losses resulting from the implementation of the program should be allocated by the Bonneville administrator consistent with individual project impacts and systemwide objectives of Section 4(h) of the Northwest Power Act.

3.1D Subregional Process

On June 1, 1991, the fisheries agencies and Indian tribes of the Columbia Basin Fish and Wildlife Authority submitted to the Council the Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin. The building blocks for the Integrated System Plan are the subbasin plans prepared for the 31 major watersheds of the Columbia River Basin that produce salmon and steelhead. These plans, along with other resource management

plans, will be the starting point for identifying actions to help specific salmon populations. Plans developed under the program, and otherwise, will be used to address other fish and wildlife species.

Fishery Managers and Bonneville

3.1D.1 Form subregional teams to assist in implementing fish and wildlife measures in the following subregions of the Columbia River Basin:

- below Bonneville Dam (Lower Columbia Subregion);
- Bonneville Dam to Priest Rapids Dam (Lower-Mid Columbia Subregion);
- Priest Rapids Dam to Chief Joseph Dam (Upper-Mid Columbia Subregion);
- above Chief Joseph Dam (Upper Columbia Subregion);
- Snake River from mouth to Hells Canyon Dam (Lower Snake Subregion); and
- above Hells Canyon Dam (Upper Snake Subregion).

Submit subregional approach for the upper Snake to Council by June 1995. Submit subregional approaches for the lower Snake and upper mid-Columbia to Council by June 1995. Submit subregional approaches for the remaining areas to Council by the end of 1995. These approaches should include list of participants, process for identifying projects, method for ensuring that activities in subregion are coordinated to avoid inconsistency and redundancy, as well as addressing all items listed below. After approval of the Council, implement each subregional approach. Until subregional approaches are approved by the Council, submit individual high priority projects to the Council for consideration.

Participation on subregional teams should include appropriate fish and wildlife agencies, tribes, utilities, Bonneville, land and water managers, private landowners, citizen groups, the Council and others. For each subregion, the teams will use the Integrated System Plan, subbasin plans, other fish and wildlife plans and any other available relevant plans and information to prepare recommendations for the annual implementation work plan (Section 3.1B) and the annual program monitoring report (Section 3.2A). Each team will be responsible for identifying any conflicts with other resource management plans in the relevant subregion, along with options for resolving these conflicts.

Recommendations should:

- Explain whether the measure would address factors that limit weak stocks. Rebuilding weak populations, especially populations listed under the Endangered Species Act, should be given priority.
- Provide reasons for concluding that the project would pose no appreciable risk to biological diversity among or within anadromous fish, resident fish or wildlife populations, using the best available tools (such as the Regional Assessment of Supplementation Projects, Chapter III.C of the Integrated System Plan, Habitat Project Selection Criteria) and data (such as the wild and natural production data in Section 7.2C, hatchery analyses in Section 7.3B and cumulative impacts studies in Section 7.2D) to support reasoning.
- For proposed artificial production measures, explain whether the measure would make use of existing production facilities and, if not, why not.
- Approach the needs of target populations from an ecosystem perspective. Give special priority to projects that are part of model watersheds or other coordinated watershed programs.
- Expedite consideration of appropriate, locally based habitat projects.
- If a measure is designed to create harvest opportunities, explain whether those opportunities will be in tributaries or other areas where there would be no significant, additional harvest pressure on weak populations.
- Explain any steps needed to ensure that activities to benefit one species will not inappropriately harm another.
- Explain whether the measure would help address a critical uncertainty (Section 3.2C).
- Provide estimates of cost and biological effectiveness of proposed measures for the target fish and/or wildlife population. Relate biological effectiveness to success in meeting survival targets, rebuilding schedules, performance standards or other relevant, biologically based factors. Specify the time period over which improvement may be expected.
- Explain how the measure would be monitored and evaluated.

Fishery Managers

- 3.1D.2 In coordination with the appropriate subregional team, periodically review and update each appropriate subbasin plan. The first updates will be completed as part of development of an implementation plan under Section 7.1C and will address the considerations, objectives, alternative strategies and recommended strategies sections of the plans. Subsequent updates should occur consistent with the needs of each subregion. Make subbasin plans available and update background

information and data in the plans through the Coordinated Information System.

Bonneville

- 3.1D.3 Fund development and implementation of the subregional approaches and updating, as necessary, of the subbasin plans.

3.1E Management Review

This fish and wildlife program has, by necessity, been drawn in large part from science that is not yet fully developed, and its many complex measures constitute an immensely difficult and highly expensive undertaking for the region. In order then to realize the best value from this program, its component measures must be implemented and monitored in a coherent, well-organized and carefully disciplined manner. In developing the program, the Council has taken the first steps toward orderly implementation. The Council also acknowledges the efforts of Bonneville, the fish and wildlife agencies, tribes and others to organize and coordinate program initiatives as they are implemented. However, the Council recognizes that the program is composed of discrete parts. These separate measures need to be systematically directed under a comprehensive structure that facilitates adaptive management and ensures that the region receives the best possible return from its investments in fish and wildlife mitigation.

Council

- 3.1E.1 For these reasons, not later than April 1, 1995, the Council will issue a request for proposals from recognized management consulting firms for an analysis of the overall management structure of the program, with particular attention to matters such as: 1) designing means to recognize and address key biological uncertainties, 2) developing measurable benchmarks and clearly identified objectives, 3)

establishing a workable mechanism for setting program priorities and monitoring progress, 4) reducing costs and delays in the implementation process and 5) putting in place a clear system of accountability.

Consultants and Council

- 3.1E.2 The consulting firm chosen for this study will be requested to complete the analysis and submit draft recommendations to the Council and the region for review and comment not later than October 1, 1995, with a final report within 45 days after close of comment. Based on this report, and the comments received on it, the Council intends to adopt an overall structure for the adaptive management of the program and its measures. Once adopted, this strategy will provide a basis for highly effective performance by ensuring that the Council focuses appropriate management attention on the key elements of, and the pivotal decisions required in, the fish and wildlife program.

3.2 MONITORING AND EVALUATION

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

Adaptive management is a scientific policy. It calls for a conscious effort to improve fish and wildlife management, using elements of this program as experiments that can provide useful

information not otherwise available. Adaptive management also is a system policy, combining monitoring, evaluation and research throughout the Columbia River Basin so that the aggregated effects of this program can be detected, assessed and improved over time. The system monitoring and evaluation process described below will aid adaptive management by providing feedback on program projects.

The purpose of these monitoring and evaluation activities is to ensure that the region systematically improves its knowledge of what measures work, what measures do not and why. To help identify areas where we most need to improve our understanding and to focus research and evaluation, the Council is calling on an independent scientific group (see Section 3.2B, below) to identify “key uncertainties”--questions whose answers are most crucial to the success of program measures in rebuilding salmon and steelhead populations. These questions will be used by the implementation process in identifying measures to be implemented, and by the Council and the region in reviewing the annual implementation work plan, to be sure that the approach to learning is well thought through. The Council sees this as a critical step in carrying out an adaptive management approach to salmon and steelhead rebuilding. The Council recognizes that the region cannot expect perfect knowledge before taking action and must act on the basis of the best information available at that time.

The Council expects to learn not only from program implementation, but also from the Endangered Species Act and other federal processes, which will tend to focus federal agency implementation of the Council program, other salmon recovery measures and other analyses of salmon recovery. The Council does not expect to amend its program each time a new development occurs. Rather, over the course of several years, a group of program issues may emerge, and an amendment process can be initiated. This will require the Council not only to pay careful attention to this program’s evaluation processes, but to monitor the National Marine Fisheries Service’s consultation process.

3.2A Program Monitoring

Council

- 3.2A.1 Coordinate monitoring efforts connected with this program. This includes the rebuilding schedules (Section 4.3), identification of index stocks and monitoring needs (**Section 4.3C**), and performance standards (**Section 4.3B**). The Council will facilitate the development and implementation of these measures and ensure that these monitoring efforts are coordinated with the program evaluation described in Section 3.2B. The Council will also ensure that information from these programs is transmitted to the coordinated information system (Section 3.3) and the annual monitoring report (Section 3.3B). Problems encountered in developing these sections should be brought to the Council for review and action.
- 3.2A.2 In consultation with fishery managers, prepare an annual report evaluating program progress. This report should be based on the annual monitoring report from the Coordinated Information System (**Section 3.3**), and should evaluate progress toward the rebuilding schedules, performance standards, and other goals and objectives of this program.

3.2B Independent Scientific Evaluation

Bonneville

- 3.2B.1 Expeditiously act to develop and fund an Independent Scientific Group to provide a biennial evaluation of the program on its scientific merits and to fulfill other tasks described in this program. The group should examine the scientific underpinnings of the program and evaluate the program as a vehicle to achieve the Council's goals and those of the Northwest Power Act.

The Independent Scientific Group should consist of people with strong natural or social science experience who have demonstrated an ability to provide independent review of complex environmental issues. The group (and contract or staff support for the group) should be organized and funded to ensure the scientific credibility of its evaluations, free of institutional constraints or biases. The initial members of the independent scientific group should be the present members of Bonneville's Scientific Review Group. Additional and future members of the group should be appointed by the policy group described in Section 3.2B.2 from a list of candidates submitted by the Independent Scientific Group. The group may suggest improvements in the program, in research projects, in the coordinated information system, or in the implementation process, including changes that would facilitate evaluation. Bonneville should take all steps necessary to ensure that this group is operational by January 1, 1995, including provision for support staff and other needed resources.

Independent Scientific Group

- 3.2B.2 The group should make use of the past efforts of the Council's Monitoring and Evaluation Group. The Independent Scientific Group also should review questions submitted by the Council or through the implementation process. The group should be compensated fully for its time and travel.

Bonneville, Fishery Managers and the Council

- 3.2B.3 To ensure the independence of the scientific group described in Section 3.2B.1, organize a policy group representing each of the three entities. The policy group will select members of the scientific group based on a list of candidates proposed by the Independent Scientific Group. The policy group should also provide a focus for policy issues related to the Independent Scientific Group and will assist the Independent Scientific Group in identifying appropriate issues and developing an annual work plan.

3.2C Key Uncertainties

Independent Scientific Group

- 3.2C.1 Identify and revise over time specific key uncertainties associated with program measures. These key uncertainties should be those information needs most critical to the achievement of program goals, and rebuilding and survival targets. These uncertainties should be used to guide the prioritization and funding of research efforts conducted under this program.

Council

- 3.2C.2 Refine and elaborate analyses of the relative contributions of various human activities to fish mortality. Circulate the resulting analyses for public review. There is continuing debate over the

contribution of various human activities to salmon mortality. To a certain extent, this debate involves complex interactions that would lend themselves to evaluation only after lengthy, basic research and analysis. However, several parties have offered analyses that provide a general picture of relative contributions to fish mortality, and the Council believes it may be worthwhile to refine these analyses in an effort to arrive at a common understanding of these questions.

3.2D Endangered Species Act Monitoring and Coordination

The National Marine Fisheries Service has responsibility for salmon populations listed under the Endangered Species Act. The Service's Salmon Recovery Team has recommended that the Service establish a Salmon Oversight Committee to oversee activities affecting listed populations. The Independent Scientific Group described above shares many features in common with the proposed Salmon Oversight Committee and could serve the needs of both the Council and the Service. The Council intends to work with the Service to coordinate any scientific and policy issues with the Council and the Independent Scientific Group.

Council

3.2D.1 Monitor the Endangered Species Act consultation process to ensure that program monitoring and evaluation results are considered, and that the Council is aware of developments in river operations, harvest, habitat and production activities that may suggest the need for program amendments.

3.2E Prioritization and Cost-Effectiveness

Council

3.2E.1 Continue to review program measures for purposes of prioritization, cost-effectiveness and biological effectiveness.

3.2F Regional Analytical Methods Coordination

To develop and assess regional strategies to rebuild fish and wildlife populations, and to make the program framework operational, analytical tools should be developed that are both understandable and credible. Computer models and other analytical methods are essential to the program framework. They provide a means to link program measures to survival targets, rebuilding schedules and rebuilding targets. A variety of tools may be developed that span legitimate scientific differences or reflect different approaches. This process should not stifle these differences, but instead should promote understanding of their implications. However, the region should integrate these tools into a unified approach. The Council applauds the considerable progress in this direction, and calls on the technical staffs of the various parties to expedite development of analytical tools and their documentation to assist decision-making.

All computer models are based on imperfect knowledge. They cannot fully represent the complexity of the Columbia River ecosystem, much less predict the future. There remain major uncertainties regarding the biological effectiveness of some measures. Models necessarily incorporate assumptions that are debatable, even where they are based on the best available scientific knowledge.

In the past few years, considerable progress has been made in the development of analytical tools. Modelers and analysts have devoted considerable effort in coordinating their activities and increasing their understanding of each group's analytical tools. However, substantial inefficiencies remain that hamper development of needed analysis. These reflect the number of regional resources devoted to these activities and institutional structures that

encourage each entity to develop its own unique analytical tools.

To deal with this, the Council calls for the development of a regional center for biological analysis. This center would provide the resources to house analysts and staff necessary to perform modeling and other analysis to support regional efforts, such as this program and activities in connection with the Endangered Species Act.

National Marine Fisheries Service

3.2F.1 Develop a center for regional biological analysis. This center should provide the resources and support necessary to develop regional analytical tools and to provide analysis needed to support regional efforts such as this program and activities in connection with the Endangered Species Act. Personnel for this center should come primarily from the various regional entities involved in these activities, on a limited fellowship basis. The mission of the center will be to foster a coordinated and objective approach to development of analytical tools and needed analysis. The analytical effort should be closely tied to the Coordinated Information System. For this reason, and to provide an administrative structure, the Council recommends that this center be administered through the Pacific States Marine Fisheries Commission.

National Marine Fisheries Service and the Bonneville Power Administration

3.2F.2 Jointly provide the funds and resources necessary for the development and operation of the center for biological analysis described in Section 3.2F.1. Develop a procedure for sharing the associated costs to ensure the efficient operation of the center over time.

3.2G Disseminate Research and Monitoring Information

Bonneville and Corps of Engineers

- 3.2G.1 Annually publish a summary of results from all studies funded under the program. This should consist of concise descriptions of the project, results to date and future directions. Summaries should be prepared by the contractors, and compiled and published by Bonneville.
- 3.2G.2 Specify as part of the above task that summaries of research originating from the fish and wildlife program be submitted to the Coordinated Information System in appropriate form for incorporation into its research information data base. Fund the development of similar summaries for prior research conducted under the fish and wildlife program.
- 3.2G.3 Hold annual symposiums at which contractors present the results of their studies, beginning in March 1993. The purpose of these symposiums is two-fold: first, to promote the use of research and monitoring information funded under this program by managers and non-research personnel, and second, to provide peer review and coordination of research within the research community.

3.3 DEVELOP COORDINATED INFORMATION SYSTEM AND PREPARE MONITORING REPORT

The Coordinated Information System is an integral part of the Council's monitoring and evaluation program. It is essential to the efficient collection and dissemination of information produced as a result of this program. The system also serves to increase the cost-effectiveness of research, monitoring and evaluation by ensuring

that information produced by these programs is readily available to the region.

3.3A Fund Coordinated Information System

Bonneville

3.3A.1 Continue to fund the development of the Coordinated Information System to promote effective exchange and dissemination of information in standardized, electronic format throughout the basin. The Coordinated Information System should be maintained as an objective vehicle for collection and dissemination of information to and from all parties. It should be developed in close cooperation with the fishery managers and other concerned parties. This development should include making available information from primary sources, such as fishery managers, and secondary sources, such as the Fish Passage Center and the Pacific States Marine Fisheries Commission. Standardizing data formats and establishing data needs will be an ongoing responsibility of those developing the Coordinated Information System. Include the data bases listed in Sections 3.3B through 3.3D.

3.3A.2 Coordinated Information System

Prepare an annual program monitoring report. This report should compile and summarize information in the anadromous fish data base (Section 3.3B), including information on program implementation, performance standards, harvest and stock status. The annual monitoring report should be the basis for the annual evaluation report (Section 3.2A) and the biennial scientific evaluation (Section 3.2B.1). The final report should be submitted to

the Council and the National Marine Fisheries Service by June 15 each year.

3.3B Anadromous Fish Data Base

Relevant Parties

3.3B.1 Those developing the Coordinated Information System should assemble and tabulate on an annual basis and make available in electronic format all data necessary to the production, updating and enhancement of information in the 1992 Stock Summary Reports. Those responsible for the Coordinated Information System should update the relevant data on a regular basis. Other types of natural, hatchery and system information requested for program monitoring and evaluation should be included in the anadromous fish data base. Hatchery data should be developed in cooperation with the Integrated Hatchery Operations Team and should contain all data necessary to ascertain the performance of Columbia River Basin hatcheries.

3.3C Scientific Information Data Base

Relevant Parties

3.3C.1 Existing information from fish and wildlife program projects, other regional research efforts, and related national and international anadromous fish research should be compiled and made available to users in the form of a computerized bibliographic data base and a systematic, readily accessible, document retrieval system. Research data bases that are maintained by various fish and wildlife entities should be cataloged in a summary data base describing the information and detailed instructions on how to access this data.

3.3D Habitat Data Base

Relevant Parties

- 3.3D.1 Information to permit evaluation of the status of anadromous fish habitat in the Columbia River Basin should be compiled and made available to Coordinated Information System users. The data base should include a hierarchical classification system. This should include information on carrying capacities, survival rates and habitat-related human activities. In developing and maintaining this capability, explore options to survey habitat conditions, such as analysis of aerial photographs, that could be more expeditious, less cumbersome and less costly than conventional methods. Also, explore using a standard organizing approach such as a geographic information system.

3.3E Project Accounting Data Base

Bonneville

- 3.3E.1 In cooperation with the fishery managers, maintain a data base and tracking system developed to monitor and categorize expenditures by geographic location (Environmental Protection Agency River Reach System), species, type of action and other relevant categories. This database should be a part of the Coordinated Information System. Data base should focus on Bonneville expenditures, but also include other agencies' funding activities under the fish and wildlife program.

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Section 4

SALMON GOAL AND FRAMEWORK

To be effective, the fish and wildlife program must be more than a collection of measures. Individual efforts must be coordinated, and measures must be integrated into an overall plan designed to achieve specific goals and objectives.

To achieve this coordination, the salmon and steelhead sections of this program do three things:

First, the program is focused and organized around a framework. This framework consists of an overall goal (of doubling salmon and steelhead runs without loss of biological diversity) and rebuilding targets for Snake River salmon populations. The program also provides a process for developing additional rebuilding targets, salmon and steelhead rebuilding schedules, survival targets and performance standards to track change for individual measures. The goal and rebuilding targets, along with the other program measures, should guide the region toward salmon and steelhead rebuilding, while important work is done to complete the framework.

Second, the program establishes a coordinated implementation process (see Section 3) in which implementing agencies, working through the Bonneville Power Administration's implementation planning process, can systematize and prioritize the implementation of program measures. Recognizing that the Council is a planning and oversight entity, not an implementing entity, action on program measures will be managed by implementing agencies, not the Council. The Council will monitor and comment on this process, offer help where requested, and may, through additional program amendments, establish new measures or priorities.

Third, reflecting the Council's longstanding commitment to adaptive management, the program establishes a process to monitor and evaluate program implementation in a way that adds systematically to the region's knowledge of salmon and steelhead recovery (see Section 3).

During the 1994 amendment process, the Council solicited further recommendations,

regarding framework elements but few were received. Following the decision in *NRIC v. Northwest Power Planning Council*, the Council sought further advice from the fish and wildlife managers on the analytical framework. This resulted in a proposal from the managers, which the Council circulated for comment. While the resulting comment was valuable, it was not possible to complete the framework on the basis of the comments. The Council will continue to work with the fish and wildlife managers and others to develop the elements of the framework, and will consider amendments to the program when that work is more fully developed.

The Council appreciates the preliminary efforts of the fishery managers to further define biological objectives and other framework elements reflected in the recent submission by the Columbia Basin Fish and Wildlife Authority. The Council looks forward to additional refinements that are anticipated in the spring of 1995 and thereafter. The Authority's submission noted the importance of a program that has as its biological objective the assured protection and restoration of the productivity of the fish and wildlife resource and produces measurable results. It called for a fishery resource that is viable, sustainable and biologically diverse in the long term and can meet tribal, commercial and recreational harvest needs.

The Authority also pulled together a number of threads throughout the program and identified biological objectives that provide for survival improvements and production improvements. Juvenile survival improvement strategies outlined by the Authority for the tributaries, mainstem and estuary include: maintaining stream and riparian habitat programs; minimizing travel times, bypass losses, predation and delay at projects; and maximizing fish passage efficiencies. For the adult segment of the salmon life cycle in the ocean and the Columbia River, the Authority suggested survival improvements that include: increasing adult migration rates and minimizing delays;

managing straying; maintaining resting pools and spawning gravel; meeting escapement goals; meeting recruit/survival ratios; minimizing by-catch; and managing harvest. To improve production, the Authority noted the importance of meeting broodstock needs; managing interactions with naturally spawning fish; conducting hatchery audits; maximizing improved release strategies and natural habitat releases; and meeting escapement and seeding targets.

Taken together, these objectives and strategies are reflected in the statements of biological purpose in this program and, with the Authority's expressed commitment to work with the Council, will provide important direction for the continued efforts to flesh out the overall program framework.

The following Section 4.0 is a largely unchanged version of Appendix A of the Strategy for Salmon. It has been brought into the body of the program to reflect the importance the Council places on framework development. Pending further work on the framework, in addition to the

rebuilding targets adopted in 1992, the Council adopted recommendations for biological and operational objectives for the mainstem and other parts of the program where such objectives were clearly based on the recommendations the Council received.

4.0 Components of the Program Framework

The program framework provides the structure for the fish and wildlife program. It includes the overall program goal, rebuilding targets for identified populations, and schedules to achieve the rebuilding targets. The framework also provides the biological objectives for the program. Biological objectives describe biological change needed to rebuild individual populations. Measures are evaluated against these objectives to identify the strategy that will achieve the objective for the least cost. Finally, performance standards provide readily measurable indices of biological and physical change expected from the measures. The relationship between these elements forms a hierarchy as depicted in the following diagram:

The components of the program framework are linked by a series of facts and assumptions that provide the rationale for the measures in the Council's program. For the most part, these assumptions have been implicit. As such, the program is difficult to evaluate. Inconsistencies among measures are difficult to identify. The Council believes that the conceptual foundation for the program should be explicit so that inconsistencies and scientific weaknesses can be identified. The Council has begun this process by identifying critical hypotheses associated with mainstem passage (Section 5.0E). In addition, the Council has called on the Independent Scientific Group to develop an overall conceptual foundation for the program (Section 5.0F).

4.0A Program Goals

The program goals set the direction and scope of the program and provide the philosophy that guides the Council's selection of measures. Examples include goals to maintain and enhance stock diversity, restore weak runs and double overall salmon production. Collectively, the other elements of the program are expected to make significant progress toward or accomplish the goals.

4.0B Rebuilding Targets and Schedules

Rebuilding targets provide the management intent and the numeric goals for the population. Rebuilding schedules describe and refer to specific populations and incorporate the idea of stock conservation units, minimum sustainable population size, compatibility with other stocks and expected variability. Rebuilding schedules are based on the biological needs of the fish, management goals and the projected effectiveness of actions. Because of the number of conditions affecting population size that are outside the control of this program, it may be necessary to state rebuilding schedules in terms of the probability of reaching a numeric target within the schedule given achievement of the biological objectives. Rebuilding targets are dynamic elements that will likely change as knowledge increases and techniques are improved.

4.0C Biological Objectives

Biological objectives describe the biological characteristics needed to achieve the rebuilding targets and, ultimately, the overall program goal. They also are intended to provide a standard against which to compare alternative measures under Section 839b(h)(6)(C) of the Northwest Power Act. Biological objectives should be independent of the measures and should not constrain the Council to a single course of action.

Development of biological objectives must be based on a sound technical and analytical foundation that incorporates all phases of the life cycle of salmon and steelhead. Because our scientific information is imperfect, the biological objectives should not be considered immutable standards, but instead should be viewed within the context of the Council's adaptive management approach and will be refined as knowledge improves.

4.0D Performance Standards

The effectiveness of actions is often uncertain or depends on other actions. It will be important for the Council and the region to track measures in a timely manner. Performance standards for each action or set of actions should provide an easily measurable index that relates to the type of biological or physical change intended. Performance standards provide a point of reference against which to monitor change, and units of measure to define change. They are not intended to state or limit obligations or to resolve technical uncertainties.

4.0E Measures

Program measures are specific actions to be undertaken to contribute to achieving biological objectives and rebuilding schedules. When monitoring shows a program measure is not performing adequately, the measure should be modified or replaced. Measures must stand or fall on the basis of their demonstrated contribution toward the biological objectives.

4.1 SALMON AND STEELHEAD GOAL: DOUBLE SALMON AND STEELHEAD RUNS WITHOUT LOSS OF BIOLOGICAL DIVERSITY¹

In crafting the overall goal of this salmon rebuilding strategy, the Council is faced with the challenge of balancing the need to increase the number of fish in the Columbia, maintain and enhance biological diversity, and preserve wild and naturally spawning populations.

The production of salmon and steelhead in the basin prior to development has been estimated at 10 million to 16 million fish. Today's total production of salmon and steelhead amounts to fewer than 2.5 million fish. Between 5 million and 11 million fish are estimated to have been lost due to development of the hydroelectric system. Thus, significant change in the system is required. To address the loss due to hydroelectric development, the Council set a numeric target for the 1987 program -- doubling of salmon and steelhead production in the Columbia Basin. In the 1994 amendment process, based on the recommendation of the Columbia River Inter-Tribal Fish Commission, the Council adopted four systemwide sub-goals based on the Northwest Power Act's call to protect, mitigate and enhance salmon and steelhead affected by the development and operation of the hydropower system: The first goal is to halt declines in the populations and rebuild populations to a biologically sustainable level by the year 2000. The second goal is to further rebuild populations by 2030 to a level that will support commercial and sport harvest and contribute to the Council's interim goal of doubling the abundance of salmon and steelhead in the basin. The third of these goals is, by 2194, to rebuild populations beyond the level in the previous goals to a level that will protect, mitigate and enhance fish and wildlife affected by the operation and development of the Columbia Basin hydroelectric system. The fourth goal is to accomplish these rebuilding efforts without loss of biological diversity.

¹Biological diversity means the variety and variability among living organisms and the ecological complexes in which they occur.

While numeric increases in salmon populations are needed, they must be tempered by the understanding that the Council wants increases that can be sustained over the long term. The importance of this was recognized by the Council in the 1987 program. Rebuilding was not to be driven inexorably toward a numeric goal, but was to be tempered by the assessment of genetic impacts, use of a mix of production methods and emphasize the area above Bonneville Dam.

Concern for biological diversity and preservation of wild and naturally spawning stocks has been heightened by the listing of several Snake River salmon populations as endangered under the Endangered Species Act, and the identification of numerous other weak populations. There is increasing concern that preservation of the diversity of populations and biological traits present in the Columbia Basin may be essential to maintain increased fish numbers on a sustained basis.

Unfortunately, these two resource values -- increased numbers and biological diversity -- often appear to be incompatible. On the one hand, measures to increase population size in the short term can decrease biological diversity. On the other, measures to conserve biological diversity may limit the region's ability to achieve short-term gains in production. Sustainable increases in numbers, however, will require a healthy, biologically diverse resource that can be productive and accommodate environmental variability.

The Council sees its role as planning for the restoration of a healthy, productive resource throughout the accessible range of habitat in the Columbia Basin. To do this on a sustained basis will require actions directed not only at increasing the number of fish, but also actions to conserve biological diversity and increase the productivity of natural stocks. Increased numbers and the conservation of biological diversity are not incompatible. They are both key to the conservation of the resource and fulfillment of the obligations of the Northwest Power Act. A productive and biologically diverse population is essential to increased production that can be sustained over the long term.

4.1A Salmon and Steelhead Rebuilding Principles

The Council has adopted as part of its overall goal the doubling of the total number of adult salmon and steelhead in the Columbia Basin as fast as possible without further loss of biological diversity among or within anadromous and resident fish populations.

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

The time needed to double the runs will depend on a number of factors, including the program policies for mainstem survival, harvest management and fish production, and on further assessment of production opportunities. The Council recognizes that any action has the potential for causing some genetic change in the population. In establishing biodiversity as part of its goal, the Council states its desire to avoid adverse genetic change to the maximum extent practicable, to consider genetic impacts as important criteria for selection of measures, and to monitor changes in genetic and life history diversity as measures are implemented. This does not preclude carefully designed, controlled and monitored supplementation programs.

Except where human-induced habitat changes have produced increases in some species to the detriment of salmon and steelhead (for example, squawfish), efforts to meet these goals for salmon and steelhead should not occur at the expense of other native species and wildlife. Because most of the loss of salmon and steelhead production as a result of hydroelectric development has occurred above Bonneville Dam, the Council will continue to focus its efforts on this area.

The Council recognizes that achieving its goal will require actions on all fronts over many life cycles of salmon and steelhead. In the short term, it will require increased attention to the need to conserve biological diversity and halt the decline in many populations. This may occur at the expense of actions that might provide greater short-term increases in numbers, but could possibly jeopardize the biological health of the resource in the long term. It will require increases in mainstem passage survival, improved habitat

and production practices, and diligent management of harvest.

To help focus efforts toward this goal, six principles should be used to evaluate activities in subregional planning (see Section 3.1D) and other program processes:

1. Priority should be given to activities that aim to rebuild weak upriver populations, including populations listed under the Endangered Species Act.
2. Program activities should pose no appreciable risk to biological diversity among or within fish populations (including resident fish), with the exception of principle number five, below. The best available data and assessment tools should be used to evaluate biological risk before determining whether to proceed, and activities should be followed-up with monitoring and evaluation.
3. The region should approach habitat and production activities from a total-watershed perspective, not as activities that occur in isolation from land and water conditions in watersheds. Special priority should be given to projects that are part of model watersheds or other coordinated watershed programs, especially those with local community involvement.
4. While the bulk of the region's attention is currently focused on threatened and endangered stocks, it is important not to lose sight of this region's obligations to fulfill Indian treaties and provide fish for Indian and non-Indian harvesters. Investments and adjustments should be made to provide harvest opportunities in tributaries or other areas and to facilitate rebuilding weak populations.
5. Consistent with the Council's adaptive management policy, priority should be given to activities that address critical uncertainties and/or test important hypotheses. Activities should be designed as experiments so that the results fill in the region's understanding of salmon and their survival requirements. Even a

measure that poses risks for a population may be acceptable if the potential learning benefits are high enough.

6. Because of concerns over the basin's salmon carrying capacity, the effects of hatchery-produced fish on those that spawn in streams, and the cost of hatcheries, new salmon production facilities generally should not be constructed unless it is clear that the need for fish cannot be met with existing facilities, or a new facility would be a better way to achieve the program's goals.

The subregional process (Section 3.1D) should generate important information on the costs and biological effectiveness of habitat and production measures. This information will contribute to the independent evaluation of program cost-effectiveness by the Independent Scientific Group (Section 3.2B), and be reflected in the annual implementation work plan (Section 3.1B.2).

All of these principles reflect important concerns, but for at least the next five years, the preponderance of the ratepayers' investment should be directed to rebuilding weak stocks. Both the potential biological value of weak stocks and the requirements of the Endangered Species Act suggest that the path to doubling must begin with weak populations.

This weak-stock priority includes populations listed under the Endangered Species Act, but is not limited to these populations. The Northwest Power Act calls for a long-term approach to fish and wildlife mitigation, not simply a reaction to immediate problems. Treaties with Indian tribes and with Canada call for the United States' best efforts to rebuild these populations to self-sustaining, harvestable levels. The Council is committed to this cooperative effort. Moreover, there are many weak salmon populations not listed under the Endangered Species Act. It is in the region's interest to take forceful steps to strengthen these populations before it becomes necessary to list them. Limiting ratepayer investments to threatened or endangered species in these circumstances is simply an invitation for new Endangered Species Act petitions.

While the preponderance of the ratepayers' investments should be directed to weak stocks,

weak stocks should not be the exclusive focus of the program. Over the past decades, Indian tribes and other harvesters have given up harvest on species after species, and that disturbing trend appears to be continuing. For tribal fishing rights to have meaning, there must be enough fish in the rivers to allow a reasonable harvest. Upriver fishers are entitled to salmon populations that are more than museum specimens. In the long term, as weak stocks are rebuilt, harvest opportunities may be expanded throughout the basin, consistent with rebuilding targets. In the short term, the region should also make investments and adjustments to provide harvest opportunities in tributaries or other areas where there will be no significant negative effect on weak populations.

4.1B Basis for the Salmon and Steelhead Goal

The Northwest Power Act directs the Council to develop a Columbia River Basin Fish and Wildlife Program to protect, mitigate and enhance fish and wildlife "affected by the development, operation and management" of the hydropower system in the basin. Essential to this definition is an understanding of the extent to which salmon and steelhead have been affected by the hydropower system. In 1985, the Council began gathering information on the extent and causes of the declining numbers of salmon and steelhead in the basin. In 1985 and 1986, the public reviewed and debated the nature and limitations of that information. (The results of the Council's efforts have been published in a separate volume entitled, *Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin*, document number 87-15A.)

After compiling information on salmon and steelhead losses, the Council solicited extensive public comment on the contribution of the hydropower system to declines in run sizes. Based on the losses information and on public comment, the Council identified alternative ways to estimate the portion of total losses that could be attributed to hydropower. (These alternatives are described in a separate volume entitled, *Numerical Estimates of Hydropower-Related Losses*, document number 87-15B.)

Following is a summary of the Council's analysis of: 1) losses from all causes, and 2) losses related to development and operation of the hydropower system. (For further analysis, refer to Council documents 87-15A and 87-15B.)

- **Estimate of losses from all causes:** After an intensive review of the available data to make an informed judgment, the Council reached the following broad conclusions regarding salmon and steelhead losses.

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

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

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

percent of upstream migrants per dam. Recent analyses suggest that reservoir mortality in upriver reservoirs and at upriver projects could be lower in some instances. Nonetheless, passage mortality has enormous effects on upriver runs.

Cumulative juvenile passage mortality for fish migrating downstream past nine dams has been estimated to be 77 percent to 96 percent, depending on the volume and timing of streamflows. Cumulative adult passage mortality for fish passing nine dams upstream to spawning areas has been estimated to be 37 percent to 61 percent.²

In some mixed-stock fisheries, upriver wild and natural stocks, already weakened by habitat and passage losses, commingle with abundant lower-river hatchery stocks. Because fisheries generally do not distinguish among stocks in mixed-stock fisheries, all stocks present may be harvested at the same rate. In the past, harvest rates in mixed-stock fisheries generally were set to ensure adequate returns of hatchery fish, rather than to protect wild and natural runs.

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

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

increased harvest of already depleted wild and upriver stocks.

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

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

Cannery records support the reasonableness of the 5 million to 11 million range. Canneries on the lower Columbia River kept records of the number of salmon and steelhead delivered by fishermen. The maximum catch, according to these records, occurred in the 1880 to 1920 period and was about 8.8 million fish annually. Anthropological information for this period suggests that the Indians caught an additional 0.9 million fish and that non-Indian settlers in the upper portions of the Columbia Basin probably harvested a similar number. Thus, one reasonable estimate of the historical maximum catch in the Columbia Basin is about 10.5 million fish. Assuming that four out of every five fish were caught, the total run size can be estimated at about 13 million fish. Given the current run size of 2.5 million fish, this would

mean that the salmon and steelhead run size has declined by more than 10 million from all causes. Of that 10 million, about 8 million can be attributed to the hydropower system. That 8 million includes 4 million salmon and steelhead that were produced in the areas blocked by Chief Joseph and Hells Canyon dams. Losses caused by mainstem hydropower operation (assuming that 15 percent of downstream migrants are killed at each mainstem dam) account for the decline of the other 4 million fish. (Documents 87-15A and 87-15B provide additional background information.)

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

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

4.1C Doubling Goal Performance Standards

The doubling goal is based on the average number of adult salmon and steelhead in the Columbia River Basin from 1977 to 1981, the five

years prior to the Council's adoption of its first Columbia River Basin Fish and Wildlife Program. That five-year average has been estimated to be 2.5 million salmon. Today's numbers should be obtained by combining the number of adult salmon and steelhead of all species counted at Bonneville Dam, the number of fish spawning below Bonneville Dam and the estimated number of salmon caught in the ocean and in rivers below Bonneville Dam. The program monitoring report (Section 3.2A) should provide an annual accounting of production relative to this performance standard.

4.1D Biological Diversity Performance Standard

The performance standard will be the existing level of biological diversity. Existing biological diversity will be defined by a list of base-line populations against which populations will be compared annually. The natural processes of extinction and speciation will result in variation around the base line over time. New knowledge also may indicate the need for revision in the base-line list of populations.

Implementing Agencies and Fishery Managers

4.1D.1 To establish the biodiversity base line, the Council calls on participants in the implementation planning process to convene an appropriate group of experts from the fishery agencies, tribes and elsewhere to provide recommendations for the population list. A final recommended list of populations should be submitted to the Council by June 30, 1995. The program monitoring report (Section 3.2A) should provide the annual list of populations and include a qualitative, and if possible, quantitative assessment of status and conditions for each population. The annual review also will include recommendations to modify the population list on the basis of new information.

4.2 SALMON AND STEELHEAD RESEARCH AND EVALUATION

4.2A Guiding Principles for the Columbia River Basin Salmon and Steelhead Research Program

- Salmon and steelhead research under this program is expected to be designed to reduce scientific uncertainty and increase knowledge to achieve the salmon and steelhead goal and policies of this program.
- Research priorities are expected to reflect a systemwide analysis of the major uncertainties and problems associated with increasing runs in a biologically sound manner.
- Funding of research by Bonneville and the Corps should be consistent with the critical uncertainties identified in Section 3.2C.
- Knowledge gained as a result of the research program is to be reviewed and evaluated in a central policy forum and made available in a timely manner to policy-makers, resource managers, biologists, hydroelectric project operators and regulators, and other interested parties.
- The fish and wildlife agencies and tribes should participate in development and oversight of the research program.
- Bonneville and the project operators and regulators are expected to provide the funding and resources necessary to implement the research program.
- Research funded by Bonneville and the Corps under this program is expected to be coordinated with research funded by other entities to ensure efficient use of

funds and maximum return on research investments.

4.3 REBUILDING TARGETS, PERFORMANCE STANDARDS AND MONITORING

4.3A Snake River Chinook Rebuilding Elements

The Council has introduced the program framework to structure and focus program measures. Work on the framework elements as well as coordinated development and refinement of analytical tools will continue. These tools will help analyze additional actions and, equally important, help identify information needs. This will help the Council establish new program biological goals, measures and performance standards and review those that already exist. Key purposes of further analytical development and Council action are to establish clear links between rebuilding targets and performance standards and measures needed to accomplish the targets and to clarify the relationship between flow, river velocity and survival.

A major part of the framework is the rebuilding plans for each Snake River chinook population. Because of pending decisions on regional initiatives, the Council is unable at this time to establish all the elements of rebuilding plans. These decisions should be made as rapidly as feasible. The Council calls on participants in the implementation process to work with the Council to develop recommendations for the rebuilding plans in time to contribute to the process of deciding on these regional initiatives. After the decisions are made, the Council will adopt rebuilding plans for identified Snake River chinook populations. These will include rebuilding targets and schedules. This process is not intended to substitute for expeditious action on the rebuilding measures already adopted in these amendments.

The Council sets rebuilding targets for wild and naturally spawning Snake River salmon populations above Lower Granite Dam as follows: annual averages of 50,000 adult spring chinook,

20,000 adult summer chinook and 1,000 adult fall chinook. These represent ambitious targets, but targets the Council believes are achievable in the long term. Relative to the estimated 1991 returns of wild and naturally spawning fish, they will require more than an order of magnitude increase in numbers. Although the targets call for a strong recovery from the current situation, they will not restore these populations to their condition prior to development of the basin's hydroelectric system. The key component for achieving this rebuilding target is increasing the percent of smolts that survive to return as adults. Survival improvements of this magnitude will require aggressive implementation of all measures in the program.

Rebuilding targets do not quantify any party's obligation under the Northwest Power Act. Rebuilding targets represent the Council's judgment of ambitious, interim population sizes that achieve the Council's goal and can be achieved by carrying out the mix of measures called for in this program. The feasibility of achieving these targets with measures in the program was checked using the best analytical computer models available.

The Council supports rebuilding Snake River salmon populations to productive, fishable levels as rapidly as possible within program goals. The Council recognizes that immediate measures are not enough to achieve an adequate level of rebuilding or the management goals of the State of Idaho and will continue to seek greater rebuilding.

Implementing Agencies and Fishery Managers

4.3A.1 Working with the Council, begin to develop rebuilding plans for identified population management units. The plans should include the elements of a rebuilding plan identified in Section 4.0, including definition of the population management unit, management goal, rebuilding target, survival targets, rebuilding schedule and performance standards. The Council views this as a limited effort that should draw on the information developed in system planning, new information developed since then (including information on genetic needs

and weak stocks) and the coordinated analytical methods process (Section 3.2F). As much as possible, rebuilding plans should reflect and incorporate the subbasin plans developed as part of the 1987 program. A schedule and work plan for development of the rebuilding plans should be submitted to the Council by June 30, 1995. Recommendations on the rebuilding plans for Snake River populations should be submitted to the Council by September 1, 1995. Recommendations for other populations should be submitted to the Council as soon as possible and not later than January 15, 1996.

Bonneville

4.3A.2 Fund travel and reasonable expenses of the fishery managers necessary to develop these recommendations.

4.3B Development of Performance Standards

The effectiveness of actions is often uncertain and depends on other actions. It will be important for the Council and the region to track measures in a timely manner. Performance standards for each action or set of actions should provide an easily measurable index that relates to the type of biological or physical change intended. Performance standards are intended to provide a point of reference against which to monitor change and units of measure to define change. They are not intended to state or limit obligations or to resolve technical uncertainties.

Performance standards will take a variety of forms. In some cases, they will specify changes in survival when these are measurable; in others, they may relate to physical or qualitative changes, or to accomplishing certain tasks within certain time frames. However, it is the Council's intention that performance standards relate to actual biological results (e.g., improvements in survival) whenever feasible, and not just to factors that relate inferentially to biological change.

At the same time, performance standards must be measurable on a timely basis and relate directly

to the biological change intended by the measure. Performance standards should be linked to the rebuilding schedules and survival targets, and reflect changes needed to meet the biological objectives. They are not intended to be rigid and inflexible, but should respond to new knowledge. As information improves, better performance standards may become apparent.

Implementing Agencies and Fishery Managers

4.3B.1 Solicit input from the following groups to develop additional performance standards: Fish Passage Advisory Committee, Fish Transportation Oversight Team, Integrated Hatchery Operations Team, Regional Assessment of Supplementation Project and the Technical Advisory Committee of the Columbia River Compact.

Recommendations for additional performance standards for individual measures or logical groupings of measures should be developed through the implementation process. Participants in the process should solicit input from other appropriate groups or individuals. Each group should review program measures appropriate to its area of expertise and provide recommendations for performance standards. A final list of recommendations should be submitted to the Council by July 1, 1995. Performance standards should reflect program measures and survival targets. The Council will review and act on these recommendations to provide a final set of performance standards.

4.3C Population Monitoring

While dam counts of salmon will provide important, timely information on progress toward rebuilding runs, they combine several possibly diverse populations of spring, summer and fall chinook above Lower Granite. In so doing, important information about the status of these individual populations can be lost. At the same time, it may be prohibitive, both in terms of money and effort, to closely monitor every potentially distinct portion of this larger

population. Monitoring activities themselves also have the potential for causing salmon losses within weak populations.

For these reasons, the Council intends to establish a limited number of indicator populations that will be the focus of intensive monitoring. The genetic stock identification project described in Section 8.4 may indicate that revision of these indicator populations is needed in the future. The purpose of indicator population monitoring is not only to provide detailed stock status information on these particular populations, but also to provide basic life history and survival information that will be applicable to all populations within the larger population. This will provide the Council with a clearer picture of the factors limiting natural populations and permit refinement of the program over time.

Fishery Managers

4.3C.1 Develop and submit to the Council:

- A limited set of populations that can serve as indicators of wild and naturally spawning salmon populations. These can include hatchery stocks if necessary to provide harvest rates for wild and naturally spawning populations. The indicator stocks selection should be closely coordinated with and take advantage of existing monitoring and research efforts, including actions conducted under the U.S./Canada Pacific Salmon Treaty. The proposal should be submitted to the Council by December 31, 1995.
- A proposal for a coordinated program to monitor key indicator populations of wild and naturally spawning populations of salmon. Hatchery populations should be included when they can form appropriate indices of harvest, for example, on wild and naturally occurring populations. This monitoring program should conform to data needs and reporting formats developed through the coordinated information system.

- A proposal to develop needed technology for monitoring of wild and naturally spawning populations and efficient and timely transfer of information to the coordinated information system. This should include development of Passive Integrated Transponder (PIT) tag detectors to monitor juvenile and adult populations and mobile counting weirs.
- A proposal for the use of video counting technology for population monitoring at mainstem dams and at tributary dams and weirs.

Council

- #### 4.3C.2 Facilitate the development of the above monitoring elements. Council staff should review the proposals as they are developed and make recommendations to the Council regarding their value to the program monitoring effort. The Council will review the proposals and give appropriate direction to the implementing agencies regarding their development.

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Section 5

JUVENILE SALMON MIGRATION

Salmon and steelhead begin and end life in many diverse streams and tributaries throughout the Columbia River Basin, but they all eventually share one route. They must make their way down and ultimately back up the mainstems of the Columbia and Snake rivers as they go to and from their spawning beds. Between passages, they spend most of their adult lives in the Pacific Ocean.

Given that their unusual life cycle depends on a long river journey that can stretch hundreds of miles, it is clear that safe passage is paramount to their survival. Downstream passage is especially dangerous for juveniles because of the effects of dams and slow-moving reservoirs, such as turbine, bypass and spill-related mortalities, predation, migration delays and high water temperatures. The fish are on a biological time clock. To reach the ocean safely, the spring migrants must complete their downstream journey quickly.

Development of the dams has greatly altered the natural flows and cross-sectional areas of rivers in the basin. The spring runoff is stored in reservoirs so it can be used to produce electricity, as well as to provide for irrigation, transportation, recreation and flood control throughout the year. However, this practice and others also reduce river flows, particularly during the spring when juvenile salmon and steelhead are migrating downstream to the ocean.

The combination of reduced flows and the greater cross-sectional area of the river due to reservoir storage slows the juvenile fish as they migrate to the ocean. An increase in travel time in the river affects the migratory behavior of juvenile fish and increases their exposure to predatory fish and birds. Reduced flows also endanger juvenile salmon by raising water temperatures, altering water chemistry and increasing susceptibility to disease.

The physical problems faced by salmon and steelhead have been compounded by the diversity of the parties involved in the river basin's management. Even with major efforts to increase the amount of water for salmon and steelhead, matching water supplies with the needs of spring and summer migrating fish poses a substantial problem of analysis and coordination.

From the start in 1982, the Council's program recognized and focused on the importance of improving mainstem survival for both smolts and returning adult salmon. However, in recent years, the problem has been exacerbated by a series of low water years, caused primarily by drought conditions in the southern and eastern parts of the basin. The Snake River Basin has been particularly dry. It is believed that this drought contributed significantly to a reversal in the increases in run sizes observed in the early 1980s.

To increase salmon survival in the mainstem, the approach must be multifaceted. Flows and reduced water temperatures alone are not sufficient. Control of predation, improved and/or new fish transportation methods and completion of programs to install and upgrade screens at both the dams and all unscreened water diversions are all vital to successful mainstem passage.

When it first addressed these problems in 1982, the Council developed a "water budget" to be used between April 15 and June 15. The water budget is a block of water set aside for fish and released during the spring runs to create an artificial freshet that speeds juvenile fish to the ocean. Separate water budgets were established for measurement at Priest Rapids Dam on the Columbia River and Lower Granite Dam on the Snake River, both in Washington.

Through the use of the water budget, the fish and wildlife agencies and tribes could increase spring flows to aid the downstream migration of

juveniles. The Council established a schedule of firm power flows for the April 15 to June 15 period to provide a base from which to measure water budget use. (Firm power is the electricity that the hydropower system guarantees it can produce. That guarantee was premised on the assumption that this amount of hydropower is available even in historic low, or "critical," water conditions.) The water budget may be used to implement any flow schedule that would ensure juvenile salmon survival, provided the flows allow existing firm non-power commitments, such as flood control, to be met.

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.

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

The Council called for a study of the water budget's biological effects, including reductions in smolt travel time, improvements in smolt survival and impacts on the power system. In 1987, the fish and wildlife program was modified to encourage experimentation with and evaluation of alternatives for implementing the water budget.

In 1991 and 1992, with new data showing continuing declines in wild stocks, the Council adopted two kinds of measures to supplement the earlier water budget volumes. The first was a

set of immediate measures that could be implemented in time for the 1992 fish migration. Second, recognizing that these immediate measures are inadequate to rebuild some weak populations, the Council identified a set of intermediate-term measures.

In this rulemaking, the Council has concluded that additional actions to improve mainstem survival of migrating salmon must be taken. Analyses conducted by the Council indicate that, absent additional action and a substantial change in ocean conditions, salmon populations in the Snake Basin will not rebuild and will, in all likelihood, go extinct. This conclusion is consistent with that reached by the Council in developing its 1992 salmon strategy. In that rulemaking, the Council put in place a number of immediate survival improvements, while acknowledging that the measures would be insufficient to protect all weak populations or rebuild salmon populations to levels specified in the Council's goals.

The urgency of action has only been heightened by the exceedingly poor returns of the past two years and the even worse projections for the coming several years. These constitute historical low numbers in the population and raise the specter of extinction. While it appears clear that a portion -- perhaps a substantial portion -- of the most recent declines can be attributed to poor ocean survival conditions and the effects of a persistent drought in the region, the Council is persuaded that a sound salmon rebuilding program must be able to withstand periodically adverse natural circumstances. The salmon runs were able to survive poor natural conditions in the past and would be able to survive in today's conditions but for a wide variety of human-caused sources of mortality. These mortalities must be reduced. Doing so will require additional action directed toward restoring the ecological health of the Columbia River ecosystem.

These additional actions are detailed below and are tied to an explicit adaptive management approach that will ensure careful monitoring and evaluation of impacts so mid-course corrections can be made. The Council believes, on the basis of the best available scientific information, that these actions are likely to improve the survival

of anadromous fish and that immediate survival improvements are needed or important components of the salmon runs will likely be lost to extinction. Flow and velocity improvements are called for on the basis of agency, tribal and other scientific information on the reasonableness of the relationship between flow, migration speed and salmon survival. While the relationship is not precisely known, and is attended by much debate, the Council concurs with the Oak Ridge National Laboratory review and believes that a positive characterization of this relationship is reasonable, and merits pursuit through a variety of actions contained in this program.

At the same time, the Council explicitly acknowledges the biological uncertainties associated with the complex ecosystem needs of the salmon and is vitally interested in seeing the level of understanding and the quality of scientific information improved expeditiously. Accordingly, the Council has established a means whereby the region can proceed with actions that appear reasonably likely to improve survival in a significant way while providing the opportunity to learn more about the biological needs of the salmon.

Further, the Council has included a number of measures to protect resident fish populations from excessive power operations or anadromous fish operations of the hydroelectric system that could undermine resident fish.

In the 1991-93 amendment process and the 1994 amendment process, the fish and wildlife agencies and tribes recommended several objectives related to hydroelectric project operations. Specifically:

- The fish managers' recommendations reflect a fairly broad consensus that flows (or equivalent velocities) of 140,000 cubic feet per second in the Snake River and 300,000 cubic feet per second in the Columbia River would improve salmon survival rates, but concerns were raised about impacts on resident fish.
- There were strong recommendations for an 80 percent fish passage efficiency

objective for measures to reduce fish mortalities at the projects.

- There were recommendations to control summer and early fall temperatures in the rivers to improve the survival of returning fall adult chinook salmon.
- The Columbia River Inter-Tribal Fish Commission recommended that the hydropower facilities be managed to achieve 120,000 cubic feet per second in the Columbia River in September.
- The Montana Department of Fish, Wildlife and Parks and the Salish-Kootenai Tribe recommended "integrated rule curves" to protect environmental conditions for resident fish and wildlife at storage reservoirs in Montana. Reservoir constraints were also proposed for Lake Pend Oreille and Grand Coulee.

Commentors expressed a variety of concerns about these objectives. For example, the Upper Columbia United Tribes and the Colville Tribe opposed flow augmentation on the order of 140,000/300,000 cubic feet per second, because of the effects it could have on resident fish in Grand Coulee. At the same time, Montana's integrated rule curves show that operating the hydropower system to protect resident fish and other reservoir values may mean more water for flow augmentation downstream. Idaho Department of Fish and Game also urged caution in augmenting flows for salmon, potentially at the expense of riverine resident fish and wildlife. To take another example, if stored water must be released to control summer temperatures when they are above 62 degrees, spring flow augmentation may have to be reduced to ensure that sufficient cold water is available later for temperature control. There are other examples -- river analysis shows that in some water years summer flow objectives may conflict with spring flow objectives -- but the point is obvious. It is not clear when and how these objectives can be achieved, particularly in low water years, and particularly when the basin

experiences a succession of low water years, as the last six or seven have been.

The recommendations described above are for operational objectives. Each operational objective must have a biological objective. Some commentators were skeptical that these operational objectives would produce the survival benefits suggested by the objectives' proponents. Giving due weight to the authorities, expertise and rights of the fish and wildlife agencies and Indian tribes, and considering the independent review conducted by the Council's consultant, Dr. G.F. Cada,¹¹ the Council accepts the agencies' and tribes' judgment on the expected biological value of these operational objectives. This is not to say that the Council accepts these judgments conclusively. The scientific data are not clear, and there are genuine disagreements among capable scientists on these matters.

One of the issues raised in connection with these objectives is whether the region will be assured of an "adequate, efficient, economical and reliable power" supply if the hydropower system is managed to meet fish and wildlife objectives. The Council has made findings on this issue in Section 1 of the program. However, these questions require further exploration for the longer term.

With this in mind, four general observations are important here:

First, for the near term, it is not clear when and how mainstem fish and wildlife objectives can be achieved along with the other authorized purposes of the hydropower system. The measures below make it considerably more likely that the region can achieve these objectives, or their velocity equivalents, recognizing that they may not be achievable in some years, especially in the near term. Inevitably, determining to what extent these objectives can be met in any given year will require careful annual planning and in-season management.

Second, beyond the near term, the Council and the region must continue to make changes in the hydroelectric system to make fish and wildlife objectives more achievable and to minimize the need for or impacts of tradeoffs among objectives, while carrying out the purposes of the Northwest Power Act.

Third, the region must evaluate the biological assumptions that underlie these operational objectives to see if changed river operations are achieving the expected biological benefits. The questions detailed in the Council's mainstem hypotheses, for example, must be investigated expeditiously through an adaptive management strategy. As new information emerges, the region must be prepared to adjust these operational objectives.

Fourth, the Council will work with Bonneville, the fishery managers, utilities and others to assure the continuing adequacy, efficiency, affordability and reliability of the region's power supply. In 1995-96, the Council will conduct a revision of the power plan that will address these issues more thoroughly.

The measures outlined below are the Council's prescription for carrying out these courses of action. Each measure or group of measures, including operational objectives, is accompanied by a statement of the measure's biological objective, which was explicit or clearly implicit in the original recommendations and in the Council's proposed amendments.

This section provides for immediate mainstem survival actions in the following areas:

- An expedited program to improve fish bypass at mainstem dams through use of surface bypass systems and, until these and other bypass improvements are in place, additional spill to levels that do not exceed state-defined levels of nitrogen gas supersaturation.
- Improvements in spill efficiency and actions to reduce dissolved gas levels.
- Improved flows in the Snake River through acquisition of 1 million acre feet

¹¹Cada, G.F., et al., 1994. Review of information pertaining to the effect of water velocity on the survival of juvenile salmon and steelhead in the Columbia River basin. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

- of additional water from willing sellers and additional water from Brownlee.
- Improved flows in the Columbia River through modified operation of Grand Coulee and Albeni Falls dams and negotiations for additional water from Canadian storage reservoirs.
- Enhanced velocity in the Snake and Columbia rivers through drawdown of Lower Granite and Little Goose reservoirs to near-spillway crest and operation of John Day reservoir at near minimum operating pool.
- An emphasis on inriver juvenile migration in all but the worst water conditions, along with improved fish transportation and an accelerated National Marine Fisheries Service-directed comprehensive scientific evaluation of transport and inriver migrant survival.
- An intensified effort to control predators and reduce competition with depressed salmon stocks.

This section also provides for expeditious evaluation of the following additional mainstem survival actions and schedules future Council decisions on them:

- Additional upstream storage reservoirs to hold water in good flow years and make it available in dry years.
- Additional velocity improvements, including additional drawdowns to spillway or natural river levels.

It also puts in place and reinforces a comprehensive monitoring and evaluation effort designed to help the region make wiser choices in the future. This monitoring and evaluation program builds on the prior Council rulemaking which developed a set of hypotheses for additional action and evaluation of mainstem survival. It will require a much stronger regional commitment than has been evidenced to date to conduct careful evaluations of the contentious flow/velocity/survival relationship -- a relationship on which the Council has consistently called for more rigorous analysis. The failure of the region to develop better

information in this area has been due in part to the unavailability of new techniques and technologies, such as the PIT tags and necessary detectors at hydroelectric facilities. However, it has also been the result of unnecessarily prolonged debates about the need for the research, the best methods for conducting it and the desirability of taking additional action pending the development of additional information. The Council hopes that its call for immediate action and immediate improvement in the knowledge base will help resolve this long-standing impasse.

Finally, in the resident fish section of the program, the Council adopts the following measures to protect resident fish populations:

- Integrated rule curves to improve operation of Hungry Horse and Libby dams for resident fish.
- A call for no significant degradation of the existing nutrient retention time² and drafting limits for the reservoir behind Grand Coulee Dam.
- A limit on the depth to which the reservoir behind Dworshak Dam is drafted.

5.0 MAINSTEM PASSAGE EXPERIMENTAL PROGRAM

5.0A Adaptive Management Approach

Clear answers regarding improvements in survival in the mainstem lie in extensive ecological research, and long-term monitoring and evaluation. At the same time, Congress recognized that these issues would rarely be crystal clear, and directed the Council to make decisions on the basis of the best *available* scientific information. Most importantly, the condition of many fish populations makes immediate action imperative.

² The amount of time microscopic food organisms, and nutrients on which they depend, spend in a reservoir. It is these organisms on which fish and the entire food chain depend. Nutrient retention time is measured by the amount of time it takes water to flow through a reservoir.

In 1984, the Council endorsed the concept of adaptive management -- using management initiatives as experimental probes to clarify uncertainties about the effectiveness of mitigation measures. The Council proposes to utilize this management technique explicitly to deal with the mainstem dilemma. Below, we call for significant actions to improve both inriver and transported survival. These actions are coupled with an experimental program intended to maximize our ability to learn and to assist the region in making crucial decisions about mainstem passage.

The mainstem experiment focuses on an approach to dealing with uncertainty termed "spread the risk." A version of this strategy was advanced by the region's fishery managers. It calls for both transportation and inriver passage to be used within each migration season -- basically, dividing the population into two more or less equal groups, one of which is transported while the other group migrates downstream. Thus the survival of the entire migrating population is not totally dependent on the benefits of either strategy. At the same time, through careful experimental design, monitoring and evaluation, the region should be able to learn which mode of passage is best and how survival under each mode is affected by the prevailing environmental conditions.

This approach is premised on the region's willingness to make within-year evaluation of the two modes of passage an explicit and integral component of the mainstem strategy. Spreading the risk makes sense only as an interim strategy to deal with critical uncertainties that are impeding the region's efforts to craft a fish recovery plan. Clearly, we must ultimately develop an approach that resolves how to use either or both modes of mainstem passage. For this to be possible, the region must be willing to adhere to an experimental program for several years and over a range of conditions.

The experimental approach has five essential features:

- A statement of hypotheses regarding the effects of transportation, flow and velocity augmentation on survival of salmon and steelhead from smolt to adult return.

- Development of the technical aspects of the experiment under the aegis of the Independent Scientific Group.
- A series of actions to improve passage survival in the river during the experiment.
- An accelerated research effort to clarify the relationships between variation in natural survival conditions, overall fish survival and the impact of human-caused actions on the production of salmon and steelhead in the basin.
- A partnership between the Council and the National Marine Fisheries Service, state fishery agencies, Indian tribes, river operators and others to plan and implement this experiment and to review the results.

5.0B Purpose of the Experiment

The experimental program has the following goals: 1) To understand the relative within-year differences in survival to adult return of fish that were transported versus those that migrated in the river over a range of environmental conditions; 2) to refine the hypotheses described below; and 3) to increase our understanding of natural survival processes in the ocean and freshwater, and how these relate to human actions and the success of this program. For each outmigration year, the experiment should compare survival to adult return between fish that were transported and those that migrated in the river under the enhanced survival conditions described below.

The technical aspects of the design of this experiment are to be developed under the direction of the Independent Scientific Group. The experimental design should describe evaluations needed to address the above questions in terms of impacts to juvenile and adult survival. The design should also describe how smolt transportation should be managed to spread risk as described above and fulfill the needs of the experiment. The experiment will likely require a reduction in the number of smolt collection points, perhaps to a single upriver site. Further, in order to compare the two modes of passage over a range of environmental

conditions, the Council expects that the relative proportion of fish in either mode of passage should remain relatively constant. As a result, compared to the situation that has prevailed through much of the 1980s and 90s, fewer fish will be transported in years of low runoff, and more fish will be transported in years of high runoff. Overall, however, the Council expects that this strategy will result in a reduction in the proportion of the migration being transported.

5.0C Oversight of the Experimental Program

An experiment of this magnitude must include input from a range of interested parties in the region. The Council will use the Fish Operations Executive Committee to provide regional review of the experimental information as it becomes available and to develop strategies to facilitate implementation of the experiment. Because of their respective roles under the Northwest Power Act and the Endangered Species Act, it is also imperative that the Council and the National Marine Fisheries Service work closely together to ensure that this experiment is successful.

Fish Operations Executive Committee

5.0C.1 Approximately every six months and well in advance of the spring/summer migration periods, convene a special meeting to review the existing results of the experiment and problems associated with its implementation.

Council and National Marine Fisheries Service

5.0C.2 Ensure that procedures are in place to provide coordination at policy and technical levels on matters that affect the success of this experiment.

Independent Scientific Group

5.0C.3 Convene and oversee a technical committee to provide technical coordination and experimental design.

5.0D Timeline for the Experiment

This experiment attempts to balance two important aspects: 1) the need to take meaningful action to address the needs of declining fish populations, and 2) the need to answer critical scientific questions. Accordingly, the region will proceed with a number of measures aimed at enhancing survival on the basis of the knowledge on hand. At the same time, a considerable expenditure of effort will be focused on the evaluation program to compare the relative benefits of the two modes of fish passage.

5.0E Mainstem Passage Hypotheses

In this section, the Council states its working hypotheses regarding two key sets of relationships. One relationship is the effect of flow, water velocity and fish travel time on fish survival. The second is the efficacy of smolt transportation for improving salmon survival. These hypotheses underlie many of the actions included in later parts of this section, and are the starting point for the adaptive experiment described above. The Council’s reasons for including these working hypotheses are twofold: first, to explicitly state the rationale behind many important measures in the program, and second, given the uncertainties in our knowledge of these relationships, to emphasize the experimental nature of these actions and facilitate their scientific evaluation. In scientific investigation, hypotheses are used to describe phenomena on the basis of existing knowledge and judgment. They are essential starting points for experimentation and an adaptive approach.

While these hypotheses do not authorize changes in river operations, they do emphasize the need to learn from actions the Council authorizes elsewhere in this program.

By stating a hypothesis, the Council does not imply that scientific evaluation should supplant action in the mainstem. Indeed, the Council has consistently emphasized the need to take action, but within an adaptive approach that promotes learning and reduces scientific uncertainty. The region is taking a number of actions to improve mainstem salmon survival, and the Council will continue to consider the need for further actions. Many of these actions are controversial and are based on uncertain science. It is necessary, however, to take immediate actions to address the needs of declining fish populations. In stating a hypothesis, the Council's purpose is to ensure that the region *learns* from taking these actions. The Council is concerned that if the region fails to take aggressive steps to learn now, we will be faced with the same difficult questions 10 years from now, with little better information on which to base choices.

Much of the controversy surrounding these issues results from conflicting beliefs based on limited and inadequate information. By stating its working hypotheses on how these actions relate to overall fish survival, the Council is providing direction for an adaptive program to address the overarching issue of how to increase the survival of salmon and steelhead in the Columbia Basin. The Council sees the experimental program acting in concert with measures to increase survival based on the best information available at this time. These working hypotheses provide the rationale for actions in the Council's program and, given the uncertainties in our knowledge of these relationships, are intended to guide research and evaluation as part of the Council's adaptive experiment.

The relationship between actions taken in the river and overall fish survival is not simple. Survival from the smolt stage to adult spawner is the result of a host of factors, only a few of which are under human control. Important relationships can be obscured because improved survival at one life stage can be negated by changes in survival at other life stages. Some survival conditions in the ocean, for example, can vary independently of survival conditions in the river or estuary. Other changes in ocean and

other natural survival conditions can also compound human-caused survival bottlenecks. In addition, the positive and negative effects of actions taken in the river to improve survival, such as flow augmentation, drawdown and transportation, may be delayed until later life stages. The amount of change in survival that occurs in the river as a result of augmenting water velocity may not tell the whole story. Changes in survival could occur later in the life cycle, particularly in the estuary. The bottom line is how actions affect the return of adult fish to spawn in the Columbia River Basin.

The Council's hypotheses must be general enough to embrace all of these aspects, while providing enough specificity to guide research and evaluation. In addition to the hypotheses themselves, the Council is providing a list of experimental considerations that expand on the hypotheses and are intended to highlight aspects of the relationship that should be examined in the experimental program. The Council expects the implementing agencies to make all possible efforts to implement quickly an experimental program to address both the hypotheses and the supporting elements.

For each hypothesis, observations regarding flows, survival and transportation are suggested by the existing scientific information. The Council therefore believes that research to test and refine the hypotheses should include investigation of these elements. Like the hypotheses, these elements are adopted by the Council as guides for further research. The supporting elements are not conclusions or findings, and do not change other substantive measures in the Council's fish and wildlife program.

As new data are generated and reviewed, the Council expects to refine and improve both working hypotheses. The Council will gear future amendment processes to information generated from the adaptive management process identified in Section 5.0A, and will determine whether further steps are warranted.

Hypothesis I: Flow, Water Velocity, Fish Migration Rate and Survival

Hypothesis: The Council accepts that there is a relationship between flow, water velocity, fish travel time and survival such that increasing water velocity increases the survival of salmon and steelhead from the onset of active downstream migration to adult spawner. Improvement in the level and frequency of favorable mainstem migration conditions for juvenile salmonids will improve fish conditions, increase migration rates, reduce vulnerability to predators, and improve timing and fitness at entry into the ocean. As a result, survival to adult recruitment will improve to levels that, together with full implementation of other measures in this program, will sustain recovery and rebuilding of salmonid populations.

Background: Major changes in the timing, magnitude and frequency of flows in the Columbia River have occurred as a result of development of the hydroelectric system. Based on evolutionary considerations and the information now available, these changes in the river have likely had a detrimental effect on fish survival.

Existing Information: Like all organisms, the behavior, physical characteristics, and life history of salmon and steelhead are influenced by their environment. Alteration of a fundamental feature of the environment, such as significant changes in flow, water velocity and water temperature, can be expected to affect fish survival and abundance. At the same time, natural survival conditions can change due to drought or changes in the ocean environment. This can compound the effects of human-induced changes in the environment.

Various attempts have been made over the past decades to evaluate the effects of changes in mainstem flow and water velocity on salmon and steelhead. Most studies have focused on the effect of water velocity on survival during the downstream migration. Examples include the National Marine Fisheries Service's flow-survival studies of the 1970s, predator studies,

and correlations between water particle travel time and fish travel time.

During the 1980s, little new information on the effect of flows on juvenile fish survival was developed. However, recent research using PIT-tagged fish shows promise as a way to evaluate survival of juvenile fish in the mainstem and possibly to the adult return stage as well. Results of some of the recent work may be interpreted to show that survival in some reservoirs could be much higher than estimated from the earlier National Marine Fisheries Service data. However, this research is too preliminary to justify conclusions regarding flows, velocity and fish survival.

A lesser number of studies have focused on the bottom line -- the relationship between actions taken in the river to augment water velocity and the subsequent return of adult spawners. These include the Marsh Creek (Idaho) study of the survival of spring chinook, other studies of Snake River chinook populations in Oregon and Idaho, and a draft report on summer migrating fall chinook salmon in the Columbia River. The latter report, by investigators at the University of Washington, evaluated the survival rate of mid-Columbia River fall chinook salmon and preliminarily reported a relatively strong relationship between survival and flow during the summer outmigration.

Many of these studies have been criticized on technical and procedural grounds, and none of them gives crystal clear answers. As part of the process of developing its working hypotheses, the Council funded an independent scientific review of the available data. (The Dr. Cada review referenced earlier.) The reviewers found that the studies were often dated, suffered from inadequate experimental designs, or provided imprecise results. Nonetheless, the reviewers concluded, "Despite these problems with the existing data sets, the general relationship of increasing survival with increasing flow in the Columbia River Basin still appears to be reasonable." As a result, the Council believes that these studies provide enough information to support the flow/velocity-

survival hypothesis and realizes that further, focused scientific research is warranted.

Uncertainties: The amount of change in survival for a given change in flow or water velocity is uncertain, as is the relative importance of different mechanisms that relate to flow from the juvenile outmigration to the survival of returning adult fish.

Supporting Elements:

a. The question of interest is how flow and water velocity and transportation affect the survival of fish to their return as adult spawners and the productivity of the populations measured as the ratio between the number of fish returning and their parental spawners.³

b. The biologically important component of the relationship is water velocity. Water velocity can affect fish survival through its effect on other environmental parameters and on fish behavior and condition. Water velocity is affected by flow, reservoir operations and other factors. The rate of downstream movement of actively migrating juvenile salmon and steelhead is positively influenced by the prevailing water velocity. The propensity of juvenile salmon and steelhead to migrate is a function of environmental cues and several factors relating to age and physiological state.

c. The effect of flow/water velocity could occur at one or more life stages after the onset of active downstream migration. For experimental purposes, these stages can be defined as

³Studies by the Idaho Department of Fish and Game suggest the relationship between flow in the Snake River and smolt to adult survival for spring chinook shown in Figure 1. Similar relationships have been reported for other Snake River spring chinook populations in Oregon and Idaho and for Mid-Columbia fall chinook. This information should be considered illustrative and not necessarily conclusive.

downstream migration (beginning of migration in the natal stream to below Bonneville Dam), estuarine/early ocean (Bonneville Dam to the first year in the ocean), ocean adult (subsequent years in the ocean) and adult passage (estuary to spawning ground). The experimental program should address the effect of water velocity during the juvenile outmigration on cumulative survival to adult return, including specific impacts at each life stage.

d. At the estuarine stage, flow/water velocity could influence survival through its effect on migration speed and fish condition. This in turn can affect the date of entry into the estuary to coincide with food availability or predator concentrations and/or by influencing the arrival to the estuary within a physiological window that

enhances the likelihood of a successful salt water transition.

e. The preponderance of information indicates that during the downstream migration, the lowest survival occurs at the lowest flow. At higher water velocities, survival continues to increase but at a decreasing rate. The relationship between flow/water velocity and survival during the downstream migration is defined by a parameter describing the rate of change in survival as flow/water velocity increases (the slope), and a parameter relating to the range of survival expected over a reasonable range of flow or velocity (the intercept).⁴ The value of these parameters is uncertain, as is the relationship between inriver survival, as affected by water velocity, and overall survival to adult spawner.⁵

⁴ In Figure 2, and in most representations of this relationship, these parameters are incorporated within an exponential equation. This implies that the rate of increase in survival will decrease as flow or water velocity increase .

⁵ For example, the National Marine Fisheries Service studies during the 1970s suggest the hypothesis shown below as Line A in Figure 2. It has been used in modeling analysis by the fishery managers and the Council. Expansion of estimated predation rates in John Day pool suggest the alternative relationship depicted as Line B, used in analysis by the Bonneville Power Administration. Other hypotheses can be suggested from more recent preliminary information. These hypotheses relate only to the downstream migration portion of the life cycle. It remains unclear how survival during this portion of the life cycle relates to the subsequent return of adults, such as that shown in the Figure 1, above. This information, too, should be considered illustrative and not necessarily conclusive.

f. The relationship between water velocity and survival may differ between species or races and could differ between hatchery and wild populations. In particular, the shape of the relationships is likely to be different for yearling (spring migrating) and sub-yearling (summer migrating) chinook

g. Most of the information on the relationship between flow/velocity and downstream migrant survival relates to chinook salmon and steelhead. However, because sockeye migrate at the same time and at about the same rate as yearling (spring migrating) chinook, hypotheses for the flow/velocity survival relationships for yearling chinook are a reasonable surrogate for sockeye salmon until more specific information can be developed.

h. Variation in ocean productivity and other natural survival conditions can confound the effects of inriver measures such as flow, velocity and transportation while, at the same time, compounding the effects of human-induced survival bottlenecks. Techniques must be developed to consider and, if possible, correct for these considerations. For example, insight into the effect of ocean conditions might be gained by comparing returns of upriver populations to similar downriver populations and to populations in other river systems on the Pacific Coast with similar life histories.

Hypothesis II: Smolt Transportation

Hypothesis: The Council accepts that under some passage conditions, transportation can increase the survival of salmon and steelhead from the onset of active downstream migration to their return as adult spawners relative to survival experienced by fish migrating in the river. Fish migrating in the river include those fish that pass dams through the collection system and are bypassed to the river, as well as fish that pass dams via turbines or spill without entering the collection system.

Background: One tool used to address the survival changes resulting from development of the hydroelectric system is to collect juvenile fish (smolts) at several Columbia River dams and transport them below Bonneville Dam. Limited information indicates that this can improve survival under some circumstances, especially when river conditions are poor.

Existing Information: Most studies of the efficacy of smolt transportation were conducted by the National Marine Fisheries Service during the 1970s. Evaluations also occurred in 1986 and 1989 under more modern conditions. In contrast to much of the work on flow and survival, smolt transportation has been evaluated in terms of its effect on adult returns. Benefits have been measured as the ratio of adult survival rate of transported fish to the survival of fish in the collection system that were not transported.⁶ These studies have shown variable results, especially for spring chinook. In general, however, most of the evaluations have indicated a positive relationship under some conditions. Again, none of these studies is conclusive and all have been criticized on technical grounds. For example, a recent Columbia Basin Fish and Wildlife Authority report⁷ suggested that transportation may be contributing to declines in wild salmon populations. Conversely, the National Marine Fisheries Service Recovery Team's draft recovery plan argues that the data show relatively clear benefits from transportation.

The U.S. Fish and Wildlife Service recently funded an independent review of the available transportation data.⁸ This review has

⁶ There are four ways that fish can pass a hydroelectric project. They can enter the collection system and be transported, they can enter the collection system and be put back into the river, or they can pass through the turbines or over the spillway without entering the collection system. Transportation has been evaluated relative to the survival of fish entering the collection system and put back into the river. It has not been evaluated relative to the third mode of passage.

⁷ Ad Hoc Transportation Review Group, *Review of Salmon and Steelhead Transportation Studies in the Columbia and Snake Rivers, 1984-89* (December 31, 1992).

⁸ Mundy, P.R. et al. 1994. Transportation of Juvenile Salmonids From Hydroelectric Projects in the Columbia River Basin; An

contributed to the formulation of the Council's hypothesis. While finding fault with the current state of knowledge regarding transportation effects, the review team concluded that the preponderance of evidence indicates that transportation can improve survival of fish to adult return under some adverse inriver conditions. They felt, however, that there was insufficient evidence to indicate that transportation alone could rebuild upriver runs. For this reason, they emphasized that transportation should be considered an experimental program.

Uncertainties: The amount of benefit and the circumstances under which a benefit is achieved are uncertain. In addition, evaluation efforts to date have not addressed the effect of transportation on adult returns to the spawning ground nor have they examined effects relative to all modes of inriver passage.

Supporting Elements:

- a. The value of transportation should be assessed relative to the alternative of inriver passage over a wide array of conditions using the ratio between adult return rates of transported and non-transported fish. Ultimately, the statistic of interest is the ratio back to the spawning ground.
- b. The benefit of transportation is expected to be inversely proportional to the survival of non-transported fish. Thus, benefits should decrease within a year as the collection point moves downstream and between years as flow and other passage conditions improve.
- c. Survival of transported fish to adult return may be decreased by adverse conditions encountered prior to the collection of juvenile fish due to environmental factors or hatchery rearing conditions, for example.
- d. Transportation benefits are likely to differ among species and populations of fish. In addition, benefits for hatchery fish may differ from those of naturally spawning fish.

independent peer review. U.S. Fish and Wildlife Service, Portland, OR.

5.0F Research and Monitoring

During the 1980s, the region made unsatisfactory progress in evaluating the relationship between spring and summer flow, velocity and fish survival, notwithstanding concerted efforts by several parties. At the same time, the scientific basis for transportation remains hotly disputed. A lack of direction on these issues has hindered recovery efforts. The importance of these issues is such that continued stalemate is not acceptable. The Council joins with the National Marine Fisheries Service and other regional interests in insisting that these relationships immediately receive the highest priority in the region's research efforts.

Because of the simultaneous need for action and better scientific information, these relationships can best be clarified through an adaptive management approach. This would involve the use of inriver passage and transportation as management experiments to address the Council's hypotheses. The experimental actions could include a combination of management actions, research, evaluation and monitoring implemented as part of an adaptive management framework. This framework would describe the overall experimental design and link the Council's hypotheses to management and research actions.

The region needs a process to ensure that the adaptive management framework is developed in an independent, scientifically credible and open manner. This will have to proceed in close cooperation with the National Marine Fisheries Service and federal river operating agencies. The region should work with the existing research process and make sure that it is coordinated with all interested parties. The primary means for coordination should be through a technical group organized under the auspices of the Independent Scientific Group. This technical group will work with the National Marine Fisheries Service and other agencies to design an adaptive framework. The role of the Independent Scientific Group will be to ensure that the adaptive framework and flow/velocity-survival research is scientifically credible and to keep

decision-makers abreast of important developments.

Independent Scientific Group

5.0F.1 As soon as possible, appoint a technical group to work with the National Marine Fisheries Service and other researchers on the design of an adaptive experiment as described in Section 5.0A. The technical group should report to the Independent Scientific Group on a regular basis. The Independent Scientific Group should provide for scientific review of the adaptive framework and ensure that the activities of the technical group are conducted in a scientifically credible manner. The Independent Scientific Group should also ensure that the Council and the National Marine Fisheries Service are kept apprised of the group's progress and communicate the draft adaptive framework to the Council. A draft adaptive framework should be completed and submitted to the Council and the National Marine Fisheries Service by February 15, 1995.

5.0F.2 The Council recognizes that the hypotheses described above are a subset of a larger set of hypotheses, assumptions and facts that underlie the entire fish and wildlife program and link program goals and measures. Collectively, these form the conceptual foundation called for by Bonneville's Scientific Review Group.⁹ The Council calls on the Independent Scientific Group to oversee the development of this foundation. The foundation should not be a reinvention of the Council's program, but should seek to define and review the scientific basis for the program. Like the hypotheses described above, the foundation should define the rationale for the program and describe scientific uncertainties that should be addressed. The hypotheses

⁹ Scientific Review Group, 1992. Critical uncertainties in the Fish and Wildlife Program. Submitted to the Bonneville Power Administration.

described above are examples of how the foundation might appear. They should be incorporated into the overall foundation. The Independent Scientific Group should prepare a proposal including a detailed description of the foundation concept and a work plan and budget for its development. The workplan should describe how the foundation could be drafted within six months of its approval by the Council. The proposal should be submitted to the Council by January 1, 1995.

Council and National Marine Fisheries Service

5.0F.3 Review the draft adaptive framework to ensure that it addresses the Council's hypotheses and supporting elements, the needs of the National Marine Fisheries Service recovery plan and this program. Evaluate the feasibility of implementation. Within six months of receipt of the draft plan provide review and direction for regional efforts to address these issues. However, the intent of the Council is that concrete action to evaluate the hypotheses and supporting elements should begin during the 1995 smolt migration season.

Bonneville

5.0F.4 After approval of the adaptive framework by the Council and National Marine Fisheries Service, fund actions necessary to implement the adaptive framework.

5.0F.5 Continue to fund, on an expedited basis, ongoing evaluations in this research area.

5.0F.6 After Council approval of the proposal from the Independent Scientific Group described in measure 5.0F.2, provide funding and resources necessary for the preparation of a conceptual foundation for the entire fish and wildlife program.

Fishery Managers

5.0F.7 Make available from hatcheries or other appropriate sources the required numbers of juvenile salmon necessary to conduct the flow, travel time and survival studies called for in this fish and wildlife program.

5.0F.8 By December 1, 1995, the fishery managers should provide to the Council for review a conceptual plan for experimental use of pulsing flows to improve salmon migration conditions. Upon Council approval, implement the pulsing experiment.

Bonneville

5.0F.9 On an expedited basis, fund the continued development of PIT tag technology, and other salmon marking techniques for evaluations.

5.0F.10 Fund the installation of juvenile salmon PIT tag detection facilities at John Day and Bonneville dams, to facilitate assessments of naturally producing stocks and improve the quality of monitoring the effects of juvenile and adult fish passage. Installation should be in coordination with the Corps of Engineers, the fishery managers, and the Independent Scientific Group’s technical group, according to the following schedule:

<u>Project</u>	<u>Installation date</u>
John Day	1996
Bonneville	1996

5.0F.11 Provide funds and resources necessary to enable the Pacific States Marine Fisheries Commission to fulfill measures 5.0F.14 and 5.0F.15, described below.

5.0F.12 Working with the Mid-Columbia Coordinating Committee and the Independent Scientific Group’s technical group, determine the steps necessary to

install PIT tag detectors on projects in the mid-Columbia River.

5.0F.13 Working with the Independent Scientific Group’s technical group, evaluate the merits of installing adult salmon PIT tag detection facilities at selected projects to facilitate evaluation of smolt-to-adult survival. Report to the Council by January 1, 1995, and, on Council approval, install these facilities.

Pacific States Marine Fisheries Commission

5.0F.14 By January 1, 1995, prepare a five-year action plan for development of PIT tag technology and other mark placement and collection practices throughout the Columbia Basin in consultation with the fishery managers and interested parties. Include the steps necessary for installation of PIT tag detectors at projects in the mid-Columbia River, and assess the merits of installing PIT tag detection facilities for adult fish at selected projects. The plan should also assess how to incorporate changing marking and detection technology into the system over time. Report to the Council for review of the plan in January 1995.

5.0F.15 As part of the Coordinated Information System, provide data management capabilities to ensure open and timely access to all mark recovery data.

5.1 COORDINATE RIVER OPERATIONS

The Columbia River and its tributaries and the hydroelectric system they fuel make up an extremely complex operating system. The Council recognizes that the flow, velocity and temperature improvement measures contained in this program will have a substantial impact on the operations of this system.

Given more time and experience, it is likely that the following measures can be refined,

resulting in greater operational efficiency and better coordination between the needs of fish and other uses of the river.

The Council welcomes proposals from river operators, especially those proposals that emerge from the river operations process described below, for better ways of providing equivalent amounts of water for salmon and steelhead within time frames specified in this program. Any such proposals should be submitted to the Council and, on approval, implemented.

The Council expects that river operation changes for fish will be in accordance with the following measures as they are now written. The Council will carefully monitor these operations and will welcome suggestions from all interested persons on how they can be improved. Each year, until further notice, the Council will review the operations. At that time, it will determine whether these measures should be revised to provide the intended benefits to fish in the most practical and efficient manner.

5.1A Fish Operations Executive Committee

Council

- 5.1A.1 Initiate an annual policy and technical process to address flow and temperature regimes and reconcile measures described below to protect salmon and steelhead. The process will be managed by the Fish Operations Executive Committee, which will be appointed by the Council and made up of senior management representatives of the Council, as well as power and fishery interests.

Fish Operations Executive Committee

- 5.1A.2 The Committee should produce a detailed, annual implementation plan for carrying out its work. The committee should produce the operating plan by

March 31 of each year and will need to begin in the preceding year to complete its work. Insofar as practical, the committee should consider matters such as spill, transportation, the Corps' Fish Passage Plan, the fishery agencies and tribes' Detailed Fishery Operating Plan, recommendations from the Ad Hoc Committee of the Columbia Basin Fish and Wildlife Authority, the coordinated plan of operation for flow augmentation (Section 5.1C), annual operating plans for the Non-Treaty Storage Fish and Wildlife Agreement, planning for coordinated system operations, Idaho Power Company's proposed operations under its weak stock plan, water identified by the Snake River Anadromous Fish Water Management Office, spring and fall trade-offs, research and monitoring results and other mainstem passage matters.

In its meetings, the committee should identify all water available in a particular year and plan for its use. During low flow conditions when the monthly average flow equivalent¹⁰ of 85,000 cubic feet per second in the Snake River cannot be provided for the full migration period, flows should be distributed to protect a portion of all known naturally reproducing stocks. The plan will have the flexibility to move flows between May and June, if such shaping is more likely to achieve the intent of this program. If there are conflicting water demands among anadromous species, conflicts should be resolved by the Fish Operations Executive Committee in consultation with the National Marine Fisheries Service. In resolving conflicts, the committee should carefully consider the value of retaining cold water in the

¹⁰ "Flow equivalent" means the flow level required to achieve the same water particle travel time as 85,000 cubic feet per second at average normal pool elevations at all projects. For example, 81,000 cubic feet per second at minimum operating pool elevations is the flow equivalent of 85,000 cubic feet per second at average normal pool levels.

Dworshak project to help control temperatures for Snake River fall chinook returning adults.

All alterations in river operations undertaken pursuant to these amendments should consider impacts on resident fish and other species, especially threatened, endangered or native species, and should seek to avoid adverse effects on them.

5.1A.3 Develop a procedure to address fish flow operations throughout the migration season, if necessary.

5.1A.4 Develop accounting procedures for the use of this water. These procedures will be provided to the Council and other interested parties. Pending development and Council approval of new accounting rules, the provisions set out below (Section 5.1D) will continue to apply. All water supplies acquired under the measures below will be applied to the fish migration.

5.1A.5 Manage water supplies for fish in accordance with the annual implementation plan. To assist the full range of stocks migrating in the Snake and Columbia rivers, every effort must be made to shape water stored for fish flow augmentation to the fullest extent practicable. Any proposed deviations from the implementation plan must be approved by the Fish Operations Executive Committee.

5.1B Fish Passage Center

Bonneville

5.1B.1 Fund the establishment and operation of a Fish Passage Center, including funds for a fish passage manager position, technical and clerical support and the services of consultants when necessary, as jointly agreed by Bonneville and the

fish and wildlife agencies and tribes. This support will assist the fish passage manager in: 1) planning and implementing the annual smolt monitoring program, 2) developing and implementing flow and spill requests, and 3) monitoring and analyzing research results to assist in implementing the water budget and spill planning and in preparing reports.

5.1B.2 Provide funds to establish a “fish passage manager” position designated by the federal and state fish and wildlife agencies and the Columbia River Basin Indian tribes. The fish passage manager will provide expert assistance to the designated entities in working with the power project operators and regulators to ensure that requirements for fish are made a part of all river system planning and operations. The fish passage manager will be selected for knowledge of the multiple purposes of the regional hydropower system and of the water needs of fish and wildlife, as well as the ability to communicate and work with the fish and wildlife agencies, tribes, project operators, regulators and other interested parties, including members of the public. The Council will provide a fish passage advisor on its staff to review the operation of the water budget, to advise the Council on all matters related to fish passage and to assist in resolving fish passage disputes.

Fish Passage Center

5.1B.3 House the fish passage manager and staff and function as the primary program center for housing data and information about juvenile fish passage. All data collected and stored at the Fish Passage Center will be available upon request to all interested parties.

Fish Passage Center and Bonneville

5.1B.4 The Council expects Bonneville and the fish and wildlife agencies and tribes to cooperate fully in developing the contractual agreements necessary to carry out tasks described in this section. Pursuant to this expectation, the Council or its staff will review all contracts related to the Fish Passage Center and the fish passage managers.

5.1B.5 The fish passage manager will be the primary point of contact between the power system and the fish and wildlife agencies and tribes on matters concerning all flow and velocity augmentation, temperature control and spill operations affecting juvenile fish migrating downstream at hydroelectric projects operated by the Corps of Engineers and the Bureau of Reclamation on the mainstem of the Columbia and Snake rivers. The fish passage manager will be responsible for informing the Corps of Engineers when and to what extent the manager wishes to draw on the water budget. In making requests, the fish passage manager should: 1) give the Corps three days advance written notice of changes in the planned flow schedule, unless otherwise agreed by the manager and the Corps; and 2) take into account flow and reservoir level fluctuation requirements for resident fish and reflect these considerations in writing in system operational requests. The Corps will inform the other project operators and regulators of water budget requests and spill communications to the extent necessary, manage and implement annual water budget and juvenile fish passage plans and make in-season spill decisions in consultation with the fish passage manager and the Fish Operations Executive Committee.

5.1C Coordinated Plan of Operation for Flow Augmentation

Federal Project Operators and Regulators

5.1C.1 By January 15 of each year, meet with a committee composed of the fish passage manager, the Council's fish passage advisor and representatives of the power system operators to: 1) review the official January water supply forecast, 2) coordinate the system's flow operation for the current year with the Fish Operations Executive Committee, and 3) report to the Fish Operations Executive Committee on development of the annual coordinated plan of operation for flows for the juvenile fish migration. Conduct a similar meeting in mid-February and mid-March of each year. This committee also shall evaluate alternative water budget and other flow measure implementation procedures and report to the Council.

Corps of Engineers

5.1C.2 By March 20 of each year, provide to the Fish Operations Executive Committee and the Council a coordinated plan of operation for flow augmentation for the periods April 15 through June 30 and July 1 through September 30. During these periods, submit to the Fish Operations Executive Committee, the Council and the fish passage manager a daily flow report and make available a copy of the National Weather Service weekly flow forecast. During the remainder of the year, submit a monthly flow report to the Council.

Fish Passage Center

5.1C.3 By November 1 of each year, submit to the Fish Operations Executive Committee and the Council a single report that explains the scheduling of flow augmentation and supporting rationale for that calendar year. This report will include:

- the actual flows achieved for that calendar year;
- a record of the estimated number of smolts that passed Lower Granite and Priest Rapids dams, and the period of time over which the migration occurred;
- a description of the flow shaping used for that calendar year to achieve improved smolt survival; and
- further assessments of tradeoffs between anadromous and resident fish.

Bonneville

5.1C.4 Pay the travel costs and related travel expenses for one or two representatives from each Columbia River Basin Indian tribe to attend up to three meetings per

year for the purpose of coordinating tribal flow augmentation activities.

5.1D Operating Rules for Flow Augmentation

Fish Passage Center and Corps of Engineers

5.1D.1 To provide a base from which to measure use of water for flow augmentation, the Council has established the “firm power flows” listed in Table 5-1. For the Columbia River, the fish passage manager will request flows for Priest Rapids and/or The Dalles dams and dates on which these flows are desired. The flow requests must be greater than the firm power flows. For the Snake River, the fish passage manager will request flows from Dworshak and/or Brownlee reservoirs to provide flow augmentation at Lower Granite Dam. The fish passage manager must give the Corps of Engineers three days’ written notice of changes in the planned flow schedule from the water budget volumes, unless otherwise agreed to by the manager and the Corps. For the Columbia River, water budget use will be measured as the difference between the actual average weekly flows or the fish passage manager’s flow request at Priest Rapids Dam, whichever is less, and the firm power flows, or as agreed to by the project operators and the fish passage manager.

Relevant Parties

5.1D.2 The Council recognizes that the description of the water budget lacks many of the operating details that will be addressed as the water budget is implemented and operating problems occur. Recognizing that operating decisions could influence the effectiveness of the water budget, the Council recommends priorities for competing uses of the hydropower system. Relevant parties should rely on these priorities in their decisions about the hydropower system.

- First: Firm power to meet firm loads
- Second: Water budget and other flow measures
- Third: Reservoir refill
- Fourth: Secondary energy generation (beyond that provided in connection with use of the water budget)

5.1D.3 Implement flow augmentation measures within the context of laws related to federal, state and Indian water rights. (See Section 14: Disclaimers.)

5.1D.4 Beginning in 1995, evaluate alternative ramping rates for flow fluctuations at mainstem Snake and Columbia River dams to constrain reductions or increases in total flow per 24-hour period at these projects.

5.2 IMPROVE SNAKE RIVER FLOW AND VELOCITY

Biological objectives:

1) To improve conditions for salmonid production by increasing flow and water velocities, decreasing downstream migration time for anadromous fish and decreasing the quantity of habitat for predatory and competing fish species; and 2) to endeavor to provide inriver conditions to maximize adult fish survival between dams.

Operational objectives:

To endeavor to provide a minimum monthly average flow or velocity equivalent of 85,000 cubic feet per second in all water years, endeavoring to achieve a monthly average flow or velocity equivalent of 140,000 cubic feet per second at Lower Granite at full pool from April 10 through June 20 in all water years. From June 21 through July 31: the objective is to provide a monthly average flow equivalent of 50,000 cubic feet per second and to exceed this flow target in years of higher runoff.

5.2A Performance Standard: Snake River Spring Migrants

Incorporate the measures described below into firm power planning.¹¹ Figure 5-1 illustrates the approximate flow equivalent attained when these measures are applied to the historical water record.

Bonneville, Corps of Engineers, Bureau of Reclamation and Other Parties

5.2A.1 Operate the Dworshak Reservoir to improve salmon migration conditions consistent with the measures listed below:

- From January 1 to April 10, in years when Snake River runoff is forecast to be below average, shift system flood control storage space to other Columbia Basin projects.

¹¹ Where the Council calls for incorporation of flow or other measures into firm planning, the Council means that the federal project operators and regulators incorporate these measures in all system planning and operations performed under the Columbia River Treaty, the Pacific Northwest Coordination Agreement, and in other applicable procedures affecting river operations, and all parties will act in good faith in implementing these measures as firm requirements.

- Dworshak should be as close as possible to its upper rule curve by April 10 of each year.
- Provide 1,000,000 acre-feet of water plus any water gained from the flood control shift for juvenile fish flow augmentation. This volume of water is in addition to any minimum flow release requirements at Dworshak.¹²
- Dworshak’s outflow is limited to 25,000 cubic feet per second during the migration period.
- In emergency situations, for capacity and reliability needs, Dworshak may be used temporarily until arrangements can be made to continue filling toward the upper rule curve.

**Bureau of Reclamation,
Bonneville and the States**

- 5.2A.2 Use uncontracted storage space to supply at least 90,000 acre-feet of water for spring migrants.
- 5.2A.3 By 1996, provide an additional 500,000 acre-feet of water from the Snake River Basin and by 1998 a further 500,000 acre-feet (for a total of 1,000,000 acre-feet over and above the 427,000 acre-feet in the Strategy for Salmon’s immediate measures and the summer water provided under Section 5.2B) to augment flows in the lower Snake River in the April 10 through September time period. All such water should be used to benefit both Snake and Columbia river migrants, with no corresponding reduction in Columbia River flows unless the Columbia River flow/velocity objective is being met. This water may be obtained through willing seller/buyer transactions, other non-structural approaches, new storage (Section 5.2E), or a combination of such alternatives. The states should cooperate to ensure that this water will be allowed to move freely downstream, undiminished by diversion. The Fish Operations Executive Committee may recommend

¹² The project minimum flow release at Dworshak Dam is assumed to be 1,200 cubic feet per second.

that some of this water be used to control water temperatures for adult salmon.

- 5.2A.4 To provide the water described above, review the cost-effectiveness of measures identified in the Bookman-Edmonston/ Snake River Water Committee report on irrigation efficiency improvements and other non-structural water alternatives, the Bureau of Reclamation's storage appraisal study and other sources, and implement least costly measures first.

Idaho, Oregon and Washington

- 5.2A.5 Facilitate water transactions to aid instream flows for salmon and steelhead by allowing water bank prices to achieve market levels, eliminating obstacles to downstream use for instream flows and developing expedited water transfer procedures.

Bonneville and Bureau of Reclamation

- 5.2A.6 Share equally the cost of securing the water described in measures 5.2A.3 - 5.2A.5.

Bonneville

- 5.2A.7 Fund an independent, third-party evaluation of the effectiveness of measures 5.2A.3 - 5.2A.5, above, to provide water for salmon and steelhead.

Council

- 5.2A.8 Refine the cost-effectiveness methodology developed by the Environmental Defense Fund for use in future analysis of structural and nonstructural water measures.

Idaho Power Company, Corps of Engineers, Bureau of Reclamation and Federal Energy Regulatory Commission

- 5.2A.9 Operate Brownlee Reservoir to ensure that water described in measures 5.2A.2 and 5.2D.1 is released to assist spring migrants. Report to the Council each year during the river operations planning process on the Idaho Power Company's effort to shape this water.

- 5.2A.10 As needed to meet operational flow or temperature objectives, operate Brownlee dam to provide up to 110,000 acre-feet of water in the spring for flow augmentation. Pass inflow in June (do not refill). Provide up to 137,000 acre-feet in July. Pass through 50,000 to 140,000 acre-feet in August. Provide 100,000 acre-feet in September.

- 5.2A.11 Modify operation of the Hells Canyon Complex to provide coordinated fall and spring flows below Hells Canyon Dam to maintain fall chinook spawning, incubation and emergence. Evaluate options for providing more water for fish flows from Brownlee Reservoir, including substantially improved ability to shape water from the Snake River Basin for spring and summer migrants and report to the Council by the end of 1993.

Bureau of Reclamation, Idaho and Oregon

- 5.2A.12 Establish, in cooperation with fish and wildlife agencies, Indian tribes and interested parties, a Snake River Anadromous Fish Water Management Office to facilitate the use of water from the Snake River Basin. Report to the Council by May 1992.

5.2B Summer Migrants

Idaho Power Company and Federal Energy Regulators Commission

- 5.2B.1 During July, draft Brownlee Reservoir to a minimum elevation of 2,067 feet above sea level to provide up to 137,000 acre-feet for juvenile fall chinook migrants (Section 5.2A.10 above).

Corps of Engineers

- 5.2B.2 Allow Dworshak to draft to elevation 1,520 feet by the end of July, if needed to assist in meeting the summer basin flow and velocity objectives.
- 5.2B.3 Use remaining water identified in measure 5.2A.3 if needed to meet the summer flow objective, or for adult temperature control, as recommended by the Fish Operations Executive Committee.

5.2C Allocation of Power Losses at Brownlee Reservoir

Bonneville

- 5.2C.1 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 should replace the lost power. 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 Federal Energy Regulatory Commission 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 providing flows on the Snake River will help significantly in providing systemwide flows for downstream migration.

5.2D Pursue Snake River Water Efficiencies and Transactions

Bureau of Reclamation, Idaho, Oregon, Bonneville and Other Parties

- 5.2D.1 Unless the forecasted April-through-July runoff at Lower Granite exceeds 29 million acre-feet, use water efficiency improvements, water marketing transactions, dry-year option leasing, storage buy-backs, and other measures to secure at least 100,000 acre-feet of water from the Snake River Basin for spring migrants. Of this amount, half should be secured by the Bureau of Reclamation, and half should be secured with financial incentives provided by Bonneville (through the Idaho Water Rental Pilot Project, or such other processes as the Bureau of Reclamation, Idaho, Oregon and Bonneville choose).

Bureau of Reclamation, Idaho, Bonneville and Other Parties

- 5.2D.2 Use water efficiency improvements, water marketing transactions, dry-year option leasing, storage buy-backs and other measures to provide up to 137,000 acre-feet of water in August, in light of the operation described in Section 5.2B.1, above, and to provide 100,000 acre-feet of water in September to reduce water temperatures (see Section 6.1D.3). Of this amount, half should be secured by the Bureau of Reclamation and half should be secured on a matching basis using financial incentives provided by Bonneville (through the Idaho Water Rental Pilot Project or such other processes the parties choose).

Bonneville

- 5.2D.3 Fund an independent, third-party evaluation of the effectiveness of measures 5.2A.3 and 5.2B.5, above, to provide water for salmon and steelhead.

5.2E Additional Storage Projects

Bureau of Reclamation, Corps of Engineers, Bonneville, Idaho, Oregon and Others

- 5.2E.1 Proceed with all necessary planning, design and National Environmental Policy Act compliance for the Galloway, Upper Rosevear Gulch and Jacobsen Gulch storage projects, to be operated exclusively to store water for flow augmentation for salmon and steelhead. Upon completion, submit to the Council for review and decision whether to proceed with construction. The Council anticipates making a decision on construction in 2002, upon completion of the spread-the-risk evaluation described in Section 5.0.

5.3 SNAKE RIVER RESERVOIR DRAWDOWN STRATEGY

Drawdowns to near-spillway crest elevations of the four lower Snake River projects offer an alternative for improving mainstem survival. The Council believes that a properly designed drawdown of Lower Granite pool will produce essential biological information needed before a long-term commitment to drawdown of the lower Snake projects is decided. Therefore, the Council calls on the Corps of Engineers immediately to take all steps needed to proceed with a Lower Granite drawdown.

The Corps of Engineers should not view the Lower Granite drawdown as a one-time test but rather as the first stage of an adaptive management plan. Knowledge gained from the

Lower Granite drawdown regarding turbine efficiency, turbine mortality, smolt travel time and adult passage should be used in deciding about continuing the Lower Granite drawdown and how a 1999 drawdown of Little Goose reservoir could be achieved if it is biologically prudent. Information, gained from the 1999 drawdown, including but not limited to adult passage mortality and gas supersaturation control from downstream weirs, should, in turn, be used in deciding if and how a 2002 drawdown of all the Lower Snake reservoirs could be achieved. The objective of the Snake River drawdown is endeavoring to achieve a 140,000 cubic feet per second velocity equivalent in all water years.

Using adaptive management techniques for each stage of the drawdown plan is also essential because it is possible that some of the central components of the ultimate drawdown strategy will not be fully completed in time for the Lower Granite drawdown. The Council calls on the Corps to take the steps needed to prevent or minimize any likely negative impact to salmon resulting from any element of the drawdown strategy being incomplete. However, the Corps should not fail to meet the drawdown implementation schedule merely because an element of the ultimate strategy is incomplete.

Snake River flow augmentation and transportation measures, described in Sections 5.2 and 5.8, will be pursued pending implementation of the Snake River reservoir drawdowns. The Council will review and re-evaluate transportation and flow measures as drawdowns are implemented. It is the intent of the Council that these measures will be in addition to or complement measures already initiated to achieve rebuilding targets, and that mitigation measures (including mitigation for transportation rate increases) be in place before drawdowns are implemented.

5.3A Initial Lower Granite Drawdown

Corps of Engineers

5.3A.1 In consultation with the fishery managers of the Columbia River Basin, as a recovery action/test, implement a two-month drawdown to elevation 710 feet at Lower Granite from approximately April 16 to June 15 starting in 1995. The 1995 Lower Granite drawdown is contingent on:

1. The manufacture of dipping baskets capable of handling the smolts that enter the gatewells;
2. Conditions where the number of migrating smolts will not overwhelm the dipping basket system prior to peak; and
3. Any needed modification of the adult ladder exit.

The Lower Granite drawdown should contain the following elements:

1. The fishery managers will develop a spill management and monitoring plan for use by the Corps of Engineers before implementing a spill program associated with the Lower Granite drawdown. The purpose of the spill program is (in order of priority) to be consistent with state water quality standards; to ensure acceptable adult passage conditions; and to provide 80 percent fish passage efficiency.
2. The Corps will extend auxiliary water pumps for the adult fish ladder to permit a maximum drawdown of 690 feet above mean sea level.
3. The Corps will commence refill of Lower Granite pool in mid-June. Minimize impacts on June flows by shifting a portion of the spring water budget into the June period.

If dipping baskets are not capable of adequately handling fish in gatewells or if insurmountable obstacles preclude implementation of the above described elements in time for the 1995 drawdown, immediate action must be taken to ensure that a 1996 drawdown of Lower Granite can be implemented. The 1996 drawdown should incorporate the lift tank system of salvaging fish from gatewells. The Corps should undertake actions to reduce the lead time needed to implement a Lower Granite drawdown as quickly as possible.

Corps and Bonneville

5.3A.2 Using Congressional appropriations, borrowing, or other authorities, whichever is more expedient, fund modifications necessary to permit drawdown of the Lower Granite pool, and mitigation, including a mitigation program in place prior to drawdown. In order to mitigate for the physical and economic impacts of the 1995 drawdown of Lower Granite, and until additional mitigation procedures can be put in place, use the claims procedures that were established to mitigate the effects of the 1992 Lower Granite drawdown test. Mitigation claims should be processed more expeditiously than occurred during the 1992 drawdown test. It is the Council's expectation that mitigation funds will be made available to affected parties as soon as possible.

5.3B Additional Lower Snake River Drawdown

Corps of Engineers

5.3B.1 In consultation with the fishery managers of the Columbia River Basin, complete the following modifications to Lower Granite and Little Goose by 1998:

1. Install either lift-tanks or improved dip net baskets, or a combination, at Lower Granite.
 2. Construct rock weirs on the downstream side of Lower Granite dam.
- 5.3B.2 Upon completion of these measures, in consultation with the fishery managers of the Columbia River Basin after Council review and absent Council disapproval, implement as a recovery action/test:
1. By 1996, the drawdown of Lower Granite to elevation 690 feet between approximately April 16 and June 15. Commence refill of Lower Granite pool in mid-June.
 2. In 1995, begin all design, engineering and environmental review activities necessary to allow construction activities to begin in January 1997 to permit drawdown of Little Goose. By January 1997, after Council review and absent Council disapproval, begin construction. In 1999, after Council review and absent Council disapproval, drawdown Little Goose to elevation 590 feet for the same time period. Commence refill of Little Goose pool in mid-June.
- 5.3B.3 Continue the drawdown program for the years following. The drawdowns will also be consistent with the fishery managers' spill management and monitoring plan described above. Minimize refill impacts on June flows by shifting a portion of the spring water budget into the June period.
- 5.3B.4 Report to the Council in March 1995 on: a workplan to meet the drawdown timelines described above; whether private engineering assistance is required to meet these schedules; and a proposal for securing such assistance. If needed, accelerate the System Configuration Study to meet this schedule, and include in the study an evaluation of spillway as well as natural river level drawdowns.
- Council**
- 5.3B.5 Using best available scientific information regarding flow and velocity contributions to life-cycle survival and experience with juvenile passage in connection with Lower Granite drawdown review and, after Council review and absent Council disapproval, proceed with 1997 construction and 1999 drawdown of Little Goose.
- Corps and Bonneville**
- 5.3B.6 Using Congressional appropriations, borrowing, or other authorities, whichever is more expedient, fund modifications necessary to permit drawdowns of the Lower Granite pool by 1996 and Little Goose pools by 1999.
- 5.3B.7 Using appropriations or borrowing, whichever is more expedient, fund ongoing evaluation of reservoir and life-cycle survival consequences of drawdowns.
- Corps of Engineers**
- 5.3B.8 Beginning immediately, and concluding not later than December 31, 1997, complete all design, engineering and environmental review of facility and operating changes necessary to operate Lower Granite, Little Goose, Lower Monumental, and Ice Harbor projects near spillway and/or natural river level: a) annually, from April 16 to June 15; or b) year-round. Include all requirements and impacts relating to power production, flood control, navigation, irrigation and other river uses. Report

results to the Council by December 31, 1997.

Council

5.3B.9 Based upon information gained from the drawdown of Lower Granite and Little Goose pools, determine by 2002 whether to implement the drawdown of Ice Harbor and Lower Monumental pools to spillway and/or natural river levels.

Corps of Engineers

5.3B.10 Secure any necessary authorization and comply with all required legal processes to permit reservoir drawdowns. Implementation of the lower Snake River drawdowns will be consistent with the fishery managers' spill management and monitoring plan.

Fishery managers

5.3B.11 By 1996, develop a monitoring program before Corps implementation of drawdown to determine whether the drawdowns reduce travel time for juvenile salmon and sustain an 80-percent fish passage efficiency rate or lower based on the maximum allowable dissolved gas level.

Corps and Bonneville

5.3B.12 Using Congressional appropriations, borrowing, or other authorities, whichever is more expedient, fund necessary project modifications and mitigation measures to permit drawdown of the Lower Snake reservoirs, including plans to protect cultural resources at the four lower Snake reservoirs during drawdown.

5.3B.13 In consultation with the fishery managers of the Columbia River Basin, starting as early as possible in 1992, conduct any tests necessary to assist in

the formulation of the plans called for in this section.

Council

5.3B.14 Establish a committee to coordinate analyses conducted by the federal agencies and to oversee the development of drawdown plans and structural modifications to both juvenile and adult fish passage facilities, as described in this section and in Section 6. The committee, chaired by the Council, will consist of a representative from each of the following: National Marine Fisheries Service, Corps of Engineers, Bonneville, Bureau of Reclamation, Idaho, Montana, Oregon, Washington and Indian tribes. The committee's work will facilitate regional involvement in ongoing federal processes relating to lower Snake River reservoir drawdowns and will help prevent unnecessary duplication between federal and Council-sponsored efforts. The Council will provide ongoing coordination with other interested parties in the region and will be responsible for overseeing the development, scheduling and completion of the plans called for in this section, in consultation with the National Marine Fisheries Service.

Bonneville

5.3B.15 In coordination with the committee, a) fund independent technical resources, as needed, to enable the committee to review the adequacy of analyses conducted by the federal agencies and to conduct their own analyses when the committee or the chair deem appropriate. Funding will be based on a scope of work approved by the Council no later than two months following adoption of this rule. b) Fund an independent panel of experts, preferably one that is already established, to evaluate current bypass technology relative to fish guidance efficiency, fish passage efficiency

and survival at mainstem Columbia and Snake River dams. The panel of experts should compare the data to the guidance and passage efficiency standards adopted by the Council and provide recommendations to the committee regarding their evaluation. The experts should also consider the feasibility of using spill in conjunction with mechanical passage measures without violating federal or state water quality standards as appropriate for gas supersaturation.

Federal Project Operators and Regulators

- 5.3B.16 Implement approved plans in accordance with the schedule adopted by the Council. To ensure prompt implementation of any plans approved by the Council, federal implementing agencies should incorporate the planning process and its results into ongoing administrative processes including, but not limited to, National Environmental Policy Act and Endangered Species Act processes.
- 5.3B.17 Incorporate the specifications of such approved plans in all system planning and operations performed under the Columbia River Treaty, the Pacific Northwest Coordination Agreement, Congressional authorizations and appropriations, all related rule curves and other applicable procedures affecting river operations and planning. Implement approved reservoir drawdown plans as “firm” requirements.

5.3C Mitigation and Assistance for Property Owners

Corps of Engineers

Develop a mitigation plan that will assist local property owners in minimizing the impacts to buildings, facilities and roads that may result from

each stage of the lower Snake River drawdown. The Corps should submit this mitigation plan to the Council no later than six months prior to the beginning of the Lower Granite drawdown and submit similar plans prior to each subsequent drawdown.

5.4 IMPROVE COLUMBIA RIVER FLOW AND VELOCITY

Biological objective:

To improve conditions for salmonid production by increasing flow and water velocity, decreasing downstream migration time for anadromous fish and decreasing the quantity of habitat for predatory and competing fish species, while endeavoring to provide inriver conditions to maximize adult fish survival between dams.

Operational objectives:

To endeavor to provide a monthly average flow or velocity equivalent at The Dalles as follows in the chart at the top of the following page.

The Council will review these objectives further based on anticipated submittals by the Columbia Basin Fish and Wildlife Authority in early 1995.

**5.4A Performance Standard:
Columbia River Spring
Migrants**

Through firm power planning, provide 58 thousand cubic feet per second per month (3.45 million acre-feet) of shapeable water. In addition, provide at least 4 million acre-feet of water, subject to conditions specified below. Also provide additional water obtained from Canadian storage reservoirs through U.S. State Department discussions with Canada.

**Bonneville, Corps of Engineers,
Bureau of Reclamation and
Other Parties**

5.4A.1 Beginning immediately, operate John Day Reservoir at minimum irrigation pool from May 1 to August 31 of each year. Minimum irrigation pool is the lowest level at which the irrigation pumps drawing from the reservoir will operate effectively. Monitor and evaluate the biological benefits of John Day Reservoir operations so that the Fish Operations Executive Committee can determine in future years how the operations can complement flow velocities and other factors to achieve rebuilding targets. The Council recognizes that, as was the experience in 1991, under certain conditions a slightly higher elevation may be required and that

some daily flexibility is necessary for operation of the reservoir. Other portions of this rule contain measures that will permit irrigators and other users of the John Day pool to operate effectively at lower pool levels. The Council expects the level of the minimum irrigation pool to be lowered as these measures are implemented and that this will be accomplished by 1994. The intent of this provision is that the John Day Reservoir will be operated at the lowest practical level during the spring and summer migrations of juvenile chinook and sockeye salmon.

5.4A.2 Through firm power planning, provide 58 thousand cubic feet per second per month (3.45 million acre-feet) of water at Priest Rapids Dam to be used by the Fish Passage Center consistent with the Fish Operations Executive Committee's annual plan during the period April 15 through June 15.

5.4A.3 When the adjusted April forecast for the January-July runoff at The Dalles Dam is less than 90 million acre-feet, have water in storage and available for juvenile fish flow augmentation by April 30. The appropriate volume is derived from the curve in Figure 5-2 based on the official April forecast and adjusted to the National Weather Service 95-percent confidence level. This volume

is in addition to the existing water budget volume. This volume of water would provide approximately the flow equivalents shown in Figure 5-3.

5.4A.4 Actions taken to store the required volume should not violate the following conditions:

- flood control limitations;
- project minimum flow requirements;
- Vernita Bar Agreement requirements, which protect fall chinook below Priest Rapids Dam.

Bonneville

5.4A.5 Beginning in January of each year, provide to the Council, the Fish Operations Executive Committee and other interested parties a monthly written report of the volume of water stored pursuant to Section 5.4A.3, above. By April 30 of each year, identify the location and total volume of water stored for juvenile fish flow augmentation.

Corps of Engineers and Bonneville

5.4A.6 Provide to the Council, the Fish Operations Executive Committee and other interested parties a monthly written report identifying where system flood control storage is being provided, including a summary of system flood control shifts.

All Parties

5.4A.7 Whenever flow augmentation measures are in effect, the weekend and holiday average flows should not be lower than 80 percent of the average of the five preceding weekdays.

5.4A.8 The 140,000 cubic feet per second flow cap in the mid-Columbia River is removed.

Bonneville

5.4A.9 Because of the uncertainty in the supply of out-of-region energy, immediately secure options for one or more resources to augment reduced hydroelectric energy during winter months. If the region is unable to store enough water for any reason other than those specified in Section 5.4A.4, above, immediately begin to acquire the optioned resources called for under Objective 2 of the 1991 Northwest Conservation and Electric Power Plan, or otherwise acquire resources that are consistent with the plan, in an amount sufficient to ensure that the full volume of required water is available in succeeding years. The Council will consult with representatives from all interested parties to determine the proper amount and timing of the acquired resource(s).

5.4B Summer Migrants

Bonneville

- 5.4B.1 During July and August in below-average water years, provide a volume of water from the U.S. Non-Treaty Storage water available in that year to facilitate evaluations described below.
- 5.4B.2 Continue to seek energy exchanges and other energy alternatives with a potential for increasing Columbia River flows in July and August to facilitate evaluations and to improve survival of summer migrants.
- 5.4B.3 Allow Grand Coulee to draft to an elevation of 1,280 feet by the end of August, if needed to meet the summer flow objective, and consistent with Section 10.3E.3, governing reduction in water retention times.

5.4C John Day Drawdown

Corps of Engineers, Bonneville, Washington, Oregon and Others

- 5.4C.1 Lower John Day reservoir so that it reaches near minimum operating pool by April 15, 1996, and operate it at that level year-round, conditioned on full, prior mitigation of impacts to irrigators and other reservoir water users. If needed, and unavailable at other projects, allow load following operation outside the fish migration season. For 1995, immediately explore whether immediate and/or temporary mitigation for such

users (e.g., by dredging) is possible at the upper end of the reservoir to allow lowering the reservoir below the current minimum irrigation pool.

Corps of Engineers

- 5.4C.2 By January 1, 1995, develop a budget to finish design work, extend irrigation pumps, modify salmon passage facilities, if needed, and move boat ramps in John Day reservoir. Develop a plan for wildlife mitigation measures and submit it to the Council by January 1, 1996.
- 5.4C.3 Install fliplips on spillways.
- 5.4C.4 Develop and implement a monitoring process to determine: the extent to which John Day drawdown reduces predation and travel time for juvenile salmon; impacts on adult salmon; effects of increased turbidity; changes in water temperature; impacts to wildlife; etc.

Corps, Bonneville, Washington, Oregon and others

- 5.4C.5 Beginning immediately, and concluding not later than April 30, 1996, complete all design, engineering and environmental review of facility and operating changes necessary to operate John Day Dam and its reservoir by 2002 at near-spillway level: a) annually, from May 1 to August 31; or, b) year-round. Include all requirements and impacts and mitigation needed for power production, flood control, navigation, irrigation and other river users. In particular, evaluate: lock modification or reconstruction to facilitate continued navigation; and alternative means to provide irrigation and other water for water users in the John Day pool at the time. Report to the Council by April 30, 1996. The Council will use the report in making a decision on John Day drawdown to spillway.

5.4D River System Investigations

Bonneville, Corps of Engineers and Bureau of Reclamation in Consultation with the Council and Other Parties

- 5.4D.1 Evaluate seasonal exchanges, long-term nonfirm transactions, options for storing water above power rule curves, accelerated acquisition of winter peaking conservation and renewables, efficient direct application of renewable resources, wholesale and retail price structures and other changes in power system operations that could increase flows for salmon and steelhead or offset the cost of improving salmon and steelhead flows. Report annually to the Council not later than the end of each year. Among alternatives examined in the System Operations Review, include a full range of system coordination alternatives to facilitate such alternative power system operations. Take steps to include the Idaho Power Company in the coordinated system.

Council

- 5.4D.2 In consultation with and approval of the fishery agencies and tribes, immediately undertake a basinwide comprehensive hydrologic, hydraulic geometry and biological analysis to determine appropriate flow duration and magnitude needed to reestablish critical mainstem and estuarine floodplain habitat. As part of the analysis, explore relation of flood control rule curves, as provided in Section 5.4E, and modification of power sales contracts to move the river hydrograph back toward historical timing and duration.

Bonneville

- 5.4D.3 Fund the evaluation in 5.4D.2.
- 5.4D.4 Fund an evaluation of all Columbia River Basin water storage and hydropower facilities to determine the availability of additional velocity improvements or water for mainstem or tributary flow augmentation. The evaluation should include resident fish or other potential endangered species status and impacts. Report to the Council by January 1, 1996.

U. S. State Department

- 5.4D.5 Initiate discussions with Canada to attempt to secure the use of additional water for flow augmentation from Canadian storage reservoirs. Attempt to reach agreement by December 31, 1996. Report findings or progress to the Council at the end of each year.

Bonneville, Corps of Engineers and Bureau of Reclamation

- 5.4D.6 Use any resulting water secured through negotiations with Canada to meet the flow objectives of this program and, in addition, to provide a minimum flow of 120 thousand cubic feet per second at The Dalles Dam during September. These flows should: decrease the migration time of the end of the juvenile subyearling fall chinook migration through the lower Columbia; reduce delay and inter-dam loss, and increase spawning success for adult fall chinook migrating through the lower Columbia; and reduce delay and inter-dam loss, and increase spawning success for adult fall chinook and steelhead.

Corps of Engineers

- 5.4D.7 Maintain Albeni Falls reservoir at a level no lower than elevation 2,056 feet in order to provide an additional amount

of water for Columbia River salmon flows (see Section 10.6E). Any replacement energy for this operation must not come from Columbia River Basin storage projects.

Bureau of Reclamation, U.S. Geological Survey, U.S. Department of Agriculture and Soil Conservation Service

- 5.4D.8 Evaluate the potential for water conservation, water efficiency or other measures in the above-listed agency programs with the most potential to benefit anadromous fish and with the least impact on third parties. Include an evaluation of the potential for using crop rotation programs to facilitate dry-year water leasing activities. Report to the Council.

Bonneville, Corps of Engineers and Bureau of Reclamation

- 5.4D.9 Under the auspices of the Columbia River Water Management Group, continue with the review of, and make recommended improvements to, the current water supply forecasting products, including, but not limited to:
 - potential for improvements in the accuracy of volume forecasts;
 - potential for forecasting the shape of runoff;
 - potential to incorporate the Southern Oscillation Index, other indices, and/or extended weather forecasts produced by the National Weather Service into runoff forecast procedures;
 - benefits of expanding the telemetered snow monitoring system; and
 - resolution of the institutional barriers for the installation of hydrologic measurement sites in existing and proposed wilderness areas.

5.4D.10 Based on the October 1993 Review of Runoff Forecasting in the Columbia River and Pacific Slope Basins related to measure 5.4D.9, continue to identify, evaluate and implement methods for improving runoff forecast accuracy. Bonneville, the Bureau, the Corps or the states should fund implementation of those methods and continuing evaluations.

5.4E Flood Control Examinations

Corps of Engineers and Others

5.4E.1 Continue to re-examine all Columbia River Basin flood control strategies and rules to identify modifications, including alternatives to impoundment that could yield more useful or shapeable flows for fish, such as alternative structural and non-structural flood protection measures. Such evaluations should include, but not be limited to: 1) the possibility of shifting flood control storage to the space provided when lower Snake River and John Day reservoirs are drawn down to minimum operating pool or lower; 2) the effects and trade-offs of reduced levels of flood protection, including decreasing the rainfall factor of safety; and 3) separating system flood control from local flood control storage requirements, favoring the latter, in upper basin storage projects. Submit a final report not later than the end of 1995.

5.5 CONDUCT ADDITIONAL RESEARCH AND MONITORING

5.5A Impact of Salmon Measures on Resident Fish and Wildlife

Idaho, Montana, Oregon and

Washington, in Coordination with Appropriate Indian Tribes

5.5A.1 Continue to review, compile and submit to the Council information on the impacts of salmon and steelhead flow operations on resident fish or wildlife. In addition, identify specific research, monitoring and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species, in and around Hungry Horse, Libby, Grand Coulee, Brownlee and Dworshak reservoirs. Use this information to develop analytical methods or biological rule curves for reservoir operations, similar to those being developed by the Montana Department of Fish, Wildlife and Parks for Hungry Horse and Libby reservoirs. Include an evaluation of impacts on recreation and the recreational industry.

Bonneville

5.5A.2 Fund research, monitoring and evaluation activities needed to determine the potential impacts of salmon and steelhead flow operations on resident fish and wildlife, particularly native species, in and around Hungry Horse, Libby, Grand Coulee, Brownlee, Dworshak and other reservoirs.

5.6 COMPLETE INSTALLATION OF BYPASS SYSTEMS

When the first hydroelectric dams were constructed in the mainstem of the Columbia River, many people believed that providing adequate upstream passage over the dams for adult salmon returning to spawn was sufficient to sustain salmon and steelhead runs. Since that time, research has shown that juvenile salmon and steelhead heading downstream also suffer a significant mortality rate as they encounter the dams.

Pressure changes within each turbine are the primary cause of juvenile salmon deaths. The impact of the moving turbine blades and the shearing action of water in the turbine can cause injuries or death. In addition, juvenile salmon and steelhead may be stunned while passing through the turbines, thus increasing their vulnerability to predators, especially squawfish, which are abundant at the base of each dam. The Council recognizes the need to address all phases of mainstem salmon survival, including installation of juvenile fish screening and bypass systems.

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

In 1982, the Council called for development of mechanical bypass systems at five public utility district dams regulated by the Federal Energy Regulatory Commission in the mid-Columbia area. In 1984, operators of four of the five dams agreed to develop bypass systems as part of a settlement with fish and wildlife agencies and tribes, which had petitioned the Federal Energy Regulatory Commission to make bypass a condition of license renewals for the dams. Spill, which is to be used to protect fish until the bypass systems are operating, is to be shaped in coordination with the fish and wildlife agencies and tribes. In 1987, the Council amended the program to incorporate provisions of a settlement agreement concerning fish protection measures at Rock Island Dam. The settlement capped several years of litigation over the advisability of mechanical bypass systems

for juvenile fish, whether a hatchery would be a reasonable substitute, what level of spill would be appropriate to protect juvenile fish and other issues. The settlement agreement calls for the development of juvenile bypass systems and installation of the systems, if certain criteria are satisfied. The agreement also provides for the creation of an innovative "Fisheries Conservation Account," which the joint fishery parties that have signed the agreement may use for bypass studies, bypass development or to purchase spill. The agreement specifies spill levels and provides for studies of summer spill. A hatchery and satellite facilities will be constructed promptly, and habitat and other studies will be conducted to help determine the proper use of the fish produced. Changes were also made in adult fishway operating criteria and modifications.

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

At the Council's request, the Corps completed a comprehensive report on smolt transportation in 1986. In addition, the Council adopted a 90-percent fish guidance efficiency standard as a design criterion for devices that deflect fish away from turbine intakes. The Council required that the level of spill be sufficient to guarantee at least 90-percent fish survival at specified projects for the middle 80 percent of the spring and summer migrations until mechanical bypass systems are installed.

In 1987, the Council adopted a "share the wealth" measure to provide increased levels of

spill in years when water is above the critical level. Recognizing that many of the issues associated with spill have been institutional in nature, the Council committed to aid agreement among the fish and wildlife agencies, Indian tribes and the Corps on this “sliding scale” approach to spill and on other matters.

In 1988, the Bonneville Power Administration, state and federal fish and wildlife agencies, Indian tribes and utility representatives negotiated an agreement on spills for a 10-year period beginning December 31, 1988, at Lower Monumental, Ice Harbor, John Day and The Dalles dams.

In this section, the Council establishes performance standards and sets schedules for the installation of new or improved screens and bypass systems at all Snake and Columbia river federal dams. The Council also calls for monitoring and evaluation of existing screens and new screen designs for improved effectiveness.

5.6A Improve Columbia and Snake River Salmon Passage

Biological objective:

To minimize delay at dams, and minimize the passage of juvenile fish through turbines by providing high survival alternative passage routes.

Operational objective:

To achieve 80 percent fish passage efficiency at each Snake River project from April 15 to July 31 and at each Columbia River project from May 1 to August 31, while keeping dissolved gas levels within the limits of federal and state water quality standards and ensuring a high degree of adult passage success.

Corps of Engineers

5.6A.1 Develop and implement a coordinated permanent juvenile passage plan, in consultation with the fish and wildlife agencies and tribes, consisting of a schedule for design and installation of a powerhouse collection and bypass system at Ice Harbor and The Dalles projects. (Unless otherwise allowed by the Ten-Year Spill Agreement, use a 90-percent fish guidance efficiency standard as a design criterion for turbine intake screens and surface bypass systems. However, the standard need not be used if it is demonstrated to the Council’s satisfaction, on the basis of hydraulic model studies or prototype testing of surface bypass systems and biological test results, that the 90-percent standard cannot be achieved.) The Corps should measure fish guidance efficiency and report results to the Council.

5.6A.2 Install and provide operational fish passage screens and bypass systems at all unscreened federal mainstem dams according to the following schedule:

- **Ice Harbor:** Provide a completed and operational screening and low-velocity flume bypass system by March 1996.
- **The Dalles:** Provide an operational screening and bypass system by March 1998. If a surface bypass system prototype is tested at The Dalles Dam, then complete engineering design for a screened bypass system, but defer screen procurement and construction contracts until testing is complete. Testing should take no longer than two years. In either case, install an operational powerhouse juvenile fish bypass system by March 2000.

5.6A.3 Ensure a 98-percent or greater salmon survival rate in all bypass and collection facilities from the deflector screens or surface bypass system entrances to the end of the bypass system outfall. Where possible, increase survival of smolts in the area below the bypass release points by removing fish predators, protecting migrants from predation by birds, providing alternative release sites or relocating bypass outfalls, particularly at Bonneville Dam by 1998, and/or modifying project operations to reduce predation, according to the schedule in Table 5-2.

5.6A.4 Complete evaluation, design and prototype testing of extended length fish screens, and, if more effective than surface bypass systems, install them at all Snake and Columbia river dams.

5.6A.5 During design and preparation for installation of fish passage facilities, evaluate and report to the Council concerning modifications that may be needed to accommodate alternative flow and velocity measures outlined in Section 5.3 (Snake River Reservoir Drawdown Strategy).

5.6A.6 Expedite evaluation of fish passage efficiency at Bonneville Dam First Powerhouse and report to the Council modifications that may be needed to meet the standards in Section 5.6A.1. Expedite rehabilitation of old generating units. By 1996, investigate project operating systems to provide independent operation of each powerhouse and modify an operating system by March 1998. Complete prototype testing of a surface flow juvenile bypass system by 1998.

5.6A.7 At The Dalles and Lower Granite, complete prototype testing of a surface flow juvenile bypass system by 1998.

5.6A.8 Investigate the feasibility of building a fisheries engineering research facility in the Columbia River Basin to evaluate how fish respond to various fish passage design structures and new fish passage

technologies. Report progress on this study by end of 1995.

- 5.6A.9 Evaluate and modify, if necessary, the juvenile mechanical bypass system at John Day Dam, especially the collection channel and outfall. Complete prototype testing of a surface flow juvenile bypass system by 1998.
- 5.6A.10 Continue studies at McNary Dam to evaluate the expanded juvenile fish bypass and collection system and make necessary modifications by 1995.
- 5.6A.11 If initial testing at Ice Harbor and prototype testing of surface bypass systems at other mainstem dams indicate potential for improved fish passage at Ice Harbor Dam, complete prototype development and testing of a surface bypass system by 1998.
- 5.6A.12 Complete comprehensive evaluation of new mechanical bypass systems at Lower Monumental and Little Goose dams by 1995.

Corps of Engineers and Other Parties

- 5.6A.13 Explore promising new approaches to fish bypass technologies, including development and prototype testing of surface bypass systems, surface spill and behavioral guidance devices, such as the use of sound to guide fish. If the results of this research indicate high efficiency at costs less than screen or other bypass system modifications and show no reason to preclude use of a new technique, propose to the Council incorporation into bypass strategies.
- 5.6A.14 Conduct laboratory studies, numerical analysis, hydraulic model studies and prototype testing to develop an improved understanding of the mechanisms of fish mortality in turbines. Use this information to

develop biological design criteria to be used in advanced turbine designs or modified unit operations to increase fish survival. Report results of studies by September 2001. Based on results of studies, replace or rehabilitate existing turbines, or modify turbine operations at mainstem Columbia and Snake river dams.

5.6B Mid-Columbia River Salmon Passage

Mid-Columbia Public Utility Districts

- 5.6B.1 Subject to Federal Energy Regulatory Commission approval, coordinate and consult with the fish and wildlife agencies and tribes through the three coordinating committees (Wells, Rock Island and Mid-Columbia) on the design of prototype bypass system studies, research, evaluation and all other activities required in this section to achieve the most effective permanent solutions to juvenile fish passage problems in the mid-Columbia. By March 20 of each year, develop and submit to the Federal Energy Regulatory Commission, members of the coordinating committees and the Council an annual fish passage and project operational and maintenance plan. The annual fish passage plan for the mid-Columbia public utility district projects should be coordinated with the various annual implementation plans developed under the auspices of the Fish Operations Executive Committee. At the request of the tribes, fish and wildlife agencies or public utility districts, the Fish Operations Executive Committee and/or the Council will help resolve any disputes related to achieving the objectives of this plan.

Douglas County Public Utility District

5.6B.2 Subject to Federal Energy Regulatory Commission approval, ensure that the installed juvenile fish bypass system tailored to the unique features of Wells Dam continues to operate effectively and in accordance with the terms and conditions of the 1990 Wells Settlement Agreement.

Chelan County Public Utility District

5.6B.3 Evaluate, design and install a prototype surface collection and bypass system at Rocky Reach Dam by 1995. Review with the Mid-Columbia Coordinating Committee, the need for and, if needed, make structural repairs to the spillway so the spillbays closest to the powerhouse can operate independently. If prototype testing indicates higher passage efficiency compared to screen modifications and shows no reason to preclude use of a surface bypass system, install a surface bypass system instead of turbine intake screens.

5.6B.4 Subject to Federal Energy Regulatory Commission approval, complete installation at Rock Island Dam of a juvenile fish screening and bypass system, as set forth in Sections B and C of the Rock Island Settlement Agreement.

5.6B.5 Subject to Federal Energy Regulatory Commission approval, develop plans for spills at Rocky Reach and Rock Island projects by March 1 of each year, as set forth in the stipulated agreement for Rocky Reach Dam and the 1986 Settlement Agreement for Rock Island Dam (Section C, "Fisheries Conservation Account," or Section D, "Spill Program").

Grant County Public Utility District

5.6B.6 Subject to Federal Energy Regulatory Commission approval, complete testing and evaluation of prototype juvenile fish screening and bypass systems at Wanapum and Priest Rapids dams, and report the results of such tests and evaluation to the Council and the Federal Energy Regulatory Commission.

5.6B.7 Subject to Federal Energy Regulatory Commission approval, complete installation at Wanapum Dam of a fully operational juvenile fish screening and bypass system by March 1, 1998, or inform the Council of the reasons why this date cannot be met.

5.6B.8 Subject to Federal Energy Regulatory Commission approval, complete installation of a fully operational juvenile fish screening and bypass system at Priest Rapids Dam by March 1, 1997, or inform the Council of the reasons why this date cannot be met.

5.6B.9 Subject to Federal Energy Regulatory Commission approval, provide an increased level of spill at both Wanapum and Priest Rapids dams to improve fish survival for 80 percent of both the spring and summer salmon migrants, while avoiding dissolved gas supersaturation problems. The Mid-Columbia Coordinating Committee will have the responsibility to govern the timing and distribution of spill. Implement such a plan for spill each year at Wanapum and Priest Rapids dams until juvenile fish screening and bypass systems are installed and operational at each project.

5.6B.10 Subject to Federal Energy Regulatory Commission approval, explore promising new approaches to juvenile fish bypass technology, including the use of surface bypass systems, by 1996. If prototype testing indicates higher passage efficiency compared to screen

modifications and shows no reason to preclude use of a surface bypass system, install a surface bypass system instead of turbine intake screens.

5.6C Spill

Corps of Engineers, Bonneville and Other Parties

- 5.6C.1 Consistent with the experimental program developed under Section 5.0, and until better means are available to move juvenile migrants past dams, for mainstem projects operated by the Corps of Engineers on the Columbia and Snake rivers, provide spill to achieve 80 percent fish passage efficiency at each Snake River project from approximately April 15 to July 31, and at each Columbia River project from approximately May 1 to August 31, or as near as possible within the total dissolved gas guidelines established by federal and state water quality agencies. Manage the spill program in close cooperation with National Marine Fisheries Service and fish managers to ensure appropriate responses to monitoring information for gas bubble trauma. Exceptions to the state standards should be approved by the states on a showing, by the National Marine Fisheries Service and state and tribal fishery managers, that the risk of fish mortality from exposure to higher levels of dissolved gas is less than the risk of failure to provide the spill regime that may result in such levels.

Fish Managers, State Water Quality Agencies and Corps

- 5.6C.2 Prior to use of spill for fish passage in 1995, develop and implement a monitoring and spill management program for ambient nitrogen supersaturation levels, symptoms of gas bubble trauma, and systemwide effects

of spill to ensure safe passage conditions for both adult and juvenile salmon.

Idaho, Oregon and Washington water quality agencies and Corps

- 5.6C.3 Develop and implement a network of water quality monitoring telemetry stations on the Snake and Columbia rivers and evaluate data produced by the system.

5.6D Turbine Operating Efficiency

Corps of Engineers

- 5.6D.1 Operate turbine units within 1 percent of peak operating efficiency from April through August of each year, and especially during peak migration periods. Plan and coordinate deviations from the 1-percent peak efficiency criterion with the fishery agencies and tribes. Complete the turbine index testing program at all mainstem dams by 1996.

5.6E Gas Supersaturation

Bonneville, National Marine Fisheries Service

- 5.6E.1 Fund a study of dissolved gas supersaturation and its effects on salmon and steelhead passing through dam turbines, collection and bypass systems, spillways, adult ladders, reservoirs and other mechanisms, particularly in connection with possible reservoir drawdowns. The study should focus on the relationship between: a) spill levels at mainstem federal projects and the resulting total dissolved gas level; and b) the symptoms of gas bubble trauma related to both lethal and non-lethal effects on juvenile and adult salmon and other aquatic species. Report to the Council by January 1, 1997.

Corps of Engineers

5.6E.2 By 1997, evaluate and modify mainstem projects to reduce dissolved gas levels during spill operations and increase spill efficiency. Include the following options in the evaluation:

- a) Installation of spillway deflectors at each of the following dams: Lower Granite, Little Goose and Lower Monumental (two outer spillbays); McNary (four outer spillbays); Ice Harbor, John Day and The Dalles (all spillbays); and Bonneville (two outer spillbays);
- b) Design and prototype test spillway and stilling basin modifications;
- c) Design and prototype test structural and fish behavioral methods to increase fish passage efficiency of spillways and control nitrogen supersaturation, including the use of a slotted spillgate design; and;
- d) Fund extensive hydroacoustic monitoring across the length of each dam to monitor smolt movement, determine spill efficiency and improve the effectiveness of spill passage.

Corps of Engineers

5.6E.3 Fund or install the following dissolved gas monitoring and abatement measures:

- a) a more extensive dissolved gas monitoring system so physical aspects of gas plumes can be identified in the water column;
- b) state water quality agencies and fishery agency and tribal entities to conduct physical and biological monitoring and evaluate data gathered by monitoring program;

- c) supply additional gas monitoring equipment for backup installation and readiness for immediate use;
- d) continued development and calibration of existing gas spill model to enable accurate prediction of dissolved gas levels under different riverine and spill conditions on a real-time basis;
- e) gas abatement structures at all Corps dams by 1997; and
- f) operational and structural measures to reduce high total dissolved gas levels caused by turbine discharges from headwater storage projects.

5.6F Develop and Implement Maintenance Plans

Federal Project Operators and Regulators

5.6F.1 Develop a plan for repair and maintenance of any part of each dam relating to the passage of juvenile salmon and steelhead, including: 1) measures to be followed in the event that any such facility breaks, is washed out or ceases to operate; and 2) designation of an individual responsible for carrying out the plan. If any dam operator fails to comply with the plan, the Council will ask the person responsible for carrying out the plan to explain at a Council meeting the reasons for the non-compliance. The Council will decide upon appropriate action at that time.

5.7 REDUCE PREDATION AND COMPETITION

Hydropower development in the Columbia Basin resulted in an environment that favors

salmon predators. Additionally, introduction of non-native species, development of some hatchery programs, and greatly increased numbers of seals and sea lions as a result of protection of the Marine Mammal Protection Act, have resulted in an increase in the adverse effects of predation and competition on salmon. Conditions beneficial to predatory fish include increased predator spawning habitat, slightly warmer water temperatures, and the introduction of millions of hatchery fish that are diseased and ill-suited to escape predation. Other factors that improve predator success include concentrations of smolts at hydropower facilities and the incapacitation of smolts passing through generator turbines. Hydropower development also increased predation by birds. Predator vulnerability may also be increased for juvenile fish passing through existing bypasses and sluiceways. The introduction of non-native species, as well as certain hatchery management practices, have also resulted in increased competition for a number of the weak runs.

In this section, the Council calls for measures to reduce predation and competition, including a squawfish management program that employs targeted fisheries or other measures to achieve the removal of more than 20 percent of the squawfish population, with the expectation that this will result in more than a 50-percent reduction in the present consumption of juvenile salmonids. This is a modification to the current predator control effort and increases the rate of squawfish removal, which will progressively reduce predation on smolts. A comprehensive monitoring and evaluation program will evaluate the effectiveness of predator control efforts. These efforts will then be modified, if necessary.

5.7A Performance Standards for Reducing Predation

Bonneville, Corps of Engineers and Mid-Columbia Public Utility Districts

- 5.7A.1 **Squawfish:** Reduce squawfish population by more than 20 percent in the Snake and Columbia rivers with the expectation that this will result in more than a 50 percent reduction in the present consumption of juvenile salmonids.
- 5.7A.2 **Shad:** Explore the population ecology of shad to determine effective methods for control and develop programs to eliminate shad from the Columbia River system above Bonneville Dam and reduce the shad population below Bonneville Dam.
- 5.7A.3 **Other Non-Native Fishes:** Reduce numbers of non-native fish wherever they exist with listed species or weak runs, and curtail recruitment of non-native fish into the habitats of listed species and weak runs.
- 5.7A.4 **Steelhead:** Evaluate the extent of residualism (precocious males) in hatchery steelhead populations. Determine the causes of residualism in hatchery steelhead populations and initiate actions, based upon the results of these determinations, to reduce the incidence of residualism by at least 50 percent to reduce the potential for residual hatchery steelhead to prey on or compete with natural salmon/steelhead populations.
- 5.7A.5 **Trout:** Use alternative planting strategies for release of hatchery trout which will reduce predation and competition to acceptable levels. Evaluate effect of native trout on survival of weak stocks.

5.7A.6 **Birds:** Monitor and assess predation by birds and identify non-lethal methods of control.

5.7B Predation Control Actions and Evaluations

Bonneville and Other Parties

Squawfish

- 5.7B.1 Continue implementation of the current squawfish project and increase the rate of squawfish removal thereby progressively reducing predation on smolts.
- 5.7B.2 Document current population dynamics, life history and behavioral attributes of squawfish throughout the migratory corridor to identify times and places where squawfish are vulnerable to control measures, to document sources of recruitment and to provide the data necessary to monitor responses of squawfish populations to control measures.
- 5.7B.3 Monitor the squawfish program effectiveness directly; i.e., measure total consumption by the predators, or rate of survival by the salmon, or both, if feasible. Other monitoring indices such as exploitation rates in the fisheries and age structures of the squawfish populations, are ancillary and informative for analyzing the program operations. The control program will be implemented and evaluated in a phased process, beginning at one or two carefully selected locations and then expanding to more areas. Evaluations should quantify changes in predator populations and in the overall rate of predation. Provide an annual report to the Council on the effectiveness of this program.
- 5.7B.4 Expand the program that monitors fish communities and populations to measure and assess the effects of

squawfish control. Of particular interest would be other salmon predators and competitors, and any changes in their impacts on salmon concurrent with changes in squawfish population levels.

- 5.7B.5 Explore the development of methods to reduce squawfish population numbers at all appropriate life stages. Continue the present fisheries (sport reward fishery, dam angling and commercial harvest) as interim measures until more directly effective methods of squawfish control are found and implemented.
- 5.7B.6 Explore the development of methods to capture squawfish by concentrating them through flow manipulation or other means into slack water areas where they would be more or less isolated from migratory salmonids and more vulnerable to capture.
- 5.7B.7 Examine potential conditions and feasibility for the use of Squoxin.
- 5.7B.8 Implement a formal process for annual peer review of the program performance.

Shad

- 5.7B.9 Explore population ecology of shad to determine the extent of adverse interactions with salmonids and identify effective methods for control.
- 5.7B.10 Concurrent with exploration of population ecology, develop programs to eliminate shad from the Columbia System above Bonneville Dam. Alternative upstream passage designs should be evaluated to find methods for preventing the upstream passage of shad while allowing salmon and steelhead to pass. The program will have to account for the very large biomass of adult shad that enter the system each year, and include components for separation of shad from salmon, their removal from

the waterway, and their utilization in some responsible way.

- 5.7B.11 Managers should use whatever methods are available to reduce the numbers of shad that spawn below Bonneville Dam.

Other Non-Native Fishes

- 5.7B.12 Wherever non-indigenous species exist with listed species or other weak runs, use any measures practicable to reduce populations of non-indigenous species. In addition, recruitment of these species into habitats of the listed species should be curtailed.

- 5.7B.13 Sport harvest of non-indigenous species should be allowed anytime, with no bag limit or size restrictions.

- 5.7B.14 There should be no programs that would directly improve habitats, production, or survival of introduced species.

- 5.7B.15 Monitor populations of non-indigenous species as part of the program that monitors reservoir fish populations and communities that was recommended for squawfish control. These data and other information should be used to identify potential times and places that populations of these species are vulnerable to control measures.

- 5.7B.16 Application of the provisions and authority of the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 should be evaluated and pursued as a vehicle to control and reduce the populations of non-native fishes in the area inhabited by the listed species.

Steelhead

- 5.7B.17 Assure that all hatchery steelhead are released at a time and in a physiological condition that will encourage rapid migration through the Columbia River system to reduce the extent of

interactions with natural stocks of salmon and steelhead.

Trout

- 5.7B.18 No hatchery trout should be released into waters essential for spawning and rearing of the listed species or weak stocks unless alternate planting strategies can be used that will reduce predation-competition to acceptable levels.

- 5.7B.19 Evaluate the effect of native trout on survival of the listed species in areas where the listed species and other weak stocks cohabit.

Birds

- 5.7B.20 Add predation by birds in the Columbia and Snake river reservoirs as part of a continuing monitoring and assessment program, including examination of stomach contents.

- 5.7B.21 Initiate a comprehensive study immediately to evaluate salmonid consumption in the estuary. Emphasize Caspian tern and cormorant colonies utilizing manmade dredge-spoil islands in the lower river.

- 5.7B.22 Identify non-lethal methods of control. For example, netting or other materials can be employed to interfere with the ability of birds to reach the fish, or manmade habitats can be altered to limit population size.

Corps of Engineers, Bonneville and Federal Energy Regulatory Commission

- 5.7B.23 Evaluate and expeditiously implement measures to reduce smolt mortality due to fish and avian predation at bypass system release sites. Currently, the outfalls dump the fish into the river a short distance downstream from the dams, usually near the shore in an area likely to have high predation rates.

Measures should be designed to disperse juvenile fish releases below dams and should include, but not be limited to, modifications to existing bypass system outfall structures, modification of project or bypass system operations.

National Marine Fisheries Service

Additional information is needed regarding the extent of marine mammal impacts on salmon populations.

Marine Mammals

5.7B.24 Investigate the relationship between the Endangered Species Act and the Marine Mammal Protection Act. Seek language in the Marine Mammal Protection Act that will permit the Secretary of Commerce the authority to allow the lethal removal of pinnipeds once all reasonable non-lethal means of deterrence have been exhausted. This type of control should be applied to pinnipeds affecting all weak stocks of salmon and steelhead, not only those that are listed.

5.7B.25 Develop a protocol for marine mammal predation control for immediate implementation in the event that evidence indicates control is needed to support listed species' recovery.

5.7B.26 Collect data on marine mammal distribution and abundance on a year round basis.

5.7B.27 Collect marine mammal food habit data, including the examination of fresh stomach contents from seals and sea lions in an area where they are assumed to be predatory on salmon.

5.7B.28 Observe and document the incidence and location of salmon predation. This should include the incidence of removal of salmon from fishing gear.

5.7B.29 Radio-tag chinook as they enter the mouth of the lower river so they can be

tracked to ascertain their interactions with the marine mammal population.

5.7B.30 Radio-tag seals and sea lions.

5.7B.31 Radio-tag scarred fish at Bonneville Dam to determine their survival during the up-river migration.

5.7B.32 Conduct captive predation studies to validate the causes of scarring and determine size and species preference.

5.7B.33 Develop a computer model to simulate the effects of removing non-breeding male sea lions.

Mid-Columbia Public Utility Districts

Predators in Mid-Columbia

5.7B.34 Subject to Federal Energy Regulatory Commission approval, develop a coordinated study plan with the fishery managers to evaluate the extent of predation on juvenile salmon migrating through the five mid-Columbia River reservoirs. By October 1993, all five reservoirs should be indexed for predator populations. The public utility districts should prepare a comprehensive report on the extent of predation and predator indexing in the five mid-Columbia River reservoirs by January 1994. The three mid-Columbia coordinating committees should consult with the Council to determine the need for predator control programs. If the mid-Columbia coordinating committees and the Council jointly determine that predator control programs are warranted, then the public utility districts will implement, monitor and evaluate measures to alleviate juvenile salmonid predation in the appropriate reaches of the five mid-Columbia reservoirs beginning in June 1994.

5.8 TRANSPORTATION

In coordination with the region's fish and wildlife agencies and Indian tribes, the Corps of Engineers operates a large-scale program to collect and transport in barges juvenile salmon and steelhead to reduce predation and passage loss. This program has been an integral part of the region's fish passage enhancement measures since 1981.

The Council recognizes that despite considerable research and evaluation on the benefits of transportation, much disagreement remains. A similar degree of controversy surrounds other passage measures, such as the benefits derived from flow and water velocity augmentation. These significant scientific uncertainties and their impacts on the region's abilities to develop an effective fish passage strategy are the basis for the mainstem passage experiment described in Section 5.0.

In the near term, especially in low water conditions, transportation is one of the few tools the region has for improving salmon survival. In the longer term, depending on results of continuing evaluation, transportation may be useful in the mix of techniques the region will use to decrease salmon mortality associated with migration through the reservoirs. However, transportation should not be regarded as a substitute for changes in the river ecosystem.

Generally, the Council encourages an interim strategy that substantially reduces the number of fish transported and evaluates transportation survival versus inriver survival. Transportation should not be used as a device to delay substantial improvements in inriver survival conditions. In-season transportation decisions should be made by the fish managers. In the case of stocks listed under the Endangered Species Act, these decisions will be made by the National Marine Fisheries Service in consultation with other fish managers). Accordingly, the Council calls on the National Marine Fisheries Service, in collaboration with the tribes, state fishery managers and the Corps, to aggressively evaluate and implement transportation in keeping with the spread-the-risk concept and as part of an experimental

design to evaluate inriver and transportation migration survival and returns to adult spawners. This approach will likely involve significant modification to the present operation of transportation, including the present policy of transporting all fish collected at Lower Granite, except fish collected for research purposes. An essential component of this strategy is the comparison of survival to adult return under the two modes of passage, ideally back to the spawning ground or hatchery. Transportation required for the evaluation, or as a survival measure, should be in accordance with guidelines developed by the fish managers. The Council recommends guidelines consistent with the following:

- For Endangered Species Act sample groups: Because the fish will be placed at risk through handling and marking, the number of fish assigned to be transported and inriver sample groups in any year, should be limited to the minimum necessary for study design purposes and should be determined by the National Marine Fisheries Service in consultation with other fish managers. In years with very low expected numbers of migrating juveniles, prudence may dictate no sample groups for that year.
- For all other Endangered Species Act-listed migrants: Other juvenile migrants should be allowed to migrate inriver except as the National Marine Fisheries Service, in consultation with other fish managers, judges inriver conditions to be extremely adverse (for low water or other reasons). Except under such conditions, the Council expects significantly fewer than half the juveniles would be transported in any year.
- For other non Endangered Species Act-listed migrants: Other juvenile migrants should be allowed to migrate inriver except as the fish managers judge inriver conditions to be extremely

adverse (for low water or other reasons). Except under such conditions, the Council expects significantly fewer than half the juveniles would be transported in any year.

The Council believes that transportation is likely to play a role in the region's salmon recovery plan. At the same time, it is apparent that additional information is needed about when and how transportation may benefit fish survival and how survival under transportation compares to the survival of fish migrating in the river. In addition, several innovative ideas for alternative transportation collection systems, techniques and management have been suggested during the amendment process. These should be investigated using the services of outside contractors and other available parties, as needed, to accelerate implementation of such improvements. The region would benefit from a regular infusion of creative ideas for the improvement of transportation management and operations from a broad spectrum of interests. The Council encourages other parties to come forward with creative ideas for transportation, and calls on the transportation operators to take these ideas into full account.

5.8A Transportation Implementation and Evaluation

Corps of Engineers

5.8A.1 In consultation with National Marine Fisheries Service, continue transportation of Snake River fall chinook. Transportation may occur in the Snake River after subyearling fall chinook migrants compose 10 percent of the daily total chinook collection for three consecutive days at Lower Granite Dam. Transportation will not occur in the Columbia River until subyearling migrants compose 80 percent of the daily total chinook collection for three consecutive days at McNary Dam.

National Marine Fisheries Service

5.8A.2 Develop and ensure implementation of a program to compare the survival of transported juvenile spring chinook and, if possible, fall chinook, with fish that migrated through the river over a range of environmental conditions. This evaluation should be based on survival to adult return, ideally to the spawning grounds. The evaluation should minimize its impact on the migration through marking and handling. If possible, the evaluation should be based on collection from a single upriver project to avoid experimental conflicts.

Fishery Managers and Corps of Engineers

5.8A.3 Beginning in 1995, conduct smolt transportation in the Snake River according to the spread-the-risk concept and consistent with the guidelines described in measure 5.8A.1 above and with the experimental design developed by the National Marine Fisheries Service described in measure 5.8A.2. Consistent with the guidelines above, the proportion of the run to be transported in any year beyond evaluation needs will be determined by the fish managers.

5.8A.4 Manage the transportation program to minimize conflict with the evaluation program.

5.8A.5 Utilize the available barges to direct load collected fish into the transportation vehicle rather than holding collected fish in the raceways. Take steps to minimize migrational delay at the project by ensuring that barges are held at the projects for no more than 12 hours. It is expected that the spread-the-risk concept will result in a smaller proportion of the run being transported relative to the situation that has prevailed in the past several years.

For this reason, it is hoped that direct loading under spread the risk can be accomplished with few additional barges. However, if this is not possible, then the Corps should immediately take steps to construct and acquire the additional barges necessary to permit direct loading.

Corps of Engineers

- 5.8A.6 On an expedited basis, improve salmon transportation by upgrading facilities and improving operations. Improvements should include direct loading of fish without holding them in raceways after collection, enlarging transport barge exits, minimizing fish densities, reducing stress in holding areas through shading or other means, developing smolt release strategies, including dispersing fish to minimize predation and reducing noise levels in the barges and collection facilities. Immediately evaluate the feasibility of constructing and operating acclimation facilities below Bonneville Dam and alternative release sites farther downriver. Report to the Council annually by the end of each year on the status of these improvements and evaluations and on the feasibility of increasing transport benefits.
- 5.8A.7 Expedite funding for a preliminary evaluation of the feasibility and benefits of net pens to increase survival of transported fish by reducing mortality associated with bypass outfall areas. The evaluation will include preliminary engineering, as well as economic and biological parameters. Report results of the evaluation to the Council by December 31, 1995.

Bonneville

- 5.8A.8 Continue to conduct research on the survival of hatchery, wild and naturally spawning chinook salmon from

headwater production areas to mainstem transport sites to determine the extent of mortality prior to transportation. Determine the cause (e.g., water quantity, water quality, food supply, disease, smolt quality, predation, etc.) of any high mortality rates prior to transport.

5.9 PURSUE MONITORING AND DISPUTE RESOLUTION

5.9A Monitoring

Bonneville

- 5.9A.1 Fund an annual smolt monitoring program to be conducted by the fish and wildlife agencies and tribes. The monitoring program will provide information on the migrating characteristics of the various stocks of salmon and steelhead within the Columbia River Basin. The program should include:
- field monitoring of smolt movement to determine the best timing for storage releases;
 - coordination of runoff forecasts with water budget use and shaping;
 - continuous monitoring of runoff conditions and fish movement at Lower Granite and Priest Rapids dams to give information for changes in water budget use if actual runoff conditions are inconsistent with runoff forecasts; and
 - coordination of hatchery releases with water budget use.

5.9B Dispute Settlement

Fish Passage Manager and Fish Operations Executive Committee

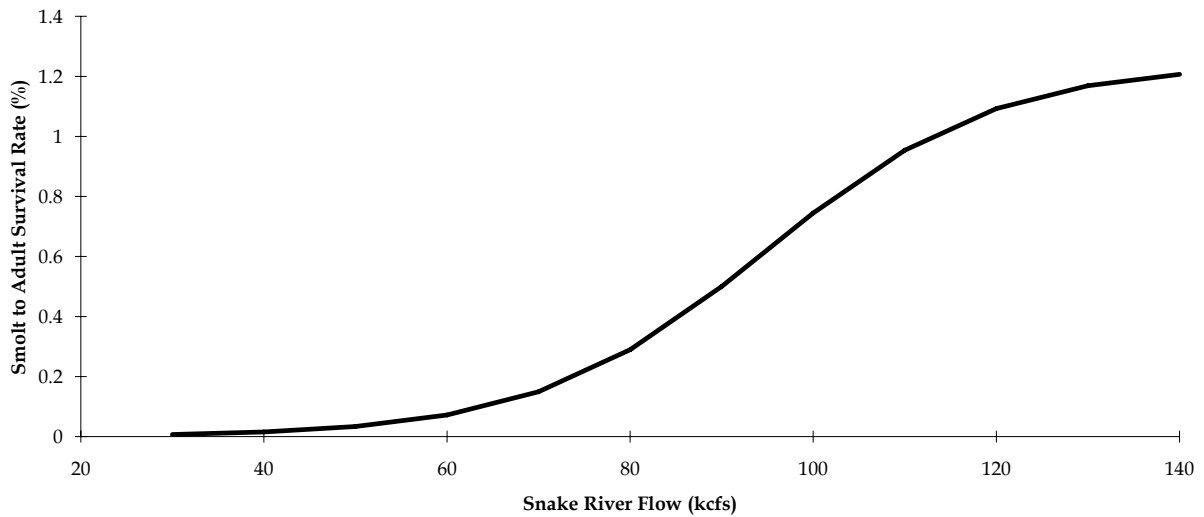
5.9B.1 In the event that the fish and wildlife agencies and tribes are unable to agree on a flow schedule for the water budget, the fish passage manager immediately will notify the Fish Operations Executive Committee, which will assist them in promptly resolving the dispute. In the event the dispute cannot be resolved, the Council may establish and transmit to the Corps of Engineers a schedule for the water budget.

Fish Operations Executive Committee

5.9B.2 If federal project operators and regulators cannot resolve planning and operational disputes related to mainstem fish operations, the Fish Operations Executive Committee will meet with representatives of those entities to help resolve the dispute.

13 Studies by the Idaho Department of Fish and Game suggest the relationship between flow in the Snake River and smolt to adult survival for spring chinook shown in Figure 1.

Figure 1. Relationship Between Spring Chinook Survival and Flow as Predicted from Marsh Cr. (Idaho) Data



Similar relationships have been reported for other Snake River spring chinook populations in Oregon and Idaho and for Mid-Columbia fall chinook. This information should be considered illustrative, and not necessarily conclusive.

Section 6

ADULT SALMON MIGRATION

Mainstem Columbia and Snake river hydroelectric projects and some tributary projects are physical barriers to adult salmon and steelhead migrating from the ocean to spawning areas upstream. To solve this problem, adult fish passage facilities have been constructed at 13 mainstem dams on the Snake and Columbia rivers. Water flows and spill guidelines also have been adopted to provide unimpeded passage and maximum attraction of fish to the fishway entrances.

However, at some adult passage facilities, there are still problems that result in delayed passage and mortality. For example, flow and spill conditions intended to assist juvenile migrants at some dams tend to discourage upstream fish migration, mask the flows that attract fish to the fishway or induce fallback so that fish must relocate and re-ascend the ladder. These conditions may also increase total dissolved gas in the water to levels lethal to both fish and fish food organisms.

In addition, inadequacies in certain mainstem adult passage facilities and in the operation and maintenance of these facilities create passage delays or otherwise reduce the success of adult fish passage. Losses and delays of returning adult salmon and steelhead at each dam due to upstream migration problems can be significant and have a cumulative effect. Reducing these passage mortalities could increase significantly the number of adult salmon available for harvest and escapement.

The Council has adopted a number of measures to improve adult migrant survival. The Council calls on the Corps of Engineers to implement all spill and operating criteria for mainstem adult fish passage facilities and to make needed improvements. In addition, the Council calls on the Corps to leave juvenile fish

screens installed for a longer period to provide protection for adult salmon that fall back through the powerhouse. The Council also recommends adding project biologists to routinely inspect fish passage facilities at mainstem Corps dams. The Corps should conduct various evaluations and studies to improve the effectiveness of passage facilities and, ultimately, the survival of adult salmon and steelhead.

In addition, the fish and wildlife agencies and tribes pointed out that some disease problems in migrating salmon and steelhead may be caused or intensified by their concentration at fish ladders. The Council maintains that this problem warrants further research and calls for research on fish disease at passage facilities.

6.1 IMPROVE ADULT SALMON SURVIVAL

6.1A Mainstem Operations and Facilities

Corps of Engineers and National Marine Fisheries Service

6.1A.1 Adhere to all existing fishway operating and spill criteria. The fish passage committee (Section 5.3B.14) should evaluate and the Corps should implement needed improvements in criteria jointly with fishery managers:

- operate all fishways according to agreed-upon criteria;
- minimize power peaking, establish ramping rates for daily flow

- operations and eliminate zero-flow operations;
 - operate spillways and turbines to enhance fish passage;
 - reduce fish ladder water temperatures;
 - install additional auxiliary water systems for attraction flow and improve entrances and exits of existing ladders.
- 6.1A.2 Complete the evaluation of all mainstem adult passage facilities, the need for new facilities, the effectiveness of entrance attraction flows and fishway hydraulics by December 1, 1996. Make facility improvements as necessary. Provide and install, as necessary, back-up parts, attraction water pumps or fish turbines at each dam for use in the event of failure of these systems.
- 6.1A.3 When adult fallback is a documented problem, keep fish screens in place at each dam beyond the juvenile migration period as indicated in the fishway operating criteria developed with the fishery managers. This is subject to the need for annual screen maintenance.
- 6.1A.4 As determined by the fish passage committee (Section 5.3B.14), the Corps should continue to upgrade existing adult fish passage facilities, including:
- automate control systems;
 - place staff gauges (flow measuring devices) in areas that are accessible for both reading and cleaning;
 - provide velocity meters in areas of known low velocity in the collection channels;
 - construct additional adult ladders at Lower Granite and Little Goose dams by 1999;
 - provide increased attraction water for fish ladder collection channels and entrances by 1997;
- modify adult collection channel at McNary Dam by 1996;
 - construct adult collection channel extensions at Lower Granite and Little Goose dams by 1998;
 - complete adult fishway modifications and improvements at Bonneville Dam by 1997, and
 - investigate covering existing ladders.
- 6.1A.5 Provide an adequate number of trained staff to regularly inspect both adult and juvenile fish passage facilities at each of the eight federal mainstem dams on a frequent basis throughout the fish passage season to ensure all fish facilities are operating according to agreed-upon criteria.
- ## 6.1B Adult Salmon Research
- ### Corps of Engineers
- 6.1B.1 Evaluate the effects of shad population increases on adult salmon passage at mainstem dams. Include in the evaluation the feasibility of selective shad removal in adult ladders. Report results to the Council by November 1994.
- 6.1B.2 Evaluate potential methods for decreasing water temperature in mainstem fish ladders and apply where appropriate.
- 6.1B.3 Evaluate the effects on adult salmon passage of zero nighttime flow conditions in the lower Snake River. Report results to the Council.
- ### National Marine Fisheries Service
- 6.1B.4 Evaluate the effects of increased spill for juvenile salmon on adult salmon passage, particularly in the early morning hours. Investigate modifications to adult fish facilities or project operations to improve adult

passage during spill operations. Report results to Council by 1997. Upon Council approval, implement needed measures to reduce the impact of spill operations on adult passage.

Corps of Engineers and Bonneville

- 6.1B.5 To improve the accuracy of the present adult fish counting procedures, evaluate the feasibility and benefits of using video-based or other automatic counting and species-recognition systems for monitoring adult fish passage at mainstem Columbia and Snake river dams. Report results to the Council. If approved by the Council, institute video-based counting of adult fish at appropriate locations.

Bonneville, Corps of Engineers and National Marine Fisheries Service

- 6.1B.6 Continue research and development on the feasibility of installing adult fish PIT-tag detectors in the adult fish passage facilities of mainstem dams, including consideration of the capability of removing selected fish stocks for transport. If feasible, develop installation schedule and install adult fish PIT-tag detectors in adult fish passage facilities of mainstem dams as soon as possible. Report results of research, installation schedule and progress on installation to the Council by February 1995 and annually thereafter.
- 6.1B.7 Fund studies to investigate diseases that occur at fish passage facilities. A number of diseases that affect adult fish have been associated with fish ladders and attraction facilities at existing dams. Studies are needed to document the extent to which these disease problems cause losses of fish.

Corps of Engineers, Bonneville and Fishery Managers

- 6.1B.8 Evaluate the extent and identify the causes of interdam adult salmon losses, including non-dam losses, and take action to address these causes, as necessary. Report results to the Council by January 1996.

6.1C Improve Flows for Naturally Spawning Fall Chinook

Vernita Bar

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

Fish and Wildlife Agencies, Tribes and Grant County Public Utility District

- 6.1C.1 Comply with the flow plan for Vernita Bar incorporated into the Federal Energy Regulatory Commission license for Priest Rapids Dam.
- 6.1C.2 Evaluate the effectiveness of the improved flows for fish production at the Vernita Bar and report the results of this evaluation to the Council and the Federal Energy Regulatory Commission.

Below Hells Canyon

The last remaining free-flowing stretch of the mid-Snake River is below Hells

Canyon Dam. The fish and wildlife agencies and tribes believe that this stretch could be improved for fall chinook salmon and steelhead spawning by establishing minimum flows and limits on river level fluctuations.

Bonneville and Idaho Power Company

- 6.1C.3 In consultation with the fish and wildlife agencies and tribes, fund studies to investigate the effects 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 of establishing limits on river level fluctuations. These studies shall also include estimates of power losses associated with improved flows.

6.1D Snake River Temperatures

Corps of Engineers, Bonneville, National Marine Fisheries Service and Other Parties

- 6.1D.1 If Dworshak Reservoir is above elevation 1,520 feet at the end of July, its use for temperature control evaluation will be addressed by the Fish Operations Executive Committee.

Relevant Parties

- 6.1D.2 Seek funding assistance for necessary modifications to recreational and commercial facilities to allow Dworshak Reservoir to operate at reduced levels to improve survival of fall chinook consistent with the mitigation provisions of this program (See Section 9).
Idaho Power Company and Federal Energy Regulatory Commission

- 6.1D.3 Annually, during September, draft 100,000 acre-feet from Brownlee Reservoir to help reduce Snake River water temperatures for adult fish passage (See Section 5.2A.10). In addition, pass 100,000 acre-feet of water from the Snake River Basin through the Hells Canyon hydropower complex. (See Section 5.2D.2)

Bonneville and Corps of Engineers, in Cooperation with Idaho Power Company and Other Interested Parties

- 6.1D.4 Continue to evaluate whether releasing cool water from both Dworshak Dam and the Hells Canyon Complex during August and September improves adult fall chinook survival. This evaluation should be consistent with the guidelines specified in Sections 6.1D.1 and 6.1D.3. The objective of this evaluation is to reduce water temperatures at Ice Harbor Dam by September 1 of each year, and to determine the effectiveness of these operations on adult fish survival and passage through the lower Snake River. Report results of this evaluation to the Council annually by December 31. Policy and technical guidance for determining the magnitude and timing of Snake River temperature control releases from Dworshak and Brownlee should be provided in a July meeting of the Fish Operations Executive Committee.
- 6.1D.5 Upgrade the COLTEMP¹ water temperature prediction model using the data and knowledge gained from all previous water temperature control operations and monitoring.
- 6.1D.6 Collect meteorological and hydrological data that will identify the effect of

¹ COLTEMP is a Columbia River Basin water temperature model developed by the U.S. Army Corps of Engineers. It is used to predict water temperatures under alternative reservoir release strategies.

tributary watershed management and resulting inflow temperatures on mainstem Snake River water temperatures. Add to the existing water temperature data monitoring network. Include additional water temperature and velocity measurements from the lower Snake River.

- 6.1D.7 Conduct additional salmon and steelhead migration studies, and coordinate with ongoing fish migration and behavior studies, such as timing, movement, fallback, straying and other characteristics. Report results to the Council annually.
- 6.1D.8 Provide for coordinated data base management.

6.1E Mid-Columbia Dams

Mid-Columbia Public Utility Districts

- 6.1E.1 Subject to Federal Energy Regulatory Commission approval, evaluate adult fish passage at each mid-Columbia public utility district project to determine if losses are occurring at or between the dams. This study should include adult fish count evaluations and development of a coordinated, comprehensive study plan with fishery managers to evaluate existing adult fish passage at all five mid-Columbia dams and reservoirs, including determination of optimum flows and development of spill configuration guidelines to improve upstream migration conditions. To the extent possible, such evaluations should be coordinated with similar adult fish passage studies being planned by the Corps of Engineers for the federal Columbia River mainstem projects. These evaluations also should complement the terms of existing Federal Energy Regulatory Commission Wells and Rock Island Settlement Agreements between Douglas and

Chelan County public utility districts and fishery managers. Compile the results of such evaluations into a comprehensive report on adult fish passage at the five mid-Columbia public utility districts projects and submit the report to the Federal Energy Regulatory Commission, the Council and members of the three mid-Columbia coordinating committees.

Douglas County Public Utility District

- 6.1E.2 Based on results of adult fish passage research and in consultation with the Wells Coordinating Committee, identify and correct all adult fishway deficiencies at Wells Dam, including hydraulic problems in the junction pools, by 1996.

Chelan County Public Utility District

- 6.1E.3 Based on results of adult fish passage research and in consultation with the Mid-Columbia Coordinating Committee, identify and correct all adult fishway deficiencies at Rocky Reach Dam, including hydraulic problems in the junction pools, by 1996.
- 6.1E.4 At Rock Island Project, implement the operating criteria and adult fishway modifications provided in Section F, "Adult Fish Ladders" of the Settlement Agreement dated April 24, 1987, filed in the relicensing proceeding for Project 943 and FERC Docket Nos. E-9569, et al. Based on results of adult fish passage research and in consultation with the Rock Island Coordinating Committee, identify and correct all adult fishway deficiencies, including hydraulic problems in the junction pools and installation of additional pumps, by 1996.

Grant County Public Utility District

of juvenile bypass systems on adults that fall back downstream through them.

- 6.1E.5 Based on results of adult fish passage research and in consultation with the Mid-Columbia Coordinating Committee, identify and correct all adult fishway deficiencies by 1995 at Priest Rapids Dam and by 1996 at Wanapum Dam.

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6.1F Maintenance Plans**Federal Project Operators and Regulators**

- 6.1F.1 Develop a plan for repair and maintenance of any part of each dam relating to the passage of adult salmon and steelhead, including: 1) measures to be followed in the event that any such facility breaks, is washed out or ceases to operate; and 2) designation of an individual responsible for carrying out the plan. If any dam operator fails to comply with the plan, the Council will ask the person responsible for carrying out the plan to explain at a Council meeting the reasons for the non-compliance. The Council will decide upon appropriate action at that time.

6.1G Structural Modifications to Adult Fishways**Corps and Mid-Columbia Public Utility Districts**

- 6.16.1 By 1996, in consultation with fish managers, complete a structural analysis of all mainstem fishways. Make any needed immediate corrections to structural elements such as diffuser gratings and orifices. Eliminate point and non-point pollution sources correctable by minor structural modifications. Undertake a comprehensive evaluation of the impact

Section 7

COORDINATED SALMON PRODUCTION AND HABITAT

An ecosystem approach to species recovery requires close coordination of habitat and production measures. Coordination should ensure that habitat and production measures are driven by the needs of specific populations and by the condition of the watersheds in which those populations live. Effective coordination should provide an opportunity to build on the energy and initiatives of local communities. This helps ensure that ratepayers get maximum return from their investments and makes the best use of the subbasin and system-wide plans prepared by the fish and wildlife agencies and Indian tribes. The process outlined in this section should rely on the analysis and judgment contained in these plans and other resource plans. Implementors should adapt those plans to the needs of weak stocks and watershed conditions.

The starting place for coordination will be a “subregional” process that brings relevant interests together to address the needs of weak fish populations in particular watersheds. A total watershed perspective, in which fish needs, land and water conditions, and local, private and government initiatives are viewed together, will play an essential role in the ultimate success of efforts to rebuild salmon and steelhead runs. To give watershed planning a head start, the Council calls for a “model watersheds” program (Section 7.7B), in which watershed-oriented techniques can be pioneered and evaluated, and promising developments may be incorporated in the subregional process.

Part of the task of coordination is to build on the opportunities and constraints of existing implementation processes, and avoid creating new processes that may diffuse the region’s efforts. The implementation planning process (developed by the fish and wildlife agencies, Indian tribes and the Bonneville Power Administration to help prioritize efforts to implement the fish and wildlife program) should play a valuable role in bringing land and water

managers and other interested parties into a coordinated implementation process.

Because many measures will be implemented by federal agencies, the National Environmental Policy Act may apply. Where it applies, the National Environmental Policy Act can generate important analysis that should inform the region’s decisions.

With the listing of salmon stocks under the Endangered Species Act, the provisions of that law will play an important role. In the process outlined below, we recognize the need to evaluate habitat and production measures in light of these laws and processes, and make the best use of these evaluations in Council decisions. The Council also supports efforts to streamline these processes, both to improve the quality of the public debate and to minimize delay in decision-making.

In Sections 7.0 through 7.5, the Council calls for immediate efforts to gather data on wild and naturally spawning stocks, review impacts of the existing hatchery system and coordinate supplementation activities. In Sections 7.6 through 7.8, the Council calls for changes in land and water management, water diversion screening, habitat priorities and an expedited funding process. In the Council’s view, this work will greatly assist the region’s decision-making processes. In the absence of this work, the Council believes that implementation of habitat and production measures will continue to suffer from inadequate information, disjointed policies, uncertainty and delay. The region should begin this work promptly, to overcome these obstacles and allow recovery efforts to proceed expeditiously.

7.0 COORDINATED IMPLEMENTATION OF HABITAT AND PRODUCTION ACTIONS

7.0A Identify and Implement Emergency Production and Habitat Actions in 1995 and 1996

The subregional approach will be the basis for the program treatment of habitat and production issues, but it is apparent that this approach will take time to develop and implement. In the interim, many salmon and steelhead populations continue a trend of decreasing abundance. Some of these populations, such as chinook produced in the Snake Basin, cannot wait for this approach to be implemented. They require expedited actions. Council evaluation indicates that even with improved salmon and steelhead survival through changes in mainstem operations, many populations will not be maintained, let alone rebuilt, without immediate and significant increases in survival at other stages of their lives.

Habitat improvements and changes in hatchery operations (for example, the use of supplementation) can be implemented to increase natural production and survival significantly. In the short term, options appear to be fairly limited in this area. The Council calls on the fishery managers to immediately identify actions that can be implemented to improve survival of adult spawners in 1995 and 1996. Actions also need to be identified that will increase egg-to-smolt survival of the progeny of these year classes.

It can be anticipated that needed survival increases will require the use of some artificial propagation technology. The Council acknowledges that artificial propagation and the proper use of hatchery fish to supplement wild and naturally spawning populations of salmon and steelhead as a rebuilding measure will continue to be as intensely debated as is the relationship of increased mainstem flows to fish

survival. Regardless, the outlook for Snake Basin chinook, as well as some other populations, requires the immediate implementation of dramatic measures. Without immediate action, these populations will not survive long enough to make the results of these debates meaningful.

Fishery Managers

7.0A.1 Develop project-specific action plans for production and habitat measures for prompt implementation in Fiscal Years 1995 and 1996. Because of the dire status of Snake River chinook, as well as some other populations in the basin, these implementation action plans should contain measures that will provide immediate increases in natural production and survival for adults returning in 1995 and 1996, and for their progeny. In identifying actions, use Table 1, Table 2 and Appendix A of the Columbia Basin Tribal Restoration Plan submitted to the Council on August 15, 1994, the Integrated System Plan and other appropriate information. Submit action plans to the Council by March 31, 1995.

Council

7.0A.2 Review the action plans for fiscal years 1995 and 1996 by the end of May 1995.

Bonneville and Other Appropriate Agencies

7.0A.3 Absent Council disapproval, fund, or share in funding, projects called for in the action plans as a high priority in the fiscal year identified by the fishery managers.

7.0B Ten-Year Implementation Plan for Production and Habitat Projects

Fishery Managers

7.0B.1 Use updated subbasin plans and acknowledged local watershed plans, where available, to develop a project-specific implementation plan that initially addresses the 10 Fiscal Years 1997 through 2006. Submit the 10-year implementation plan to the Council for review by March 1, 1996. Thereafter, annually revise the 10-year implementation plan and submit to the Council by March 1. Once it is operational, use the subregional process to identify projects for specific populations.

Council

7.0B.2 By June 1 of each year, review the 10-year implementation plan and the proposed Annual Implementation Work Plan for consistency with the program.

Bonneville and Other Appropriate Entities

7.0B.3 Fund implementation of the Annual Implementation Work Plan.

Relevant Parties

7.0B.4 Upon implementation of the subregional process, habitat and production measures should be coordinated, evaluated and implemented in a five-step process:

- The subregional process (Section 3.1D) should identify measures to help specific populations. These measures should be included in an annual work plan submitted to the Council and the fish managers.

- The fish managers should prioritize measures that emerge from the subregional process (or the process described in Section 7.3A) using the six principles discussed in Section 4. This process should include independent peer review on the degree to which proposed measures pose risk to biological diversity. For measures that pose appreciable risk to biological diversity, but address critical uncertainties, the peer review should also provide an opinion on whether potential learning benefits justify the risk. These measures should be incorporated into the annually updated 10-year implementation plan and submitted to the Council for review and approval. A fast-track process should be developed for appropriate, locally based habitat initiatives. Upon approval, Bonneville should incorporate these actions into the Annual Implementation Work Plan.
- Where applicable, the National Environmental Policy Act and the Endangered Species Act processes should be initiated. The “purpose and need” section of any environmental document should reflect the six principles discussed in Section 4. If the National Environmental Policy Act or the Endangered Species Act are not applicable, or these processes do not provide information required in master plans (Section 7.4B), a master plan should be developed. Information available from cumulative impact studies (Section 7.1F), carrying capacity studies (Section 7.1A), and wild and natural production data (Section 7.1C) should be incorporated into these evaluations.

- The resulting analyses should be reported to implementing agencies, interested parties and the Council. The Council will determine whether the projects are consistent with this program and the Northwest Power Act.
- Following approval, implementation, monitoring and evaluation should occur.

7.0C Regular Updating and Distribution of Subbasin Plans

Fishery Managers

- 7.0C.1 Expeditiously update the subbasin plans. Particular attention should be directed to sections addressing considerations, objectives, alternative strategies and recommended strategies. Use Tables 1 and 2, and Appendix A of the Columbia Basin Tribal Restoration Plan submitted to the Council on August 15, 1994, and other appropriate information in updating the subbasin plans. Submit the updated subbasin plans to the Council by December 31, 1995. Thereafter, update the subbasin plans as needed. Once it is operational, use the subregional process to update subbasin plans. Submit subbasin plans to the Council as updated.
- 7.0C.2 Make subbasin plans readily available through the Coordinated Information System. As much as possible, update sections of the subbasin plans that address background information, data and other appropriate sections annually, as a function of the Coordinated Information System.

Bonneville

- 7.0C.3 Fund updating the subbasin plans.
Fishery Managers

- 7.0C.4 Subbasin plans, as the foundation of the fish and wildlife program, must reflect the provisions of Section 4.1. Implementing an ecosystem approach requires knowledge of the Columbia River ecosystem and its ability to support salmonids (see Section 7.1A Evaluation of Carrying Capacity). The conservation of the existing salmonid genetic resources found in the Columbia Basin is also basic to having sustainable production and fisheries in the future (see Section 7.1B Conserve Genetic Diversity). While many of the states and tribes have adopted wild and natural fish policies, there is need to develop basinwide policies to ensure conservation of genetic resources throughout the basin and to facilitate the updating of individual subbasin plans (see Section 7.1D Wild and Naturally Spawning Population Policy). In some of the original subbasin plans, basic biological information on the fish populations was sparse. It will be important in updating plans not only to identify needed information but also to develop a schedule for obtaining such information (see Section 7.1C Collection of Population Status, Life History and Other Data on Wild and Naturally Spawning Populations). To help in prioritizing restoration efforts among populations, a vulnerability or risk analysis should be developed and performed (see Section 7.1E Population Vulnerability Analyses). In planning for new production, fishery managers must also address the question of the impacts of existing and proposed artificial production activities (see Section 7.1F Systemwide and Cumulative Impacts of Existing and Proposed Artificial Production Projects; also see Section 7.0D Comprehensive Environmental Analysis). In the interim, fishery managers will need to take precautions not to exceed carrying capacities for juvenile salmonids through operations

of the Columbia River hatcheries (see Section 7.1G Adjust Total Number of Hatchery Fish Released to Stay Within Basin Carrying Capacity). The reprogramming of existing hatchery production or space to address restoration priorities, where some form of fish culture is to be used, may be less expensive, more expedient, and avoid bottlenecks in carrying capacity as opposed to new production and facilities (see Section 7.1H Reprogramming Exiting Hatchery Stocks and Facilities).”

7.0D Comprehensive Environmental Analysis of Federal Production Activities

A Programmatic Environmental Impact Statement is being designed to assess the impacts on naturally produced salmon of large numbers of anadromous fish being introduced from federally funded hatcheries in the Columbia River Basin. The U.S. Fish and Wildlife Service is examining the options and opportunities for changing how, when, where and why hatchery-produced salmon and steelhead are released into Columbia Basin streams.

The Programmatic Environmental Impact Statement was not designed to specifically meet any Council program objective. However, it is being funded in substantial part by the Bonneville Power Administration. It is evident that overlap exists between some Programmatic Environmental Impact Statement objectives and specific Council measures. The Programmatic Environmental Impact Statement objectives that potentially satisfy Council measures need to be identified and coordinated with the Council program to avoid duplication and expedite resolution of questions surrounding the use of hatchery-reared salmon and steelhead. The following Council measures have been tentatively identified as being partly or completely addressed by Programmatic Environmental Impact Statement: 7.1C.1, 7.1F.1, 7.1F.2 and 7.2A.2. In helping to fund the Programmatic Environmental Impact

Statement, Bonneville may appropriately take credit for funding portions of those measures.

Columbia Basin Fish and Wildlife Authority

7.0D.1 Periodically consult with Council on status of Comprehensive Environmental Analysis, particularly regarding progress on those measures listed above and any reevaluation of planned accomplishments.

Identify areas where additional effort is required to more fully address the Council measures listed above or where Comprehensive Environmental Analysis activities could logically be expanded to address additional Council measures.

Identify measures in the Council’s program where additional or more timely progress would facilitate Comprehensive Environmental Analysis achieving its objectives.

7.1 ENSURE BIODIVERSITY

Scientists and natural resource managers have become increasingly concerned about the need to manage fish and wildlife in a way that recognizes the importance of a diverse and productive ecosystem. Biodiversity is the variety of and variability in living organisms, with respect to genetics, life history, behavior and other fundamental characteristics. Biodiversity is important at the levels of landscapes, ecosystems, species and populations. There is increasing recognition that conserving biodiversity is key to the sustainability of natural resources, including fish and wildlife. Conserving biodiversity means fostering human development activities that protect the integrity of ecosystems, thereby sustaining natural resources.

7.1A Evaluation of Carrying Capacity

Implementing an ecosystem approach requires knowledge of the Columbia River ecosystem. The Council therefore calls on Bonneville and federal agencies to evaluate salmon survival in the Columbia River, its estuary and in the near-shore ocean. This analysis should increase understanding of the ecology, carrying capacity and limiting factors that influence salmon survival under current conditions.

Bonneville

7.1A.1 Fund an evaluation of tributary, mainstem (including reservoirs), estuary, plume, near-shore ocean and marine salmon survival, ecology, carrying capacity and limiting factors. Include analysis of competition between non-native species and anadromous salmonids and negative competitive interactions resulting from hatchery management practices. As part of the evaluation, estimate the current salmon carrying capacity of the Columbia River mainstem, tributaries, estuary, plume and near-shore ocean for juvenile fish, using primarily existing data. The analysis should include an evaluation of the effects of the alteration and timing of the ocean plume as caused by the construction and operation of the hydroelectric system. The evaluation should identify residency time of juvenile salmonids, and their level of smoltification. Management measures to protect and improve estuary habitat as well as increase the productivity of the estuary should also be identified. The evaluation should make recommendations for management responses to fluctuating estuary and ocean conditions, such as adjusting total numbers of releases to take such conditions into account. The evaluation should include analysis of existing data, identification of critical uncertainties and research needs, and estimates of incremental gains in survival from

improvements in each area. The analysis should also propose a monitoring program to identify optimal timing for residency in the estuary and the near-shore environment (coordinate with measure 7.2D.2. under Improved Propagation at Existing Facilities).

7.1A.2 Fund development of a study plan based on the critical uncertainties and research needs identified in the above evaluation, which should be presented to the Council by December 1995. The study plan should include provisions for federal funding or cost sharing of the study. Upon approval by the Council, Bonneville and/or other parties identified by the Council should fund the proposed study.

States of Oregon and Washington and Federal Agencies

7.1A.3 Based on existing information, identify management measures that can be implemented immediately to provide better protection and improve estuarine productivity. Include identification of seasonal water volume needs in the estuary for fish and wildlife. Report to the Council by June 30, 1995, on opportunities, needed actions, time frame and funding sources to implement recommendations.

7.1A.4 Explore expanding the scope of the Columbia River Estuary Bi-State Study to include all of the Columbia River Basin. This study could be an effective means of addressing comprehensively all interrelated water quality and quantity aspects of the basin. Also, explore the feasibility of the Columbia Basin participating in the Environmental Protection Agency's national "estuaries of significance" program.

Council

- 7.1A.5 Begin rulemaking in December 1995 to identify measures aimed at improving estuary conditions and survival for salmon and steelhead. Review results of the Columbia River Estuary Bi-State Study as well as other pertinent information to develop these measures.

7.1B Conserve Genetic Diversity

Council Genetics Team

- 7.1B.1 Review current efforts for conserving genetic diversity within and among Columbia River Basin salmon and steelhead stocks. Report to the Council by December 31, 1995. The review should provide recommendations for how to achieve sustainable increases in salmon and steelhead populations. Specifically, recommend an approach to identify provisional genetic conservation units for production and harvest, and rules for taking action with regard to those conservation units. Coordinate with measure 7.1C.1. The team also should assist in the development of performance standards for conserving genetic diversity of natural, supplemented and hatchery stocks.
- 7.1B.2 Participate in the coordinated habitat and production process described in Section 7.0A.1. Develop technical proposals for improved conservation of biodiversity, including identification of genetic conservation refuges, alternative approaches to artificial production and any other appropriate proposals.

7.1C Collection of Population Status, Life History and Other Data on Wild and Naturally Spawning Populations

To meet the program goal, base-line information that will improve management and conservation of wild and naturally spawning populations is needed. High priority populations should be identified immediately so that these can be monitored as soon as possible. An extensive initial data collection effort is needed so that provisional population units in the basin can be identified. And long-term monitoring strategies need to be developed. The following actions should be coordinated with development of rebuilding schedules called for in Section 4. Utilize the Habitat Selection Criteria developed by the coordinated habitat and production process as part of the criteria for collection of biological data.

Bonneville

- 7.1C.1 Fund a study to: 1) determine what level of differentiation is necessary to identify stock boundaries or genetic differences, and 2) determine what attributes need to be measured. Obtain peer review of the study approach and the results. Report study progress periodically to the Council. The study should begin no later than February 1, 1995, and conclude by June 1995.
- 7.1C.2 Fund the design of an extensive one- or two-year study to identify wild and naturally spawning salmon and steelhead populations in the Columbia River Basin based on genetic, morphological, life history and any other relevant information. Recommend possible indicator populations for monitoring. Consult with appropriate specialists in designing the project. Take into consideration the findings from measure 7.1C.1 and coordinate with the Genetics Team (see measure 7.1B.1).

Bring alternative study designs to the Council by December 31, 1992. Upon Council approval, fund the study.

Fishery Managers in Consultation with National Marine Fisheries Service and Other Technical Experts

7.1C.3 Develop and submit to the Council a proposed program to collect information on wild and naturally spawning populations, including index populations, by June 30, 1996. This should be consistent and coordinated with population monitoring specified as part of the rebuilding schedules in Section 4. The long-term objective of the program is to collect information related to the sustainability of wild and naturally spawning salmon and steelhead populations, including risk-containment monitoring of impacts of management action or inaction. The program should include proposals to accomplish the following elements:

- Refine the identification of wild and naturally spawning populations provided for above and develop necessary data bases.
- Develop a profile on the status of wild and naturally spawning populations.
- Develop a profile on genetic, life history and morphological characteristics of wild and naturally spawning populations. Describe the characteristics to be maintained by management actions.
- Identify limiting factors for wild and naturally spawning populations.
- Identify natural carrying capacity of habitat for the populations.

7.1C.4 Coordinate with the activities described above and fund a project to scope program costs, duration, feasibility and relative benefits for levels of monitoring ranging from complete monitoring of all

wild and naturally spawning salmon and steelhead populations, to monitoring of index populations only. Report to the Council with alternative program approaches by September 30, 1996.

7.1D Wild and Naturally Spawning Population Policy

To conserve, manage and rebuild the basin's remaining wild and naturally spawning populations, a policy giving such populations explicit priority is needed.

Oregon, Idaho and Washington and Indian Tribes

7.1D.1 By March 31, 1995, develop and review with the Council a proposed wild and naturally spawning population conservation policy consistent with the Council's overall program goal and intended to protect genetic diversity, population identity, long-term fitness and evolutionary capacity. The policy should address habitat protection, restoration, management and improvement; water use; harvest management; releases of non-native fish; interactions between resident and anadromous fish; use of wild and naturally spawning populations as brood stock for artificial production; risk assessment and containment; and monitoring and evaluation. Consider recovery plans and other products developed under the Endangered Species Act for Columbia River Basin species in development of this policy.

7.1D.2 By June 30, 1995, in consultation with appropriate specialists in genetics and state, federal and tribal land and water managers, establish a comprehensive wild and naturally spawning salmon population conservation program. Provide for Council and public review. The program should consider for inclusion, but not be limited to, the following:

- Management and funding to address factors that limit populations.
- Habitat management and restoration to maintain and increase the productivity of wild and naturally spawning populations through the maintenance of their biological characteristics.
- Management to maintain the genetic, life history and morphological characteristics of wild and naturally spawning populations, including sustainable long-term spawning escapements and redd counts.
- Maintenance of reproductive isolating mechanisms for wild and naturally spawning populations.
- Determination of current and sustainable effective population sizes for wild and naturally spawning populations, and determination of natural carrying capacity of the habitat that supports these populations.
- Annual evaluation and reporting of the results of fisheries, land and water management actions.
- Recovery plans and other products developed under the Endangered Species Act for Columbia River Basin species.

7.1E Population Vulnerability Analyses

Bonneville

- 7.1E.1 Fund a review of existing procedures for conducting population vulnerability analyses for depleted salmon and steelhead populations. The procedures should be used to determine the status of populations and facilitate the selection of options for recovering them. Coordinate with appropriate fishery managers, specialists in genetics and the regional analytical methods coordination process (see Section 3). Report findings

and recommendations for development and application to the Council by June 30, 1995.

7.1F Systemwide and Cumulative Impacts of Existing and Proposed Artificial Production Projects

Bonneville

- 7.1F.1 Design a study to evaluate the cumulative and systemwide impacts of existing and proposed artificial production activities on the ecology, genetics and other important characteristics of Columbia River Basin anadromous and resident fish. Coordinate this study with the genetic impact assessment of Columbia River Basin hatcheries called for in Section 7.2A.2. Report to the Council by December 31, 1995. Upon Council approval, fund the study.
- 7.1F.2 Fund a study to develop a method to be used by project proposers and implementors for assessing systemwide and cumulative impacts of proposed new artificial production projects. The method should take into account impacts of ongoing artificial production programs as identified above. The method should help meet requirements of the National Environmental Policy Act and the Endangered Species Act. Report to the Council by June 1996.

Fishery Managers

- 7.1F.3 In addition to existing methods for evaluating proposed artificial production projects (for example, Regional Assessment of Supplementation Project and Chapter III.C of the Integrated System Plan), use the method for assessing systemwide and cumulative impacts when available (see 7.1F.2).

7.1G Adjust Total Number of Hatchery Fish Released to Stay Within Basin Carrying Capacity

The number of hatchery fish released into the Columbia River has steadily increased since hatchery production began in the late 1800s. Between 170 million and 200 million hatchery fish are released into the Columbia River Basin system annually. However, the capacity of the Columbia River Basin to support young fish has decreased during this time. Some scientists have suggested that the number of fish released may exceed the capacity of the present-day river, estuary and ocean to support their growth and survival to adulthood. Exceeding system carrying capacity may be partly responsible for decreasing survival of hatchery and wild and naturally spawning stocks.

Fishery Managers

- 7.1G.1 Until the carrying capacity preliminary evaluation in Section 7.1A.1 is complete (December 1995), take precautions to not exceed carrying capacity for juvenile salmonids through operations of Columbia River Basin hatcheries. Report to the Council by December 31, 1995, on the precautionary measures that will be put in place.

7.1H Reprogramming of Existing Hatchery Stocks and Facilities

The Council acknowledges the commitment of parties to *U.S. v. Oregon* to use the framework of the Columbia River Fish Management Plan to rebuild upriver runs through production planning and the commitment of the parties to make recommendations for actions by June 1995. The Council further recognizes that Congress has instructed the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to prepare plans and implement pilot programs designed to assist in rebuilding fish runs above Bonneville Dam and to report to Congress on such activities within 120 days of enactment of those agencies' appropriations.

Fishery Managers

- 7.1H.1 To coordinate with the foregoing measures, the Council calls on the fishery managers to:
- take the products of the Regional Assessment of Supplementation Project and the Council's genetics team into consideration in production planning;
 - obtain review of production plans by appropriate scientific experts in light of the frameworks provided by the Regional Assessment of Supplementation Project and the Council's genetics team;
 - coordinate with the Integrated Hatchery Operations Team in production planning; and
 - periodically brief the Council on progress.

Council

- 7.1H.2 Review a comprehensive plan developed by the fish and wildlife agencies and tribes for reprogramming lower river hatcheries. Where current

knowledge is sufficient, certain stocks may be moved to particular upriver streams. Initial efforts shall focus on the needs of upriver stocks. The fish and wildlife agencies and the tribes will cooperate in this effort.

Bonneville

- 7.1H.3 After Council review of the reprogramming plan developed by the fish and wildlife agencies and Indian tribes, provide funds to transfer a portion of the fish from existing lower Columbia River hatcheries to release sites in the upper Columbia River system to assist in restoring naturally spawning stocks, as provided in that plan. The Mitchell Act and John Day hatcheries were provided to mitigate fishery losses that result from the federal development of the Columbia River Basin for hydropower and other purposes (such as irrigation and navigation) for which these projects were authorized. Reprogramming hatchery operations by developing new release strategies is intended to help rebuild upriver runs and improve tribal fisheries. The Council strongly supports restoration of naturally spawning upriver stocks, but further consultation with the fish and wildlife agencies and tribes is required to determine a final release plan.

7.1I Biodiversity Institute

All Interested Regional Entities

- 7.1I.1 Cooperatively fund a feasibility study for a Pacific Northwest biodiversity institute. The institute would address native and resident salmonids, their habitat and ecosystems at stream, watershed and landscape levels. The purpose of the institute would be to assist in developing research and monitoring programs, provide scientific peer review, provide scientific expertise

for regional planning and conduct research. Upon Council approval, fund project design, including cost sharing.

7.2 IMPROVE EXISTING HATCHERY PRODUCTION

Because opportunities to achieve significant salmon production increases through improving natural habitats are limited, additional salmon increases may have to be achieved through artificial production by creating artificial spawning and rearing environments such as hatcheries. The dilemma is that artificial production can have negative effects on wild and naturally spawning salmon populations. For example, young hatchery-produced fish may compete with wild and naturally produced juveniles for food and habitat. Or, returning hatchery-bred adults may interbreed with naturally spawning fish, altering gene pools. In the past, artificial production programs have had detrimental effects on wild gene pools and biodiversity.

In developing these production measures, the Council has identified measures that are consistent with the goal of doubling the number of salmon and steelhead in the basin while maintaining existing levels of biodiversity. This means understanding and documenting the life cycle of wild and naturally spawning fish populations at the stream level so that broader management decisions, while not necessarily made at the stream level, are better informed. It means improving the operations of artificial production facilities, so that impacts of hatchery fish on wild and naturally spawning populations are minimized and the quality of hatchery fish is improved. It means making investments and other adjustments to provide harvest opportunities in tributaries or other areas and to facilitate rebuilding of weak populations. It includes scientifically supported programs to supplement weak wild and naturally spawning fish populations with hatchery fish. It also means proceeding with extreme caution to avoid damaging remaining wild and naturally spawning populations, and fully implementing adaptive management with a systematic monitoring and evaluation strategy.

Populations whose numbers have been greatly depleted as a result of human activities pose a special dilemma. All parties agree that restoring the freshwater habitats and migration corridors of Columbia River Basin salmon is key to recovering depleted populations. There is concern, however, that implementation of passage improvement, habitat protection and restoration measures that have been proposed to date will not be sufficient to recover depleted populations in a timely manner. As a result of this concern, artificial propagation has been identified as an important tool to further aid depleted populations. However, there has been much debate in the region concerning the proper role of artificial propagation.

Some oppose or are skeptical of using artificial propagation to assist depleted populations. This is because of the risk that artificial propagation could change the identity of depleted isolated populations or reduce their ability to recover by altering their ability to survive over the long term in their natural environment.

Others recommend the proper use of some form of artificial propagation (such as supplementation) to aid in recovery of depleted populations. Proponents of this view say that numerous small populations are being lost due to continuing damage and lack of corrective action, with the result that basinwide population diversity is declining. They fear that these populations have already lost the ability to recover on their own because severe reductions in population size have already reduced the genetic diversity important for recovery. In addition, these populations may not be well adapted to survival in the face of dramatic human-caused changes in the basin's environment. Thus, proponents of artificial propagation recommend rapidly increasing the sizes of these small populations to prevent their extinction and loss of genetic diversity by properly using some form of artificial propagation.

The process of devising the best strategies for restoration of depleted populations of threatened and endangered species will require rigorous integration of genetics, evolutionary biology, demography and ecology in addition to

the best cooperative efforts of resource managers. Scientific resolution is unlikely to provide one "generic" answer, but rather two or more different answers appropriate for different existing conditions of populations in the basin.

Because the Council recognizes that there are legitimate biological concerns associated with measures to protect and restore depleted anadromous fish populations, it calls for the undertaking of multiple actions on a site-specific basis.

For salmon, the Council envisions a strategy that considers all available options to develop an effective approach to salmon restoration, and monitors and evaluates the results of these actions in an adaptive management approach. The appropriate combination of actions for a specific population should be determined by the site-specific circumstances of that population. The following options should be considered:

- Take actions to protect and rebuild the freshwater habitat of weak wild and naturally spawning populations. This would include combinations of a variety of techniques: restoring healthy stream/river habitats used for spawning, rearing and overwintering; improving mainstem passage and migration corridor condition; reducing losses of downstream migrants owing to irrigation diversions; restoring water quality; and restoring overall watershed and riparian system condition. Fish harvest rates also should be reduced to support rebuilding.
- Take actions to rebuild populations of weak wild and naturally spawning fish as quickly as possible. This would include combinations of a variety of techniques such as: the proper use of artificial propagation to prevent extinction and further loss of genetic diversity; prevention or minimization of detrimental genetic and ecological impacts to wild and naturally spawning populations from all human actions affecting the river and its watershed, including hatchery programs; and

management of fish harvests to support rebuilding.

- Fully implement adaptive management for the purposes of carrying out restorative actions. Adaptive management is an approach to complex natural resource problems where prompt corrective action is needed despite incomplete knowledge of the resource. Adaptive management relies on a systematic monitoring and evaluation strategy.
- Develop a procedure for conducting a population vulnerability analysis to determine the status of various populations and facilitate the selection of various options for restoring the population.

7.2A Hatchery Policies, Coordination and Operations

Nearly 100 artificial production facilities produce 170 million to 200 million smolts annually in the Columbia River Basin. Approximately 75 percent of Columbia River Basin salmon and steelhead adults are produced in hatcheries. The purpose of these facilities is to mitigate for losses of salmon and steelhead production resulting from dams and other developments. The facilities are operated by different entities, each with its own guidelines for selection, maintenance and spawning of brood stock, mating, rearing and release of juveniles. The Council concluded that regional standards and procedures for hatchery operations should be developed that are consistent with the goal of rebuilding weak wild and naturally spawning stocks. To help develop tools to reduce the impacts of hatchery production on wild and naturally spawning stocks, the Council convened a group of nationally recognized geneticists. These geneticists have been asked to bring the best current scientific knowledge to salmon and steelhead production issues. A number of products have resulted from this effort and are

being reviewed at the technical and policy levels in the region.

Bonneville

7.2A.1 Fund fishery managers and other experts as needed to develop by October 31, 1995, in consultation with appropriate specialists in genetics, basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning stocks. In the development of the guidelines, apply the best available scientific knowledge, and include: 1) approaches to basinwide coordination of hatchery production to reduce impacts of hatchery stocks on wild and naturally spawning fish; and 2) monitoring and evaluation of hatchery and wild and naturally spawning stock interactions. Submit a report to the Council for public review by March 1, 1996.

7.2A.2 Fund the design of an impact assessment to examine the effects of Columbia River Basin hatcheries (individually and collectively) on wild and naturally spawning fish. The impact assessment would use the best available scientific knowledge and state-of-the-art assessment procedures. Coordinate with measure 7.1F.2, complete the design, and report to the Council by December 1995.

7.2A.3 Continue to fund the activities of the Integrated Hatchery Operations Team and the Implementation Plan for Integrating Regional Hatchery Policies.

Council

7.2A.4 Continue to convene and fund a team of scientific experts that will be available to Bonneville, the Council, the fishery managers and the Integrated Hatchery Operations Team to help scope the hatchery impact assessment (see section 7.1F) and review basinwide hatchery

operating policies and guidelines. The team will be available to consult with Bonneville, the Council and the fishery managers or the implementation of new artificial production activities. It also will review ongoing artificial production, in light of the basinwide hatchery operating guidelines. The products and activities of the team will be made available for public review.

Fishery Managers

- 7.2A.5 The Integrated Hatchery Operations Team should consist of representatives from Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Idaho Department of Fish and Game, U.S. Fish and Wildlife Service, Confederated Tribes and Bands of the Yakama Indian Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, Shoshone-Bannock Tribes of Fort Hall, Confederated Tribes of the Colville Reservation, National Marine Fisheries Service, and associate members. It should coordinate with production planning activities described in this section. Duties of the group are described below.

Integrated Hatchery Operations Team

- 7.2A.6 Continue to update regionally integrated policies for management and operation of all existing and future hatcheries in the Columbia Basin as required. These policies should be monitored for consistency with the goal of increasing sustained production while maintaining genetic resources in the Columbia River Basin.

The policies should continue to include the following elements:

- **Fish health policy:** Hatchery practices and operations should preclude the introduction and/or spread of any fish disease within the Columbia Basin, and maximize the health of fish released from hatcheries.
- **Genetic policy:** Hatchery facilities and programs should avoid adverse genetic effects on wild, natural and hatchery fish populations and enhance the sustained quality of production from hatcheries.
- **Ecological interactions policy:** Hatchery facilities and programs should avoid adverse interactions between wild, natural and hatchery fish populations, including predation, displacement or competition for habitat. They should maximize post-release survival of hatchery fish by increasing similarity of hatchery fish to wild and naturally spawning fish, and by balancing the numbers of fish released and release strategies with the capacity of the natural environment.
- **Hatchery performance standards policy:** The purpose, goals and objectives of each hatchery should be evaluated in light of the general hatchery policies stated above. Performance standards should be developed for each hatchery, in addition to those provided in this program, including expectations for harvest, maintenance of genetic integrity (including life history, effective population size, morphology and other important traits), fish health and ecological interactions. Criteria and plans for monitoring and evaluating achievement of the performance standards should be developed.

- **Regional hatchery coordination policy:** Columbia River Basin production facilities should operate under a regional coordination program, including hatchery programs and operations, harvest and research. The objectives of the coordination program should be to facilitate implementation of the regional hatchery policies, incorporate harvest and research considerations in hatchery planning, increase information exchange, coordinate operations to minimize impacts on wild and naturally spawning populations, and foster sharing of facilities to increase their effectiveness.
- 7.2A.7 Submit to the Council a plan for implementing the policies by December 1994. As part of implementing the regional hatchery coordination policy, identify measures for better coordinating basinwide hatchery management that ensure coordinated planning and learning while encouraging creative, site-specific approaches to improving operations. Upon Council approval of the plan, fishery managers may request Council approval of Bonneville funding for implementing specific parts of the policies.
- 7.2A.8 Review the formal audit report findings. Submit recommended actions to the appropriate operating and funding entities. Annually report findings to the Council.
- 7.2A.9 Continue to review and update audit criteria and obtain independent scientific review for the criteria and revise them as necessary. Report to the Council on this and the following measures annually in January.
- 7.2A.10 Update hatchery operating plans annually for anadromous fish production facilities in the basin.
- 7.2A.11 Report to the Council annually, beginning in January 1995. Describe new hatchery policies and how operations at existing and planned hatcheries are being changed to implement them and any new information leading to revision of policies and operations. New information should include results of the hatchery impact assessment (Section 7.2A.2), the hatchery survival trends analysis (Section 7.2B.2) and the carrying capacity evaluation (Section 7.1A), when available. Finally, describe the extent of achievement of performance standards, and recommend future improvements and needed research. The annual report will be made available for review by all relevant parties.
- ## 7.2B Hatchery Evaluation
- ### Bonneville
- 7.2B.1 Beginning in 1995, fund ongoing independent audits of hatchery performance in consultation with the Integrated Hatchery Operations Team. Such audits should be conducted at least every three years and more frequently, if possible and warranted. Include recommendations for improving performance and for modifying or terminating hatchery programs based on audit criteria. Results of the audits should be presented to the Council beginning in January 1996.
- 7.2B.2 Fund a comprehensive analysis of existing data on basinwide trends in hatchery fish survival. The analysis should identify trends over time and by hatchery or geographic area, and correlate hatchery fish survival with natural factors, hatchery operations and other fish or river management actions. The results of the analysis should be

reported to the Integrated Hatchery Operations Team by January 1996.

7.2C Creative Partnerships in Hatchery Production

Bonneville

- 7.2C.1 By June 15, 1995, fund an analysis of opportunities for alternative hatchery institutional arrangements and ways to implement them. By December 31, 1995, develop and report to the Council on the potential for artificial production programs in which alternative institutional arrangements between implementors and managers are used.
- 7.2C.2 The Council does not take a position on funding for the construction of any other hatcheries or the operation and maintenance of existing hatcheries

7.2D Improved Propagation at Existing Facilities

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

The traditional spring outmigration period for most wild juvenile salmon and steelhead in the Columbia River Basin is in April and May. Historically, hatchery release strategies emulated wild fish outmigration in terms of the timing and size of juvenile fish released from hatcheries. But environmental conditions in the river and estuary have changed markedly due to hydroelectric development. New rearing strategies are required to match the release time of hatchery salmon and steelhead to the changed

conditions of the river and estuary. Downstream migrations must be programmed to coincide with the most favorable conditions of food availability, predator abundance, river and ocean temperatures, flows and other influencing factors.

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.

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

Bonneville

- 7.2D.1 Fund research, development and demonstration of improved husbandry practices at hatcheries, which will lead to increased production and improved fish survival to adulthood. Also fund tests of new techniques at Columbia River Basin artificial propagation facilities.
- 7.2D.2 Immediately fund an evaluation to determine whether the high levels of sound at hatcheries has an adverse effect on survival of hatchery fish after they are released. Develop cost-share programs to fund necessary improvements at hatcheries if sound is found to adversely affect survival. Submit findings and recommendations to the Council regarding the relationship of sound to survival by December 31, 1996.
- 7.2D.3 Fund research, development and testing of hatchery rearing operations and release strategies aimed at improving the efficiency of hatcheries and increasing the survival of artificially propagated

fish to adulthood. This research, development and testing should incorporate effective husbandry practices from Section 7.2D.1.

7.2D.4 Fund development of programs and methods to improve fish health protection in hatchery facilities. The development and related research of methods should include:

- prevention of the introduction of diseases into the Columbia River Basin;
- prevention of the spread of detected fish pathogens;
- improvement of breeding and rearing practices;
- minimization of the impact of fish diseases on wild and cultured stocks; and
- improvement in detection, diagnosis and control of fish diseases and parasites.

7.2D.5 Upon approval by the Council, provide funds to develop a sensitive, reliable index for predicting smolt quality and readiness to migrate. The index shall be validated by conducting a test using a selected species and selected hatcheries. Proposals for further action may be submitted to the Council upon completion of the test.

Bonneville

7.2D.6 Consult with the Integrated Hatchery Operations Team regarding needed research projects to improve fish health in both hatchery and naturally reared populations.

Integrated Hatchery Operations Team

7.2D.7 Develop a comprehensive fish health research agenda taking into consideration information provided, for example, by the Pacific Northwest Fish Health Protection Committee, the independent audits authorized in Section 7.2B.1, results from monitoring and evaluation studies, and asking various entities that operate hatcheries and/or use hatchery fish to mitigate for production deficiencies.

7.3 DEVELOP, IMPLEMENT AND EVALUATE SUPPLEMENTATION PLANS

7.3A Regional Assessment of Supplementation

The Regional Assessment of Supplementation Project was created in late 1990 to provide a comprehensive framework for supplementation--the practice of using carefully selected stocks of hatchery fish to "reseed" streams. The project is being carried out by technical representatives from the fishery managers, utilities, Bonneville, the Council and others. One of its products will be a recommended planning process. This process will include setting supplementation objectives in terms of post-release survival, reproductive success, long-term fitness and ecological interactions; analyzing benefits and risks; and developing monitoring strategies to contain risk. This project was completed in December 1992.

Bonneville

7.3A.1 Continue to fund workshops to assist agencies and tribes in understanding and using the planning concepts and guidelines developed by the Regional Assessment of Supplementation Project, particularly as they can be applied to updating subbasin plans. Continue to support the updating of the guidelines and further development of the ecosystem diagnosis and treatment method.

7.3B Final Planning and Implementation of Proposed Additional High Priority Supplementation Projects

For some time, the Council has urged the National Marine Fisheries Service to develop a clear policy to guide the use of supplementation. The fishery managers and the Council have developed and extensively reviewed a list of high priority supplementation projects from an original list of 19 proposed projects. The National Marine Fisheries Service has agreed to review these proposals on a case-by-case basis. Final planning is required to complete the necessary elements of the high priority supplementation projects before implementation. These projects will represent the first use and test of the Regional Assessment of Supplementation Project's Planning Guidelines and the Supplementation Guidelines of the 1991 Integrated System Plan.

Fishery Managers

- 7.3B.1 Use the supplementation guidelines described in Chapter III.C of the 1991 Integrated System Plan and in Regional Assessment of Supplementation Project to prepare evaluations, biological risk assessments, and final plans for the high priority supplementation projects recommended by the fishery managers. Complete evaluations, biological risk assessments, and final plans by June 30, 1995.
- 7.3B.2 Absent Council disapproval of the final plans, implement the high priority supplementation projects including design, construction, operation, maintenance, monitoring and evaluation. Provide progress reports on the implementation of the projects.

National Marine Fisheries Service

- 7.3B.3 To facilitate appropriate coordination under the Endangered Species Act, the National Marine Fisheries Service should expeditiously review the high priority supplementation projects identified by the fishery managers and provide a clear schedule for completing its review and rendering a decision.
- 7.3B.4 Immediately complete analysis and provide Council with decision regarding policy for supplementation of weak Columbia River Basin salmon and steelhead populations. At the latest, provide policy by January 31, 1995.

Bonneville

- 7.3B.5 Fund the evaluation, biological risk assessment, and final planning of the high priority supplementation projects recommended by the fishery managers.
- 7.3B.6 Absent Council disapproval of the final plans, fund implementation of the supplementation projects including design, construction, operation, maintenance, monitoring and evaluation.

Hatchery Operators Not Funded by Bonneville

- 7.3B.7 Monitor and evaluate future and ongoing major supplementation activities to answer critical uncertainties. Use the Regional Assessment of Supplementation Project planning tools when planning new projects or reevaluating ongoing project objectives. Report to the Council on progress implementing this measure by June 1995.

Chelan County Public Utility District

- 7.3B.8 Upon approval from the Federal Energy Regulatory Commission, Chelan County Public Utility District should fund design, construction, operation and

maintenance of a hatchery program, including satellite facilities, for Rock Island Project in accordance with Section E “Hatchery-Based Compensation” of the Settlement Agreement dated April 24, 1987, filed in the relicensing proceeding for Project No. 943 and Docket Nos. E-9569, et al.

7.4 PURSUE NEW PRODUCTION INITIATIVES

7.4A Identify, Evaluate and Implement New Production Initiatives

Fishery Managers

7.4A.1 Use the Coordinated Habitat and Production process identified in Section 7.0 to identify, evaluate and implement new production initiatives. Such initiatives may include measures to address the needs of weak stocks, such as scientifically sound supplementation, restoration of eliminated populations, demonstrations of captive brood stock technology, cryopreservation, portable and low-capital techniques, acclimation, conversion of existing artificial production facilities and other approaches. Initiatives may also include actions to provide harvest opportunities in tributaries or other areas and to facilitate rebuilding of weak stocks.

Bonneville

7.4A.2 Should the Council determine that additional hatchery propagation facilities are required to compensate for fish losses caused by the hydropower system, Bonneville shall provide funds to design, construct, operate and maintain such facilities.

7.4B Develop Master Plans

Fishery Managers

7.4B.1 Because of the need to address potential conflicts among increased production, mixed-stock harvest, gene conservation, consistency with other plans and other objectives, the Council calls for detailed master plans where there is not a National Environmental Policy Act document that provides enough information to evaluate new artificial production projects. Below, the Council provides a suggested list of master plan elements. This list is intended to offer guidance, not to impose requirements. Not all of these elements may be relevant in all projects, and some unlisted elements may be important. In general, however, the following elements should be considered in the course of master planning:

- project goals;
- measurable and time-limited objectives;
- factors limiting production of the target species;
- expected project benefits (e.g., gene conservation, preservation of biological diversity, fishery enhancement and/or new information);
- alternatives for resolving the resource problem;
- rationale for the proposed project;
- how the proposed production project will maintain or sustain increases in production;
- the historical and current status of anadromous and resident fish in the subbasin;

- the current (and planned) management of anadromous and resident fish in the subbasin;
- consistency of proposed project with Council policies, National Marine Fisheries Service recovery plans, other fishery management plans, watershed plans and activities;
- potential impact of other recovery activities on project outcome;
- production objectives, methods and strategies;
- brood stock selection and acquisition strategies;
- rationale for the number and life-history stage of the fish to be stocked, particularly as they relate to the carrying capacity of the target stream and potential impact on other species;
- production profiles and release strategies;
- production policies and procedures;
- production management structure and process;
- related harvest plans;
- constraints and uncertainties, including genetic and ecological risk assessments and cumulative impacts;
- monitoring and evaluation plans, including a genetics monitoring program;
- conceptual design of the proposed production and monitoring facilities, including an assessment of the

availability and utility of existing facilities; and

- cost estimates for various components, such as fish culture, facility design and construction, monitoring and evaluation, and operation and maintenance.

7.4C Emergency Cases

Fishery Managers

7.4C.1 The Council recognizes that more immediate actions may be required for emergency cases, such as badly damaged populations with decreasing escapements. Documentation of the emergency nature of any such case and proposals for immediate production actions should be brought to the Council, which then will work with relevant parties to evaluate and initiate the necessary actions.

National Marine Fisheries Service

7.4C.2 At an early date, develop guidelines for determining when emergency actions, such as using captive brood stock or other emergency propagation, live trapping and transplantation technologies, should be used to aid in recovery of listed or potentially listed salmon and steelhead populations.

7.4D Captive Brood Stocks

Captive brood stock programs have the potential to rapidly increase adult fish numbers, while retaining genetic diversity of severely depleted wild or naturally spawning stocks of salmon. The captive brood stock concept differs from that used in conventional hatcheries in that fish of wild origin are maintained for a single generation in captivity. Their offspring are released to supplement wild and naturally spawning populations.

Implementation of captive brood stock programs may be the most effective means of

accelerating recovery of severely depleted stocks. High survival from egg to adult and maintenance in captivity for no more than a single generation should ensure that genetic integrity and adaptability to native habitats are preserved. Even in a situation where barriers to survival were relaxed to the point that the population could double each generation, it is projected to take more than nine generations for a run to rebuild to the same number of spawners as could be provided by a captive brood stock program in one generation. Furthermore, stable egg supplies provided by a captive brood stock program should be a catalyst for habitat restoration and help ensure stock recovery.

Researchers have been developing basic captive brood stock methodologies for a number of years. Nevertheless, considerable technical information is required prior to implementation of large-scale captive brood stock programs.

National Marine Fisheries Service and Bonneville

7.4D.1 A scoping study identifying captive brood stock research needs is nearing completion. Upon completion of the scoping study, fund development of captive brood stock technology and implementation of captive brood stock programs to aid in recovery of severely depleted stocks of salmonids in the Columbia River Basin. Programs should be consistent with the products and conclusions of the genetics and natural production framework provided elsewhere in this section. Critical investigations that need to be funded concurrently include:

- review of the state of the art of captive brood stock management technology;
- development of genetically sound methods of sourcing and breeding brood stock to ensure genetic stability and gamete quality;

- modeling of genetic consequences of captive brood stock programs;
- development of captive brood stock culture systems that minimize loss of fish;
- development and testing of a model brood stock program;
- evaluation and comparison of fish husbandry techniques;
- evaluation of fish health problems;
- investigation of reproductive and non-reproductive physiology; and
- evaluation of fitness of captive brood progeny for supplementation.

7.4D.2 Fund captive brood stock demonstration projects identified under the coordinated habitat and production process.

7.4E Cryopreservation

Cryopreservation (preservation of fish gametes by freezing) has the potential of allowing “banking” of genetic stocks for future use, especially when the population is severely depleted and its habitat has been damaged or destroyed.

Federal and State Agencies

7.4E.1 In June 1995, report to the Council on research needed to improve cryopreservation technology and develop applications for helping to restore and preserve depleted populations.

7.4E.2 Fund needed research and demonstrations of cryopreservation

identified in the coordinated habitat and production process.

7.4F Portable Facilities for Adult Salmon Collection and Holding, and for Juvenile Salmon Acclimation

As weak stocks or populations of salmon and steelhead are identified and assessed, supplementation will be one option to consider to help rebuild these stocks. Decentralized facilities to permit the capture and holding of brood stocks and facilities to acclimate the juvenile fish before release could be useful in this effort. The use of local brood stocks is fundamental to maintaining genetic diversity. The use of acclimation and release facilities prior to release is important to increase juvenile fish survival and ability to imprint on the release stream, and thereby reduce to natural levels their straying into other watersheds. The portability of these facilities should allow them to be used flexibly.

The demonstration project should involve only existing hatchery programs or fish populations that are currently being supplemented.

Bonneville

- 7.4F.1 Fund the planning, design, construction and operation of a demonstration project for the development of portable adult collection and holding facilities and juvenile acclimation and release facilities. The project should build on the earlier work funded by Bonneville¹ and other relevant information and experience. The project should be initiated in 1991, with facilities in place in 1992. Report on this measure annually as part of report on measure 7.4O.1.

¹ Bonneville Power Administration. Compendium of Low-Cost Pacific Salmon and Steelhead Trout Production Facilities and Practices in the Pacific Northwest. October 1984.

- 7.4F.2 Fund additional demonstration projects identified in the coordinated habitat and production process.

7.4G Ringold Hatchery Site Enhancement and Water Development

The Washington Department of Fisheries and Wildlife currently has a water right for 100 cubic feet per second from springs located adjacent to the Ringold Hatchery site. Of this amount, the agencies are only able to capture and use about 36 cubic feet per second. The agencies cannot make the full water right permanent unless facilities for capturing, transporting and using the water are improved. This right has been permitted, which means the state has the legal right to take water, but a certificate of appropriation is not issued until the water is actually being used. The temporary permit will be revoked and the water right lost in 1991, if action is not initiated to use the water.

Bonneville

- 7.4G.1 Insofar as needed to secure a 100 cubic feet per second water right for the Ringold hatchery facility, fund planning, design and construction of the necessary facilities to capture up to 100 cubic feet per second of water and deliver it to the area of the hatchery site.
- 7.4G.2 Fund planning, design and construction of the facilities determined to be necessary to improve existing production. Report to the Council for approval before proceeding with construction.

7.4H Reintroduction of Anadromous Fish in the Upper Cowlitz River Basin

In 1991, Bonneville entered into an agreement with Public Utility District No. 1 of Lewis County to purchase the electricity output

from the Cowlitz Falls Project. The project is located above Mayfield and Mossyrock dams on the Cowlitz River, which currently block passage of anadromous fish into the upper Cowlitz Basin. In a settlement agreement for Bonneville's acquisition of the project, Bonneville agreed to fund smolt collection and transportation facilities at Cowlitz Falls to facilitate the reintroduction of anadromous fish above Mossyrock Dam. Bonneville is coordinating a technical advisory group, composed of state and federal fish agencies, Tacoma and Lewis County utilities and environmental groups, to establish objectives for fish in the upper Cowlitz watershed. One of the objectives includes reintroduction of anadromous fish. The members of the working group are guiding development of project plans and their implementation. The Council notes with approval the cooperative effort to plan reintroduction of anadromous fish in the upper Cowlitz and the agreement on production objectives. The Council expects these agreed-upon objectives to be incorporated in the system planning identified in the coordinated habitat and production process for the Cowlitz Subbasin.

In December 1991, the Washington Department of Fisheries announced its change in policy on the reintroduction of a limited number of adult anadromous fish to the upper watershed. The Fisheries Department felt the risk from disease was minimal for spring chinook. The Department indicated an intent to withhold a decision on fall chinook until more data was in hand and indicated that winter run steelhead were also suitable for reintroduction. As a direct result of this change, reintroduction of salmon and steelhead to the Cowlitz tributaries above Mayfield Dam has already begun.

Relevant Parties

7.4H.1 All precautions should be taken to ensure the sound application of biological principles during reintroduction of anadromous fish in the upper Cowlitz Basin.

7.4I Umatilla Production Facilities

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

Bonneville

7.4I.1 Fund the Confederated Tribes of the Umatilla Reservation of Oregon to operate and maintain the Bonifer and Minthorn juvenile release and adult collection and holding facilities on the reservation. Also fund the operation and maintenance of the Umatilla Hatchery to demonstrate the use of oxygen supplementation hatchery techniques, and to produce summer steelhead and chinook salmon smolts for release in the Umatilla River.

7.4I.2 Fund the construction and operation of planned juvenile release and adult collection and holding facilities for outplanting in the upper Umatilla River to enhance natural and hatchery production.

7.4J John Day Acclimation Facilities

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

Fish and Wildlife Agencies and Tribes

7.4J.1 Develop a plan for designing, constructing and evaluating temporary acclimation ponds. The primary purpose of the temporary acclimation ponds will be to assess the effectiveness of using acclimation ponds to improve survival of fish released in upriver habitat. If suitable release sites are not identified above McNary Dam, then sites in the John Day Pool should be considered. The plan will provide the following:

- A proposal for temporary acclimation sites;
- Design elements that are necessary to test the effectiveness of the concept of acclimation ponds. The plan may include different technologies in different locations;
- Brood stock and release guidelines for the proposed facilities to ensure that releases: 1) do not adversely affect the genetic integrity of stocks potentially affected by the hatchery releases; 2) are compatible with the fish naturally inhabiting the release locations; 3) are disease-free; and 4) are coordinated with other management and enhancement activities in the basin;
- Monitoring and evaluation studies to assess the effectiveness of the facilities, including a comparison of the survival of juveniles released without benefit of acclimation with those benefiting from acclimation; and,
- Cost estimates and a schedule for design, construction and evaluation.

Bonneville

7.4J.2 Upon approval by the Council of the acclimation pond plan, fund design, construction and evaluation of the temporary facilities.

7.4J.3 Upon approval by the Council, fund the design, construction, operation and maintenance of permanent John Day acclimation ponds. These ponds will be used to imprint fall chinook.

U.S. Department of Energy and Yakama Tribe

7.4J.4 Evaluate options for using K-Basins on the Hanford Nuclear Reservation for the artificial propagation of fall chinook salmon, coho salmon, and sturgeon. Submit evaluation including recommendations to the Council by December 31, 1995.

Bonneville

7.4J.5 Fund evaluation called for in 7.4J.4. Upon Council approval, fund recommendations for use of K-Basins for artificial propagation.

7.4K Yakama Production Facilities

Much is still unknown about the impact of hatchery-produced fish on wild populations. The design and management of this hatchery will allow fish and wildlife agencies and tribes to learn more about these impacts and to identify the best methods for carrying out hatchery production and supplementation of natural production. The Outlet Creek site, because of its water supply and available acreage, was identified by the U.S. Fish and Wildlife Service in a 1979 feasibility study, The Yakama Fish Hatchery, funded by Bonneville as the best location for a hatchery on the Yakama Indian Reservation. The Council believes it is important to proceed with this project as soon as possible because of the importance of the added production to be provided by the facility, the potential learning benefits of the facility, and the

long lead time required for planning, design and construction of the facility.

Bonneville

7.4K.1 Fund design, construction, operation and maintenance of a hatchery to enhance the fishery for the Yakama Indian Nation as well as other harvesters. The hatchery will be a central outplanting facility, used to raise juvenile fish for release in the Yakima Basin and elsewhere in the Columbia River Basin. The purpose of the hatchery will be to supplement natural runs. Nothing in this measure is intended to imply that this will be the only outplanting facility for the Yakima Basin or the Columbia River Basin.

- Upon Council approval of the master plan, fund the detailed design, engineering and construction of the hatchery and associated facilities.
- Fund management of operation and maintenance of the hatchery. Before making annual budget requests for operation and maintenance, the hatchery manager will develop a status report on the previous year's operations. The status report will include a production plan for the coming year and an analysis showing how the plan is consistent with salmon and steelhead management activities throughout the basin.
- Fund biological monitoring and evaluation studies identified in the master plan. The results of the studies will be used to improve management at the Yakama central outplanting facility and at similar facilities elsewhere in the basin.

7.4L Northeast Oregon Production Facilities

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

The Hood River Production Program component of Northeast Oregon Production Facilities was disaggregated from the other basins and a master plan was submitted to the Council in 1992.

Bonneville

7.4L.1 Fund planning, design, construction, operation, maintenance and evaluation of artificial production facilities to raise chinook salmon and steelhead for enhancement in the Hood, Umatilla, Walla Walla, Grande Ronde and Imnaha rivers and elsewhere. The artificial production facilities will be used to supplement natural production in these rivers.

- Prior to design of the facilities, fund development of a master plan for the outplanting facilities, coordinated with the Integrated System Plan. The master plan should address the elements shown in Measure 7.4B.1 or substitute environmental analyses prepared under the National Environmental Policy Act.

- Upon approval by the Council of the master plan, fund the detailed design, engineering and construction of the hatchery and associated facilities.
- Fund operation and maintenance of the hatchery. Before making annual budget requests for operation and maintenance, the facility manager will develop a status report on the previous year's operations. The status report will include a production plan for the coming year and an analysis that shows how the plan is consistent with salmon and steelhead management activities throughout the basin.
- Fund biological monitoring and evaluation studies identified in the master plan. The results of the studies will be used to improve supplementation programs elsewhere in the basin.

7.4L.2 Fund the Hood River Production Project elements identified in the Council's letter of April 16, 1992, accepting and commenting on the master plan. Final design and additional work elements should begin immediately, and construction should begin contingent on a finding of "no significant impact" by Bonneville in the National Environmental Policy Act environmental analysis.

7.4M Nez Perce Tribal Hatchery

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, construction, operation and maintenance of low-cost, small-scale salmon and steelhead propagation facilities will be funded

on the Nez Perce Reservation. The Nez Perce Tribe submitted a master plan to the Council that is consistent with measure 7.4B.1.

Bonneville

7.4M.1 Upon approval by the Council of final design, construction plans, production schedules and biological monitoring and evaluation plans pursuant to measure 7.4M.3, fund the construction, operation and maintenance of those facilities.

7.4M.2 Fund project elements identified in the Council's letter of April 15, 1992, accepting and commenting on the master plan. Final design and additional work elements should begin immediately, and construction should begin contingent on a finding of no significant impact by Bonneville in the National Environmental Policy Act environmental analysis.

7.4M.3 Complete the environmental analysis required by the National Environmental Policy Act as quickly as possible so that the Nez Perce Tribe and the Council can come to conclusion on the scope of the supplementation program, facilities needed and the adequacy of the monitoring and evaluation program.

7.4N Pelton Dam Fish Ladder

Bonneville

7.4N.1 Fund propagation of salmon and/or steelhead smolts in the 2.8-mile long fish ladder located at Pelton Dam on the Deschutes River in Oregon. This production will be in addition to the fish propagation activities being conducted there by Portland General Electric to mitigate the effects of Pelton and Round Butte dams and will not affect the mitigation responsibilities of that company. The Oregon Department of Fish and Wildlife and the Confederated Tribes of the Warm Springs Reservation

of Oregon developed a master plan which the Council accepted prior to Bonneville funding of design and construction. The master plan was consistent with Section 7.4B.1.

- 7.4N.2 Fund project elements identified in the Council's letter of April 15, 1992. Final design and additional work elements should begin immediately, and construction should begin contingent on a finding of "no significant impact" by Bonneville in the National Environmental Policy Act environmental analysis.

7.4O Small-Scale Production Projects

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

Bonneville

- 7.4O.1 Immediately, provide funds to develop and test low-cost, small-scale salmon and steelhead propagation facilities adaptable to Columbia River Basin locales. Include investigation of artificial spawning channels, on-site streamside incubators, acclimation ponds and other related technologies. Coordinate this work with portable acclimation facility demonstration projects in measure 7.4F. Report to the Council on this measure annually by June 30. As feasible approaches to low-cost, small-scale facilities are identified, take the steps necessary to use as many of these low-cost, small-scale facilities as required. In implementing this measure, put particular emphasis on implementing aspects of the updated subbasin plans including immediate needs for acclimation facilities.

7.5 SPECIFIC ACTIONS TO ASSIST WEAK STOCKS

7.5A Snake River Sockeye Salmon

In the summer of 1991, the Shoshone-Bannock Tribes, the Idaho Department of Fish and Game, the Bonneville Power Administration, National Marine Fisheries Service and others initiated an emergency program to conserve and rebuild Snake River sockeye. The Council endorses this effort, but regards this program as a highly experimental measure that should be implemented with appropriate safeguards.

Bonneville, National Marine Fisheries Service, U.S. Forest Service and Others

- 7.5A.1 Fund the program to protect and rebuild Snake River sockeye. Include the following features in the program:
- Continue captive brood stock programs derived from four separate parental stocks.
 - Locate and equip hatcheries needed to house projected numbers of captive brood stocks.
 - Maintain captive brood stocks through a second generation, where necessary and found to be genetically acceptable, to ensure sufficient releases into target lakes.
 - Divide smolts captured for rearing in this program among two or more lots. Each lot should have a separate

water supply, alarm system and other protective measures.

- Release brood stock progeny generally into the lake of origin, at density levels within conservative carrying capacity limits consistent with long-term monitoring and evaluation needs.
- Designate Genetic Protocol and Fish Culture/Health work groups to provide continuing advice throughout the recovery effort. These groups address aspects such as rearing and mating techniques, research and reintroduction protocols and monitoring needs.
- Undertake long-term monitoring and evaluation of the captive brood stock program production as the basis for program improvements, and decisions concerning its continuation.
- Control recreational activities in critical spawning and rearing areas.
- Remove or modify barriers to migration.
- Conduct lake fertilization experiments.
- Provide an annual report on the practices and performance of the program for review by the National Marine Fisheries Service and the Council.

7.5A.2 Regularly update the Governors of the Northwest states, the Northwest Congressional delegation, the Council and other concerned parties on the progress of this program.

Bonneville and Fishery Managers

7.5A.3 Fund and develop for Council review a feasibility study for reintroduction of sockeye salmon into appropriate production areas. These studies should consider reintroduction in all historical production areas such as Wallowa and Warm lakes. It should develop a protocol for fostering natural production in lakes selected for sockeye restoration. This study should also consider creating anadromous populations by managing kokanee, such as those found in Pelton Reservoir, in a manner that allows access to the ocean. This study should be coordinated with the Regional Assessment of Supplementation Project, appropriate specialists in genetics, and the coordinated implementation, monitoring and evaluation approach. It should also be consistent with the National Marine Fisheries Service's recovery plan for sockeye in the Snake River.

7.5B Snake River Fall Chinook Salmon

Fishery Managers

7.5B.1 As quickly as possible and in consultation with the National Marine Fisheries Service, develop an experimental design for implementing, monitoring and evaluating supplementation of and, if appropriate, a captive brood stock program for, Snake River fall chinook. Submit to Council for approval by February 1, 1995. The proposed work should be coordinated with Sections 7.3B -- Final Planning and Implementation of Proposed Additional High Priority Supplementation Projects and 7.5C: Emergency Cases.

Bonneville

7.5B.2 Upon approval by the Council and in consultation with the National Marine Fisheries Service, implement supplementation and/or captive brood

stock programs developed by the fishery managers.

- 7.5B.3 Continue to fund basic life history studies for Snake River fall chinook. This study should identify the range, limiting factors, effects of flow, temperature, spawning and rearing habitat, and migratory behavior.

Fishery Managers

- 7.5B.4 As rapidly as possible, complete genetic guidelines for using supplementation, captive brood stocks and captive rearing for rebuilding weak populations.

7.5C Lower Columbia River Coho Salmon

Natural production of coho salmon in the lower Columbia River has declined to extremely low levels. Fewer than 25,000 spawn naturally in scattered tributaries of the lower river. In 1990, a petition was filed with the National Marine Fisheries Service for protection of the population under the Endangered Species Act of 1973. On June 7, 1991, the National Marine Fisheries Service declined to list the population after its review of available data failed to identify a population segment in the lower Columbia River genetically distinct from coastal populations. However, the service expressed a willingness to evaluate additional data.

Naturally reproducing coho in the lower Columbia River represent an important resource that can be protected and rebuilt. The values of doing so include maintaining genetic diversity, reducing the almost exclusive dependence on hatchery production and preserving recovery opportunities. In implementing the following measures, Bonneville funding should be limited to the extent to which coho populations have been affected by hydropower, or to particular instances in which off-site recovery measures would be appropriate mitigation for hydropower impacts.

Oregon and Washington

- 7.5C.1 Explore adopting management goals to rebuild naturally reproducing populations of lower river coho to self-sustaining levels.

- 7.5C.2 Continue research to determine genetic distinctions between lower river coho and coastal populations. Submit products of the research to the National Marine Fisheries Service.

- 7.5C.3 Incorporate recommendations of the Regional Assessment of Supplementation Project and the Council's genetics team in developing management directions.

Bonneville and Fishery Managers

- 7.5C.4 Survey subbasin plans submitted as part of the Integrated System Plan to determine limiting factors for naturally reproducing coho populations.

- 7.5C.5 Fund a survey of land management regulations affecting coho habitat. Include reviews of state forest practices, regulations and federal land management plans affecting coho habitat. Develop recommendations for revisions to support rebuilding objectives.

- 7.5C.6 Fund a review of current production and harvest management practices for impacts on naturally reproducing coho populations, including competition from release of juveniles, disease and predation. Solicit recommendations for revisions of management practices to support rebuilding efforts.

7.5D Columbia River Chum Salmon

Chum salmon are listed in the Integrated System Plan as a stock of high concern. Counts from the spawning grounds have dropped from more than 700 per mile in the early 1950s to a low of fewer than 100 per mile in recent times. Catches of this species exceeded 700,000 per

year in the 1920s, but catches have exceeded 2,000 fish only twice since 1960.

Chum once spawned in many tributaries of the Columbia Basin, including some above Bonneville Dam. They are now found only in the Grays, Elochoman and Lewis subbasins, and Hardy and Hamilton creeks. Habitat degradation, passage barriers and harvest have all contributed to reductions in this species. In implementing the following measures, Bonneville funding should be limited to the extent to which chum populations have been affected by hydropower, or to particular instances in which off-site recovery measures would be appropriate mitigation for hydropower impacts.

Oregon and Washington

- 7.5D.1 Identify naturally reproducing populations of chum salmon and adopt management goals to rebuild those populations to self-sustaining levels.
- 7.5D.2 Incorporate recommendations of the Regional Assessment of Supplementation Project and the Council's genetics team in developing management directions.

Bonneville and Fishery Managers

- 7.5D.3 Survey subbasin plans submitted as part of the Integrated System Plan to determine limiting factors for naturally reproducing chum salmon populations.
- 7.5D.4 Fund a survey of land management regulations affecting chum salmon habitat. Include reviews of state forest practices, regulations and federal land management plans affecting chum salmon habitat. Develop recommendations for revisions to support rebuilding objectives.
- 7.5D.5 Fund a review of current production and harvest management practices for impacts on naturally reproducing chum salmon populations. Solicit recommendations for revisions of

management practices to support rebuilding efforts.

7.5E Columbia River Sea-Run Cutthroat Trout

Sea-run cutthroat trout are found in all tributaries below and several tributaries above Bonneville Dam. No good measure of run strength exists. Likewise, little is known about early life history survival, ocean survival, catch, or escapement of Columbia Basin sea-run cutthroat trout populations. It is known that these populations have declined over time. Experts believe that habitat degradation and interactions with hatchery salmon and steelhead have caused this decline. Regardless, sport angling for sea-run cutthroat trout is an important fishery, and much support for rebuilding these populations is evident. In implementing the following measures, Bonneville funding should be limited to the extent to which sea-run cutthroat trout populations have been affected by hydropower, or to particular instances in which offsite recovery measures would be appropriate mitigation for hydropower impacts.

Oregon and Washington

- 7.5E.1 Identify naturally reproducing populations of sea-run cutthroat trout and adopt management goals to rebuild those populations to self-sustaining levels.
- 7.5E.2 Incorporate recommendations of the Regional Assessment of Supplementation Project and the Council's genetics team in developing management directions.

Bonneville and Fishery Managers

- 7.5E.3 Survey subbasin plans submitted as part of the Integrated System Plan to determine limiting factors for naturally reproducing sea-run cutthroat trout populations.

7.5E.4 Fund a survey of land management regulations affecting sea-run cutthroat trout habitat. Include reviews of state forest practices, regulations and federal land management plans affecting sea-run cutthroat trout habitat. Develop recommendations for revisions to support rebuilding objectives.

7.5E.5 Fund a review of current production and harvest management practices for impacts on naturally reproducing sea-run cutthroat trout populations. Solicit recommendations for revisions of management practices to support rebuilding efforts.

7.5F Pacific Lamprey

Pacific lamprey are anadromous fish historically present in the Columbia and Snake rivers. Lamprey are a traditional food source for Columbia Basin Indians and remain culturally important. The Council has not previously called for measures to address lamprey populations. The tribes have noted that lamprey populations appear to be declining.

Bonneville, Corps of Engineers, and Bureau of Reclamation

7.5F.1 Fund a unified data collection and analysis project to provide a status report to the Council on Pacific lamprey populations in the Columbia and Snake rivers. As part of the report, identify research needs for passage, habitat, and life history as well as alternative actions for addressing lamprey populations. Submit report to the Council by the end of June 1995. Upon approval by the Council, fund actions recommended in the report.

7.6 HABITAT GOAL, POLICIES AND OBJECTIVES²

Wild and naturally spawning populations of salmon and steelhead are generally at low levels throughout the Columbia River Basin as a result of impaired mainstem passage, blocked habitat, habitat degradation, fishing, predation and other sources of mortality. Accordingly, habitat is seeded at low levels. Even so, improvements in habitat quality are needed to increase the productivity of many stocks. Reduced habitat quality results in lower survival during critical spawning, incubation, rearing and migration periods, even when population densities are low.

Improved habitat quality would allow greater juvenile and adult survival at each freshwater life stage and can result in more offspring surviving to begin migration to the ocean. The Council is cognizant of the importance of the freshwater period in the life cycle of salmon and steelhead species. These fish spend from one to three years of their life cycle in freshwater as juveniles and several months as adults. It is during these freshwater stages that human activities have the greatest impact on the survival of these populations.

An example of habitat change caused by human activities has been documented by the U.S. Forest Service for spring chinook salmon. In an ongoing project that is comparing 1936-1942 stream survey records to current conditions, the Forest Service has found that large pool habitat in representative subbasins throughout the Columbia system has decreased 50 percent to 75 percent over the past 50 years. Much of this habitat was already degraded to some extent when the surveys were initially completed. Significantly, the sole exception to pool loss has been in wilderness areas, where quantity of pool habitat has remained constant or

² For this section of the program, habitat is defined generally as freshwater tributary areas where salmon and steelhead rear and/or spawn, and tributary migration corridors. It should be noted that salmon and steelhead habitat extends beyond these areas into the mainstem Columbia and Snake rivers, the Columbia River estuary and the ocean. Other sections of the program address these other habitat areas.

increased. It is critical for all parties to reduce or eliminate activities known to degrade anadromous fish streams.

Maintaining and improving the productivity of salmon and steelhead habitat is an extremely complex task. It requires coordination of virtually all activities that occur in a subbasin. The Council maintains that the best approach to watershed restoration is for activities to be cooperatively undertaken by federal, state, private and tribal parties. Furthermore, if watershed restoration is to be successful, instream restoration should be accompanied by riparian and upslope restoration. A comprehensive watershed approach can help fisheries resources recover from their depressed state and minimize impacts to local economies.

It is not the intent of the Council to exclude customary land- and water-use activities. Through comprehensive watershed management, innovative approaches that allow fisheries resources and economic activities to co-exist can be developed cooperatively. This approach, which includes both local and regional participation, has an additional benefit of ensuring better results and, therefore, more effective investments by ratepayers and others interested in the subbasin.

Positive actions taken to rehabilitate watersheds in the interest of rescuing and restoring salmon and steelhead stocks will result in long-term benefits to other basin resources dependent on watershed health. However, maintenance and recovery of anadromous fish resources will not be possible unless dramatic steps are taken to protect existing high quality habitat, improve the quality of degraded habitat, and increase the quantity of presently blocked habitat that could be made accessible. Coordinated, cooperative efforts to protect and improve salmon and steelhead habitat in the basin are needed. Habitat has decreased by more than a third, and much of the remaining habitat has been degraded as a result of diverse human activities.

According to the Northwest Power Act, ratepayer funds may be used, in appropriate circumstances, as a means of achieving off-site protection and mitigation for the impacts of the hydropower system. These impacts include

salmon and steelhead losses caused in the mainstem and tributaries of the Columbia Basin. Losses and degradation of habitat have been caused by the construction of hydroelectric dams and numerous other human activities.

Funds to maintain and improve habitat have come from the region's ratepayers to provide off-site mitigation for losses caused by the dams, and from federal, state, local and private sources. In this section, the Council has identified additional actions that need to be implemented by Bonneville and others. The Council expects that a significant portion of the funds to accomplish these important tasks will come from sources other than ratepayers.

Bonneville funding for the ratepayer share of fish mitigation should proceed expeditiously, pursuant to short-term agreements. There is no reason for ratepayer fish mitigation in the short term to wait for a determination of the financial responsibility of other project purposes. Other entities with responsibilities for funding non-ratepayer shares of mitigation should also proceed expeditiously. For the longer term, if there is no agreement on funding allocations, federal and state agencies, and tribes should work with the Council and the Congressional delegation to arrive at a solution.

The Council recognizes the loss of stocks of salmon and steelhead has occurred, in part, because of continual degradation of the quality and reduction of the quantity of habitat in the Columbia River Basin. Anadromous fish are among the most sensitive of the native fish inhabiting streams of the region. Management practices known to pose minimal risk to anadromous fish habitat, and habitat objectives considered by fishery professionals to meet the biological requirements are needed. Therefore, the Council advocates implementation of the habitat objectives listed in Section 7.6C.5. The structure and provisions of the Council's habitat section recognize this relationship and also the urgency of implementing projects addressing the habitat needs of these stocks.

7.6A Habitat Goal

Protect and improve habitat conditions to ensure compatibility with the biological needs of

salmon, steelhead and other fish and wildlife species. Pursue the following aggressively.

All Relevant Parties

- 7.6A.1 Ensure human activities affecting production of salmon and steelhead in each subbasin are coordinated on a comprehensive watershed management basis.
- 7.6A.2 At a minimum, maintain the present quantity and productivity of salmon and steelhead habitat. Then, improve the productivity of salmon and steelhead habitat critical to recovery of weak stocks. Next, enhance the productivity of habitat for other stocks of salmon and steelhead. Last, provide access to inaccessible habitat that has been blocked by human development activities.

7.6B Habitat Policies

Federal, State and Local Land and Water Managers, Users and Owners; Fishery Managers; and Others

- 7.6B.1 Improve and maintain coordination of land and water activities to protect and improve the productivity of salmon and steelhead stocks. The Council encourages local cooperation and coordination to address habitat protection and improvement and to resolve problems created by competing missions. The Council encourages private parties to be proactive and to work cooperatively with resource managers to maintain and improve habitat.
- 7.6B.2 Develop and implement procedures to ensure compatibility and compliance with the Council's habitat goal, policies and objectives. Implement and require compliance with state, federal, local and tribal laws, regulations and policies

relating to Columbia River Basin salmon and steelhead habitat regulation and management.

- 7.6B.3 Give highest priority to habitat protection and improvement in areas of the Columbia Basin where low or medium habitat productivity or low pre-spawning survival for identified weak populations are limiting factors. Give priority to habitat projects that have been integrated into broader watershed improvement efforts and that promote cooperative agreements with private landowners.
- 7.6B.4 For actions that increase habitat productivity or quantity, give priority to actions that maximize the desired result per dollar spent. Also, give higher priority to actions that have a high probability of succeeding at a reasonable cost over those that have great cost and highly uncertain success.
- 7.6B.5 Provide elevated or new funding necessary for the successful and timely implementation of the items listed in this section. Funding sources for implementing provisions of the habitat section should include, but not be limited to, the U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation, Soil Conservation Service, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Corps of Engineers, Agricultural Stabilization and Conservation Service, Bonneville Power Administration, other relevant federal agencies, all relevant state agencies, local governments, private landowners, resource users and tribes. Cost and effort sharing is encouraged.
- 7.6B.6 Encourage the involvement of volunteers and educational institutions in cooperative habitat enhancement projects. Promote public outreach and encourage education in watershed and

resource management and protection throughout the basin.

7.6C Coordinated Habitat Planning

Federal land management agencies, states and others with ownership and/or management responsibilities for lands and waters that contain or materially affect salmonid habitat must accelerate efforts to restore the health of that habitat. Such restoration activities, to be successful, must be coordinated across many jurisdictional and ownership boundaries. Management entities must be accountable for their own actions, but these actions must be integrated on a ridgetop-to-ridgetop watershed basis. Failure to so integrate will put each action at risk of being undermined by uncoordinated actions downstream, upstream or upslope.

Therefore, the Council adopts the habitat objectives addressing watershed health and land management set forth below. The Council recognizes that habitat conditions differ naturally to some degree around the region, due to differences in soils, topography, vegetation and climate. Consequently, habitat objectives that acknowledge and incorporate these local differences might be appropriate in some instances. Variances in habitat objectives should only recognize natural habitat limitations that occur because of differences in geographic conditions, while fully meeting the biological needs of fisheries resources.

The Council addresses these objectives principally to publicly owned and managed lands. Nonetheless all parties should recognize that limiting restoration actions to public lands would be biologically futile and wasteful of public funds. Private and public landowners should act in concert. Where listed species are, or could be present, private landowners face considerable uncertainty in any event. On the other hand, private lands managed to achieve and maintain high quality habitat may be eligible for habitat conservation plan status under the Endangered Species Act. This could protect them from further required actions.

Therefore, the Council urges all parties in a watershed to undertake, collectively and

voluntarily, the habitat assessment and restoration actions needed to achieve watershed conditions that meet the habitat objectives set forth below, or locally-adopted, subbasin-specific objectives that are functionally equivalent in terms of biological consequences, with these regional objectives.

In setting forth objectives below, the Council wishes to make clear certain expectations as to how progress toward meeting them should be achieved. These expectations derive in part from the experience gained in the Grande Ronde, Upper Salmon and Lemhi Model Watersheds established pursuant to this Program.

Watershed Assessment: There is no substitute for current, validated data, and there is no shortcut to acquiring it. Local watershed committees and public land managers should cooperate to assess watershed health on a stream-reach-by-stream-reach basis. Assessment methodologies and results should be peer-reviewed to ensure appropriateness and quality of data. Only with such assessments can recovery plans be designed for the needs of each stream .

Watershed Management: People are easily polarized over this concept, some advocate aggressive intervention and others a strict hands-off strategy. The Council anticipates that there will be intervention; otherwise, restoration actions such as removing man-made stream barriers and controlling road erosion would be precluded. But the Council also cautions moderation in devising intervention measures where complex and still poorly understood natural systems are at work. Our history is replete with well-intentioned, but ill-informed actions compounding problems they were intended to solve: forest fire suppression is one example. Habitat interventions should seek to restore and employ natural healing mechanisms wherever possible, reserving civil and bio-engineering approaches for problems that will not respond otherwise, and where the science is well understood.

Collaboration: Another issue that is often polarizing is the false choice between “top down” and “bottom-up” management of watershed restoration. Either approach by itself is doomed to fail. Local residents have a special interest at stake in their watershed and a unique knowledge of it that no other party brings. It is their home and often their livelihood as well.

Parties outside the watershed also have legitimate interests in its health, and they often have the resources and authorities essential to watershed recovery (e.g., federal land managers; state water quality authorities). In such circumstances, the only sound strategy is the kind of collaboration that is evolving in the model watersheds and a few other places. Joint or coordinated assessments, plans and restoration actions will be both more effective and more efficient with the region’s limited resources. They will succeed only when they are based on working relationships that are neither “top-down” nor “bottom-up,” but truly collaborative, respecting the different perspectives and assets each party brings, grounded in science, concerned with problem-solving and focused on results.

Locally adopted Watershed Plans: While the Council is promulgating regional habitat objectives and believes these offer a useful reference base for any watershed, the Council expects and encourages development and refinement of local watershed restoration plans adopted to stream-specific conditions within that watershed. Examples of such local efforts include the Wallowa County/Nez Perce Salmon Recovery Plan and the Grande Ronde Model Watershed Action Plan. Such local plans should be products of the collaborative approach described above, and they should also reflect the history and values of those communities -- both tribal and non-tribal. They should be grounded in thorough, peer-reviewed watershed assessments and restoration plans that will result in watershed health of no lesser quality than what would be achieved by meeting the regional objectives described below. The Council believes such collaborative plans offer the greatest opportunity for accelerated watershed recovery if they incorporate both science-based

direction and the commitments by all essential parties to the actions and objectives contained therein.

Local Watershed Managers

7.6C.1 The Council expects that the relevant parties will report to the Council the biological rationale for departures from the approach and objectives provided below. If local watershed managers believe that habitat objectives in this program are not appropriate for local conditions, they may develop alternative objectives and submit them to the Council for review. The Council will approve locally adopted, subbasin-specific objectives upon determining that they are functionally equivalent to the biological benefit intended by the habitat objectives in this program.

Federal Land and Water Management Agencies, States, Tribes or the Lead Watershed Review Entity

7.6C.2 Institute a comprehensive program to monitor progress in achieving compliance with the Council’s habitat objectives. Such a program will involve coordination of data collection, analysis and reporting, and also adaptive management. As part of the program, by December 31, 1995, and annually thereafter, each entity having watershed management and/or regulatory responsibilities will be asked to provide the Council with a report describing compliance with each habitat objective. Begin wherever appropriate with the subbasin plans already developed pursuant to this program. The report should explain the reason for departures from the Council’s objectives and corrective measures being taken, including schedules for achieving compliance.

Council

- 7.6C.3 Review habitat monitoring reports as submitted, for consistency, appropriateness and regional coordination. Report to the President, the Congress and the Governors on success or failure of managers and responsible agencies to restore and maintain the health of salmon and steelhead habitat encompassed in this rule.

National Marine Fisheries Service

- 7.6C.4 Address program and Council-reviewed subbasin specific habitat objectives, and progress in complying with such objectives, as well as other appropriate program measures, in developing biological opinions, performing consultations and adopting habitat conservation plans as required under the Endangered Species Act. Accelerate efforts to review locally developed watershed plans and award Section 10 Habitat Conservation Plan status, where merited, or provide guidance to local watershed committees and participating agencies on criteria for awarding such status. Provide assistance to local initiatives in complying with these criteria.

Federal Land and Water Management Agencies, States, Tribes and Private Landowners

- 7.6C.5 Because the region places a very high priority on protecting existing habitat, manage activities to restore and maintain the quality and quantity of existing habitat. In so doing, take all steps necessary to comply with the following regionally adopted habitat objectives, or with locally adopted objectives that are consistent, in terms of biological consequences, with these regional objectives in perennial and

intermittent streams supporting salmon and steelhead. Provide sufficient funding to support needed watershed restoration activities and schedules. In addition, where possible, manage riparian and floodplain areas to promote the protection and re-establishment of natural ecological functions and, thereby, protect and improve salmon and steelhead habitat.

7.6D Habitat Objectives³

These objectives should apply to all watersheds until, for any given subbasin, site-specific, peer-reviewed assessment, objectives and watershed plan based on the geomorphic and climatic characteristics of the watershed are developed collaboratively among local, tribal, state and federal parties of interest, adopted locally, and acknowledged by the Council, or by the National Marine Fisheries Service in a Section 10 Habitat Conservation Plan process. However, the Council does not intend for recovery actions under such plans to be delayed or deferred until such acknowledgment is secured.

Sediment

- Take action as needed to limit the percentage of fine sediments (less than 6.4 millimeters) in salmon and steelhead redds to no more than 20 percent. Limit cobble embeddedness to less than 30 percent or documented historic condition.
- In subbasins currently limited by sediment problems, ensure as a first priority no increase in sediment input from human activities.

Bank Stability

³Appendix A contains a list of actions recommended by the fish managers that might be taken to achieve these habitat objectives.

- Maintain greater than 90 percent of streambanks in stable condition.

Water Quality

- Water Temperature: Attempt to maintain temperatures in historically usable spawning and rearing habitat at less than 60 degrees Fahrenheit. Under all circumstances, do not exceed 68 degrees Fahrenheit throughout each watershed.
- Water quantity and timing: Determine instream flow needs for salmon and steelhead and establish flows if not yet established, to meet these needs. Flow needs should be based on instream flow evaluation that considers channel morphology, sediment routing, floodplain function, water temperature and salmon and steelhead passage, rearing and spawning.
- Where the instream flow needs of salmon and steelhead identified above are not being met, the Council recommends actions such as protecting and restoring wetlands and degraded meadow systems, restricting additional surface water or ground water withdrawals that do not consider the effects of stream flow on anadromous fish needs, and acquiring instream flows as needed for fish production.
- Other water quality objectives: Fully comply with the existing federal and state standards. Ensure that species biological requirements will be met if there is not an applicable state or federal water quality standard.

Large Woody Debris

- Retain large woody debris in stream channels (including waters where salmon are not produced) to protect the sediment and nutrient storage and processing function of stream

ecosystems supporting salmon and steelhead.

- The Council recommends actions such as addition of large woody debris only after the causes of large woody debris loss and pool loss have been completely addressed.

Large Pools

- Attain the following minimum pool frequency objectives (pools per mile) or documented historic pool frequency if different from these objectives.

Wetted Width: (in feet)	5	10	15	20	25	50	75	100	125
Pools per Mile	184	96	70	56	47	26	23	18	14

- The Council recommends actions such as actively restoring riparian vegetation if there is a declining trend in pool volume as well as monitoring trends in pool frequency and volume.

Riparian Vegetation

- Retain vegetation in riparian areas to stabilize banks, prevent warming of water, provide fish cover and food, and supply woody debris in the stream.

Stream Morphology

- Improve stream morphology (the structure and quality) to benefit salmon and steelhead.

Land Management Generally

- The Council recommends that prior to initiating management activities, land managers complete a watershed analysis to document existing habitat conditions, determine actions needed to meet habitat

objectives provided herein and establish a schedule for implementation.

trees, or 300 feet slope distance, whichever is greater.

Riparian Areas

- Managers should take special care to minimize vegetation removal or soil disturbance in the following areas:

Fish-Bearing Streams: The area on each side of the stream equal to a distance equal to the height of two site-potential trees, or 300 feet slope distance from the edge of the 100-year floodplain, whichever is greater.

Permanently Flowing Streams That Don't Produce Fish: The area on each side of the stream to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the 100-year floodplain, whichever is greater.

Seasonally Flowing Or Intermittent Streams: The area on each side of the stream to a distance equal to the height of one site-potential tree or 100 feet slope distance from the edge of the 100-year floodplain, whichever is greater.

Constructed Ponds And Reservoirs And Wetlands Greater Than One Acre: The area from the edge of the wetland or the maximum pool elevation to a distance equal to the height of one site-potential tree, or 150 feet slope distance, whichever is greater.

Lakes And Natural Ponds: The body of water and the area to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential

Wetlands Less Than One Acre And Unstable And Potentially Unstable Areas:

The extent of unstable and potentially unstable areas, and wetlands less than one acre to the outer edges of the riparian vegetation.

Roads

- New roads should only be constructed consistent with the sediment objective. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

Grazing

- Implement grazing systems that are designed to either recover fish habitat within five years or maintain acceptable habitat conditions.

Irrigated Agriculture

- All activities should be conducted consistent with these objectives. In particular, return flows should meet state water quality criteria or these habitat objectives.

Timber Harvest

- All harvest should be conducted consistent with these habitat objectives.

Mining

- All mining should be conducted consistent with these habitat objectives.

Recreation Management

- The Council recommends that recreational facilities within riparian zone areas be operated in a manner that contributes to the attainment of these habitat objectives.

7.6E Expedited Process for Funding Projects

Many high priority habitat improvement projects involve transactions with private landowners and water rights holders. In working with the private sector, timely access to funding will be essential once negotiations have concluded and parties are ready to proceed. This ability to move quickly is not current practice, but it is essential to capitalize on agreements to undertake cooperative habitat improvement and protection.

Bonneville

7.6E.1 In consultation with the fishery managers, the Council and other relevant parties, explore alternative procedures for funding high priority habitat projects expeditiously. Report to the Council on a proposed procedure by March 31, 1995.

7.7 COOPERATIVE HABITAT PROTECTION AND IMPROVEMENT WITH PRIVATE LANDOWNERS

The Council has adopted the following as a program habitat goal: Ensure human activities affecting production of salmon and steelhead in each subbasin are coordinated on a comprehensive watershed management basis. The Council does not view comprehensive watershed management as a planning process. It is a way of doing business that allows for coordination of the goals and objectives of all interests in order to use available natural, human and fiscal resources in the most beneficial manner. Thereby, investments in development and usage of resources in a subbasin, including production of salmon and steelhead, will benefit.

Comprehensive watershed management should enhance and expedite implementation of actions by clearly identifying gaps in programs and knowledge, by striving over time to resolve conflicts, and by keying on activities that

address priorities. A long-term commitment from all local, state and regional entities interested in each subbasin will be necessary. This effort cannot be viewed as something to be accomplished quickly or having an endpoint. It will need to evolve over time to become truly comprehensive. To succeed, it must become institutionalized in each subbasin.

The Council believes that protection and improvement of habitat on private lands is an essential component of comprehensive watershed management. A key to this approach is the voluntary action of the owners of these lands. Without explicit, direct involvement of private landowners in identification and implementation of habitat actions, protection and improvement of habitat on private lands has little chance of success.

During investigation of habitat issues, the Council was impressed with the number of private initiatives to protect the fisheries habitat in the region. These include activities to prevent erosion, as typified in the Tucannon River Subbasin, as well as other programs conducted by local conservation districts, Oregon Governor's Watershed Enhancement Board, Trout Unlimited, Long Live the Kings, the Adopt-a-Stream Foundation, Wallowa Basin Salmon Recovery Plan, Grande Ronde Model Watershed Action Plan, Asotin Creek Model Watershed Plan, Upper Salmon Model Watershed, Tucannon/Pataha Model Watershed, and others. The Council applauds these worthy efforts to involve different affected interests in development, implementation and funding of coordinated habitat protection and improvement activities. These types of activities need to occur in every subbasin and on a more comprehensive level.

The Council recognizes that some public lands are held under constitutionally imposed trust obligations. For example, the Washington Department of Natural Resources is obligated to manage lands to provide funds for schools as set forth in *Skamania County v. Department of Natural Resources*. Similarly, the Oregon Constitution mandates the state to manage its forest lands primarily to replenish the state's common school fund. In such cases, the Council urges the trustee to develop habitat conservation

plans to the full extent of its authority in order to address applicable trust obligations. These plans should be coordinated and consistent with watershed approaches developed for the subbasin in which it occurs.

In addition, the Council is aware that in urban, suburban and areas of developed small plot ownership, the habitat objectives set forth in this rule may not be fully attainable. An example is riparian areas covered substantially by structures. In such cases, watershed approaches developed under this program should seek to obtain the maximum habitat protection and restoration that is possible under programs such as the Natural Resource Conservation Service's best management practices.

- **Local role:** A locally based, bottom-up, voluntary approach for protection and improvement of habitat on private lands is needed. The coordinated resource management approach is an example of the type of program that might provide the basis for such an approach. This process brings together local landowners and key interests in a facilitated forum to identify goals for improving and managing lands within a geographic area of common interest.
- **State role:** Statewide lead entities, such as the state conservation commissions or other appropriate bodies, should be identified to facilitate coordinated habitat protection and improvement with private landowners. Collaborate with local watershed committees in watershed planning and implementation, and provide funding, technical advice and assistance. In addition, the Council's model watersheds should complement these efforts.
- **Federal role:** Coordination of watershed activities will include an important role for federal agencies, in collaboration with state, local and tribal authorities and local watershed committees. Activities on federal and private lands must be coordinated and consistent to achieve comprehensive watershed management. In addition, federal funding of activities on private and public lands must continue and at increased levels. The Council is committed to supporting efforts in this regard. Also, it is expected that coordination of activities on private lands will result in approaches that complement and comply with the requirements for habitat recovery plans under Section 10 of the Endangered Species Act. This will require coordination of watershed activities with the National Marine Fisheries Service.
- **Tribal role:** In the last century, individual tribes ceded large tracts of traditional lands in the Columbia River Basin to the federal government. During this process, the tribes retained rights, among others, to harvest fish, wildlife and plants. Management of watersheds in a manner that continues to produce these resources is critical to tribal cultures and to obligations to comply with tribal rights. Therefore, the full involvement of tribes in developing and maintaining local and regional watershed approaches on reservation and ceded lands should occur. The experience of tribes as stewards of watersheds for thousands of years will also be important to the ultimate success of watershed approaches.
- **Council role:** The Council expects that coordination of watershed activities will result in identification of projects to improve and protect habitat on private lands. These projects should be submitted directly to the Council to allow for the necessary subbasin and regional coordination. The Council will review these submissions to identify appropriate funding sources and to help ensure prompt, coordinated implementation of appropriate projects. The Council, in identifying funding sources for private-landowner projects,

will take into consideration, to the extent possible, whether the private land is being managed in accordance with applicable federal and state laws such as the Endangered Species Act and state water quality standards.

7.7A Coordination of Watershed Activities

Idaho, Montana, Oregon and Washington

- 7.7A.1 Each state should select a lead entity, such as the state conservation commission or other appropriate entity, to support local subbasin efforts to coordinate watershed activities. This support should include providing technical or other resources, coordinating state agencies involvement and ensuring consistency with state law and policies. The local subbasin efforts should include all interested parties and work with appropriate model watershed groups. They should develop and implement approaches, such as the coordinated resource management approach, for coordinating watershed activities. These efforts should include consideration of the salmon and steelhead integrated and subbasin plans and other relevant documents. Report on these efforts to the Council, U.S. Fish and Wildlife Service and National Marine Fisheries Service for review.

Bonneville

- 7.7A.2 Provide initial funding for one or more coordinators in each of the states of Idaho, Montana, Oregon and Washington to initiate efforts to coordinate watershed activities. These coordinators may also coordinate development of model watersheds (see Section 7.7B, below). Appropriate coordinating entities include tribes, conservation districts, county governments, as well as other entities.

Council, U.S. Fish and Wildlife Service and National Marine Fisheries Service

- 7.7A.3 Coordinate review of local watershed coordination effort reports for consistency with other activities in the appropriate subbasin and the region. Identify funding sources and assist in obtaining funding for appropriate activities. Appendix A contains a listing of potential funding sources.

Idaho, Montana, Oregon and Washington

- 7.7A.4 Each state should identify at least one focus subbasin to apply the approaches developed in the model watersheds (Section 7.7B) for implementation starting in 1995. Submit proposed focus subbasins by the end of March 1995. In addition, each state submit by the end of August 1996 at least one additional focus subbasin for implementation starting in 1997. Upon Council approval, implement watershed approaches in these focus subbasins. Implement watershed approaches applying the requirements of Section 7.7B and in a manner that ensures the sustainability of ongoing model watersheds and other watershed approaches. Focus subbasins will be coordinated by coordinators identified through measure 7.7A.2.

National Marine Fisheries Service and U.S. Fish and Wildlife Service

- 7.7A.5 In consultation with the Environmental Protection Agency, Bonneville, U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, Soil Conservation Service, Council and

other appropriate entities, continue to develop an approach to habitat conservation plans that will satisfy the mandate of the Endangered Species Act. Report to the Council regarding this approach by March 31, 1995.

Soil Conservation Service

- 7.7A.6 Compile a report documenting the implementation of all watershed restoration approaches involving private lands in the Columbia River Basin. Include in the report identification of entities involved, approaches used, funding sources and other pertinent information. Submit report to the Council by April 30, 1995, and by January 15 annually thereafter.

7.7B Model Watersheds

Bonneville

- 7.7B.1 Provide initial funding for at least one model watershed coordinator selected by each respective state. These coordinators may also coordinate watershed activities described in Section 7.7A.

Idaho, Montana, Oregon and Washington

- 7.7B.2 Each state should select a coordinating entity for each model watershed project, such as the state conservation commission, a tribe or other appropriate entity. The Council expects that the experience gained in the model watersheds will result in progress toward implementing a watershed approach for other subbasins. The Council understands that fully attaining a watershed approach will take decades, but incremental progress toward this end should be apparent every year. At the same time, the Council encourages experimenting with these approaches and recognizes that not all experiments

will provide positive results. This is the essence of adaptive management, which is a basic premise of the program. The Council believes that accomplishment of certain elements in the first year of implementation of each model is critical to success. It expects the coordinating entity to ensure that each model accomplishes the following critical elements during the first year of implementation:

- Identify *all* parties with an interest in each model watershed. Set up procedures to ensure that *all* these parties have the opportunity to participate fully in the development and implementation of the model watershed. Convene a watershed conference that includes *all* parties with an interest in the model watershed.
- Compile all existing plans, programs, policies, laws and other appropriate authorities that relate to comprehensive watershed management in each model watershed.
- Identify gaps and conflicts in the existing plans, programs, policies, laws and other appropriate authorities that hinder comprehensive watershed management in each model watershed.
- Set out a path and procedures for filling gaps and addressing conflicts.
- Identify key factors limiting salmon and steelhead productivity.
- Identify priority on-the-ground actions to address key limiting factors.

- Compile a list of *all* human and fiscal resources that are potentially available for protection and improvement of habitat for the model watershed. Include on the list all potential federal, state, local government, and other public sources as well as private sources such as local businesses that rely on natural resources in those watersheds. Coordinate this activity on a regional and state level, as appropriate.
- Provide for the involvement of volunteers and educational institutions in the implementation of projects.

7.7B.3 By the second year, begin implementation of priority on-the-ground actions that address key limiting factors for salmon and steelhead production through the implementation planning process (see Section 3.1B). In addition, initiate procedures for filling gaps and addressing conflicts.

7.7B.4 Each state should report individually to the Council annually by October 15 on progress in each model watershed. Include in the report an overview prepared by the coordinating entity for each model watershed. Detail knowledge gained through experience in the subbasin that could be useful for developing comprehensive watershed management in other subbasins. Specifically address progress and accomplishments for each item bulleted in Section 7.7B.2.

7.8 IMPLEMENT STATE, FEDERAL AND TRIBAL HABITAT IMPROVEMENTS

7.8A Land Management

U.S. Forest Service (Regions 1, 4 and 6) and Bureau of Land Management (Idaho and Oregon/Washington Offices)

- 7.8A.1 Continue implementing the procedures outlined in the Anadromous Fish Habitat Policy and Implementation Guide as outlined in the policy signed January 1991. In addition, incorporate and implement the Guide in the President's forest plan, PACFISH, and other appropriate initiatives. Seek the means to accelerate the Anadromous Fish Habitat Plan. Include quantitative fish habitat objectives in the plan. By September 1, 1992, all land management activities should be designed to at least maintain the quantity and quality of existing salmon and steelhead habitat.
- 7.8A.2 In streams where either water quality objectives or federal land management plan objectives for fish habitat and water quality are not being met, initiate actions needed for recovery. Through the Columbia River Basin assessment and Eastside and Upper Columbia River Environmental Impact Statements, identify fish restoration measures and forest health concerns, and develop strategies to enhance the aquatic habitats for the production of salmon and steelhead. Special attention should be given to insect infestation as it relates to catastrophic fire danger that may threaten salmon and steelhead habitat.

7.8A.3 Review and, as necessary, amend existing land management plans to incorporate the Council's habitat goal, policies and objectives. In the immediate future, evaluate and develop a range of alternatives that display PACFISH riparian management objectives through the Eastside and Upper Columbia River Basin Environmental Impact Statement.

7.8A.4 As a condition for ratepayer funding of habitat protection or improvement projects on federal lands, demonstrate that federal land management activities are consistent with and, therefore, will not undermine the benefits of any project implemented through this program.

7.8A.5 Continue to improve livestock management by developing, updating and implementing livestock management plans. Provide adequate staff and funding to monitor and supervise all livestock permits in salmon and steelhead production areas consistent with the Council's habitat goal, policies and objectives. Revise all livestock management plans, as necessary, to incorporate and implement the Council's habitat goal, policies and objectives and to address enhancement of riparian areas and compliance with state water quality standards and best management practices.⁴ Through the Eastside and Upper Columbia River Basin Environmental Impact Statements, incorporate PACFISH riparian management objectives, standards and guides, and riparian habitat conservation

⁴ Best management practices are a practice or combination of practices that are the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with state water quality goals. The practicality of these efforts should include technological, economic and institutional considerations. The development and evolution of best management practices requires the input of experts on each resource that may be impacted in order that all values are appropriately considered.

strategies into livestock management plans.

- 7.8A.6 Report annually to the Council by March 15 on the effectiveness of federal land management actions to protect and improve anadromous and resident fish populations and habitat on federal lands in the Columbia River Basin. For each subbasin where federal lands occur, include an assessment of consistency with the Council's habitat goal, policies and objectives, and actions that will be initiated to address any inconsistencies, including a schedule approved by the Council for achieving compliance and actions that will be initiated to remedy problems. In addition, include an assessment of population and habitat status and trends in each subbasin. In particular, provide information on average, high and low water temperatures where major streams leave federal lands and at other key locations. Temperatures should not indicate an increase. Maintain summer temperatures below 60 degrees Fahrenheit or demonstrate that temperatures are declining toward attainment of this objective.

Council

- 7.8A.7 In consultation with fish managers, review reports for consistency with the program, subbasin plans, and other appropriate plans.

Soil Conservation Service

- 7.8A.8 Explore alternatives to provide permanent erosion control for lands in the Columbia River Basin that are currently enrolled in the Conservation Reserve Program. Submit alternatives and recommendations to the Council by the end of June 1995.

7.8B Best Management Practices

Idaho, Oregon, Washington and Appropriate Indian Tribes in Consultation with Appropriate Water Quality Agencies

- 7.8B.1 Establish best management practices under the Clean Water Act to maintain and improve salmon and steelhead production. Best management practices should be designed to meet the Council's habitat goal, policies and objectives. Conduct monitoring to ensure that best management practices are implemented and that instream salmon and steelhead habitat and water quality goals are met. Present practices to the Council by December 31, 1995.

7.8C Mining

State and Federal Agencies and Tribes

- 7.8C.1 Review and, if necessary, seek improvements to mining laws and administrative practices to promote salmon and steelhead productivity. Ensure that all mining activities comply with state water quality standards. Report to the Council on progress on this measure by June 30, 1993, and annually thereafter.

7.8D Streambanks, Streambeds and Plant Nurseries

Idaho, Montana, Oregon, Washington, Bureau of Land Management, U.S. Forest Service, Corps of Engineers and Tribes

- 7.8D.1 Work with model watershed committees and other appropriate groups to identify and protect riparian and underwater lands associated with perennial and

intermittent streams that contribute to anadromous and resident fish production, regardless of whether a particular portion of a stream is fish-bearing. Where water quality objectives are being met, retain existing shade, vegetation, standing and down large woody debris and small woody debris. Where water quality objectives are not being met, initiate action to increase shade, vegetation, standing and down large woody debris and small woody debris. Use non-structural methods as the first choice for protecting and improving riparian areas and streambeds. Report to the Council on progress on this measure by June 30, 1993, and annually thereafter.

Bonneville

- 7.8D.2 Evaluate the adequacy and capacity of existing native plant nurseries to supply plant materials for use in protecting and improving riparian and other habitat. Submit the evaluation to the Council by June 30, 1995. If the Council finds existing supplies are inadequate, the entity(ies) identified by the Council should bring existing nurseries up to capacity and, as needed, fund development of additional native plant nurseries.

7.8E Land Exchanges, Purchases and Conservation Easements

Idaho, Oregon, Washington, Bureau of Land Management (Idaho and Oregon/Washington Offices) and U.S. Forest Service (Regions 1, 4, 6)

- 7.8E.1 Implement land exchanges, purchases or easements of a sufficient width to improve and maintain salmon and steelhead production in privately owned riparian areas and adjacent lands, with full compensation of landowners.

Consider factors such as need for fish passage facilities and potential improvements to instream flow conditions when purchasing or exchanging private property. In implementing this measure, acquisition of easements should be the preferred approach for protecting riparian areas and adjacent lands. Exchange or purchase that results in net gains of land in public ownership should be considered the lowest priority method for this purpose. States and federal agencies provide an updated list and report progress to the Council by December 31, 1993. In addition, federal agencies should provide to the Council by December of each year, a list of high quality riparian lands that potentially could be acquired through exchange.

Bonneville and Other Implementing Entities

- 7.8E.2 Provide funding for the acquisition and management of permanent conservation easements for rebuilding and maintaining Columbia Basin salmon and steelhead populations. These acquisitions should be on a willing-seller and willing-buyer basis. Report to the Council on progress on this measure by June 30, 1993, and annually thereafter.

7.8F Water Regulation

Idaho, Oregon and Washington

- 7.8F.1 Review state water quality standards and compliance procedures by June 30, 1995, and report to the Council findings and any limitations in resources to programs that could impact meeting the habitat goal, policies and objectives of the program. If necessary, adjust water quality standards and compliance procedures to meet the program habitat goal, policies and objectives.

Idaho, Montana, Oregon, Washington, and Federal and Tribal Agencies

- 7.8F.2 Improve enforcement of existing water rights and duties for diversions and use from the mainstems of the Columbia and Snake rivers and tributaries. To facilitate these determinations, ensure that existing and new diversions affecting salmon and steelhead streams are equipped with devices to measure instantaneous and seasonal flows. Report progress to the Council by December 31, annually.

Bureau of Reclamation

- 7.8F.3 Identify all cases of water spreading on reclamation projects in the Columbia River Basin. Determine quantities and market value of water that has been spread by water users. Propose alternative approaches for addressing this issue, including alternatives that provide incentives for water conservation, that would make water available for instream uses and that recognize whether instream needs are satisfied.

Corps of Engineers

- 7.8F.4 By June 30, 1995, propose to the Council a network of water quality monitoring stations in the Snake and lower Columbia rivers capable of instantaneous telemetry. After Council review, fund the water quality monitoring network.
- 7.8F.5 By January 1996, with consultation and approval of fish managers, fund a comprehensive assessment of all existing and planned dredging activities in the Columbia and Snake River mainstems. Report results of assessment to Council by December 31, 1997.

7.8G Instream Flows for Salmon and Steelhead

Idaho, Montana, Oregon and Washington

- 7.8G.1 To protect salmon and steelhead in the Columbia River and its tributaries: establish instream flow protection levels; enforce water right permit conditions; deny new water rights if water is not available consistent with salmon and steelhead needs at all life stages, or if existing water rights or the public interest would be detrimentally affected; and acquire water rights on a voluntary basis by purchase, gift, or through state or federal funding of water conservation or efficiency improvements that produce water savings. Use all available authorities to protect water provided for salmon and steelhead habitat or passage. If existing authorities are inadequate, identify authorities needed and seek legislative approval. In determining whether a proposed diversion or transfer would be consistent with salmon and steelhead needs, consult with fish and wildlife agencies and Indian tribes to determine whether the proposed use would cause any reduction in the quantity or productivity of salmon and steelhead habitat.

Bonneville and Other Implementing Entities

- 7.8G.2 Provide funding for the acquisition and management of critical water rights for rebuilding and maintaining Columbia Basin salmon and steelhead populations. These acquisitions should be on a willing-seller and willing-buyer basis. Report to the Council on progress on this measure by June 30, 1993, and annually thereafter.

Idaho, Oregon, Washington and Bureau of Reclamation

- 7.8G.3 Review the adequacy of existing law and its implementation to protect enhanced instream flows for fish. Complete review and report recommendations to the Council by December 31, 1995. Thereafter, report to Council on progress by December 31, annually..

Bonneville and Bureau of Reclamation

- 7.8G.4 Fund and implement four water leasing demonstration projects; one in the Yakima River Subbasin, along the lines proposed in the Environmental Defense Fund's March 1994 report, and three in the Snake River Basin. Work with the states, the Council and other parties to demonstrate and evaluate the use of water leases and transfers to increase stream flows for salmon and steelhead. Identify goals for each demonstration project in cubic feet per second of additional instream flows measured at specific points at certain times of the year. Report to the Council annually by the end of August regarding progress.

Bonneville

- 7.8G.5 Share funding of the demonstration projects as follows:
- Because Yakima River fish are affected by only four mainstem federal dams, and the purpose of the project is to address both mainstem and tributary water problems, provide one-fourth of the cost of the water leasing demonstration project.
 - In areas of the Snake River Basin above eight federal mainstem dams, where the purpose of the project is to address both mainstem and

tributary water problems, fund 70 percent of the cost of the project(s).

- In areas of the Snake River Basin above eight federal mainstem dams, where the purpose of the project is to address mainstem water problems, fund 85 percent of the cost of the project(s).

7.8H Water Conservation

Salmon and steelhead need adequate river flows for spawning, rearing and migration. With growing development pressures on streams, there is a need to find innovative ways to leave more water in streams. More efficient out-of-stream water use may be a fruitful strategy. There are many questions about how conserved water actually can be secured for salmon and steelhead, although there is agreement that standing water over time refills aquifers that in turn feed the river system. The Council agrees that there is a pressing need to answer these questions.

Council

- 7.8H.1 Continue to emphasize water conservation and efficiency improvements to help salmon and steelhead.

Bureau of Reclamation

- 7.8H.2 In 1991, initiate a cooperative effort with the states of Idaho, Oregon and Washington, and with irrigators, to select and design at least four demonstration water conservation projects to provide additional instream flow and enhanced water quality for production of weak stocks. One or more weak stocks should be present in any given subbasin selected for demonstration. There should be at least one demonstration project in Idaho, Oregon and Washington. Consider opportunities to combine one or more of the water conservation demonstration

projects with model watershed projects described under Section 7.7B.

- 7.8H.3 Take initiative to secure the necessary funding to complete watershed selection and planning by the end of 1993, and complete implementation of the demonstration projects by December 31, 1996.

Idaho, Montana, Oregon and Washington

- 7.8H.4 The Council urges the states to evaluate putting into place statutes or regulations that call for establishing water conservation programs, with a goal of 25 percent more water conservation regionwide by 2005. All or a substantial portion of such conserved water should be dedicated to instream uses.

7.8I Water Resource Information Coordination and Development

Environmental Protection Agency and the Council

- 7.8I.1 Secure funding through appropriate sources and establish a mechanism to facilitate coordination of water quality activities relating to Columbia River Basin fish and wildlife resources. This should be an integrated basinwide approach that includes coordinated data management and an annual public report and review process. Use a cooperative approach including participation by all relevant entities such as Bonneville, Corps of Engineers, Federal Energy Regulatory Commission, Bureau of Reclamation, fish managers, state water quality agencies, state water resource agencies, tribal agencies, land management agencies, U.S. Geological Survey and others. Report status of this activity to the Council annually by April 15.

- 7.8I.2 Coordinate development of a study plan to compile and evaluate existing water quality information, identify data gaps and priority problems, and recommend proposals to address gaps and priority problems. Use a cooperative approach including participation by all relevant entities such as Bonneville, Corps of Engineers, Federal Energy Regulatory Commission, Bureau of Reclamation, fish managers, state water quality agencies, state water resource agencies, tribal agencies, land management agencies, U.S. Geological Survey, Council and others. Coordinate with the Columbia River Estuary Bi-State Study as well as other appropriate studies and programs. The project should include analysis of point sources, non-point sources, dioxin pollution, transboundary pollution, sewage in metropolitan areas and cumulative effects. Complete study plan and submit to the Council by April 15, 1993. After Council approval of the study plan, the Environmental Protection Agency, the Council and other relevant entities should secure funding through appropriate sources to implement study plan. Report status of this activity to the Council by April 15 annually.

7.8J Water Availability

Water is a finite resource. The Council is concerned that continuing diversions of Columbia River and tributary water will degrade stream conditions needed by salmon and steelhead. Competing demands for water must be evaluated, and Idaho, Oregon and Washington must consider the cumulative effects of new diversions on water for salmon and steelhead. Elsewhere in this program, the Council calls for water efficiency, water marketing programs and other means of augmenting flows for fish. Continuing with water diversions that would deprive salmon and steelhead of the benefits of these programs would make little sense.

Idaho, Montana, Oregon and Washington Water Agencies

- 7.8J.1 In coordination with projects described in 5.2A and 7.11C, and similar efforts, develop coordinated, interstate mechanisms to protect from appropriation additional Columbia and Snake river basin stream flows that come from storage releases, water conservation or other efficiency improvements, where the water is needed to maintain and rebuild salmon and steelhead populations.

National Marine Fisheries Service

- 7.8J.2 Develop a regional assessment of the availability of water for salmon and steelhead spawning, incubation, emergence and migration in the Columbia River and its tributaries, given current and projected water use and plans to provide secure flows for salmon and steelhead. The assessment should include a range of 50 percent to 95 percent probability of water availability. In cooperation with the states, tribes, and other federal agencies and interested parties, fund an evaluation of the effects of water withdrawals, depletions and return flows on the natural hydrograph. Compare the magnitude of these effects to the magnitude of effects caused by upstream storage. Develop hydrographs of the mainstem Columbia and Snake rivers and selected tributaries. Analyze the cumulative effects of likely future additional withdrawals on at-risk stocks of anadromous fish. Report results and provide recommended measures to the Council by April 1995.

7.9 PURSUE SUBBASIN WATER PROJECTS

7.9A Willamette Subbasin

Corps of Engineers

- 7.9A.1 Complete investigation of the feasibility of installing devices to control the temperature of the water discharged from Detroit Dam on the North Santiam River by March 31, 1996. The Corps should report progress to the Council annually and should make recommendations to the Council at the conclusion of the study.
- 7.9A.2 Complete investigation of the feasibility of installing devices to control the temperature of water discharged from Cougar and Blue River dams in the McKenzie River Basin by March 31, 1995. The feasibility study should include an evaluation of non-structural alternatives, such as modification of existing project operating rule curves, in combination with various temperature control devices to restore downstream water temperatures to near pre-project conditions. The Corps should report progress to the Council every six months and should make recommendations to the Council at the conclusion of the study.

Corps of Engineers, Bureau of Reclamation and Fishery Managers

- 7.9A.3 Immediately begin consultations to develop a storage agreement to ensure minimum flows necessary to protect salmon and steelhead below Willamette River projects.
- 7.9A.4 Continue studies to establish flow guidelines for the spawning, incubation and rearing of salmon and steelhead in the Willamette Basin.
- 7.9A.5 Based on the results of the required studies, propose to the Council flow guidelines to be incorporated into the

operation of dams in the Willamette Basin.

7.9A.6 Upon approval by the Council of flow guidelines for federal hydropower projects in the Willamette Basin, operate federal projects in accordance with those guidelines. In the meantime, meet minimum flows established annually by the state natural resource agencies in consultation with the Corps of Engineers. In setting minimum flows, consider needs for water volume in the estuary for fish and wildlife.

7.9A.7 The Corps of Engineers should annually report the results of the studies in 7.9A.4 to the Council.

Eugene Water and Electric Board

7.9A.8 Subject to Federal Energy Regulatory Commission and Council approval, fund a study of the lower McKenzie River to determine the flows required for the spawning, incubation and rearing of salmon and steelhead.

7.9B Umatilla Subbasin

Bonneville

7.9B.1 Provide power or reimbursement for power costs to Bureau of Reclamation pumping plants designed to exchange Columbia River water for Umatilla River water, so long as the exchange is administered in accordance with federal and state laws, the permit issued pursuant to Application 71293, the transfer order issued pursuant to Application T6621E, and memoranda of agreement resulting from the Contested Case Proceeding on Protested Water Applications 71293 and T6621E.

Bureau of Reclamation

7.9B.2 Use the 6,000 acre-feet of storage in McKay Reservoir, which is not

contracted on a long-term basis, to enhance Umatilla River flows for anadromous fish, in cooperation with the fish and wildlife agencies and tribes.

Federal Project Operators and Regulators

7.9B.3 If new reservoirs are constructed for additional storage, the federal project operators and regulators should propose dedicating a specific portion of storage necessary for the achievement of flows to protect, mitigate and enhance fish and wildlife.

Bonneville

7.9B.4 Provide power or reimbursement for power costs to Bureau of Reclamation pumping plants designed to exchange Columbia River water for Umatilla River water.

Bureau of Reclamation

7.9B.5 Obtain consent from all affected water users and regulators, and provide assurance to the Council that water exchanged to augment streamflows will be used to meet annual flow objectives established by the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation of Oregon.

Oregon Water Resources Department

7.9B.6 Report annually to the Council regarding the amount of water provided by pumping, the amount of exchanged water and the disposition of the exchanged water. In describing the disposition of exchanged water, the report should indicate how much exchanged water is: 1) lost to evaporation, ground water, and other

natural causes; 2) diverted for out-of-stream uses, and of this diverted water, the extent and timing of return flows; and 3) left instream without loss or diversion. If any of this information cannot be provided because of the problems in monitoring or otherwise, the report should discuss whether and how monitoring problems could be solved. Report to the Council regarding the establishment of a water right for enhanced instream flows resulting from the pumping exchange.

Bureau of Reclamation

- 7.9B.7 Fund Oregon Department of Fish and Wildlife and Umatilla tribe's quantitative monitoring and evaluation studies to determine the biological effectiveness of this measure.

Bonneville

- 7.9B.8 Pending installation of Bureau of Reclamation pumping plants, provide power or reimbursement for power costs associated with interim pumping for anadromous fish as proposed by the Columbia Basin Fish and Wildlife Authority.

Oregon Water Resources Department

- 7.9B.9 Report to the Council annually on interim pumping, as in Section 7.9B.6, the long-term pumping measure.

Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation

- 7.9B.10 Monitor and qualitatively evaluate the biological benefits of interim pumping, and file a report with the Council and Bonneville annually.

Bureau of Reclamation

- 7.9B.11 Beginning in 1989, fund state fish and wildlife agency and tribal quantitative monitoring and evaluation studies to determine the biological effectiveness of interim and long-term pumping.

Bureau of Reclamation, Bonneville, Oregon Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation and the Oregon Water Resources Department

- 7.9B.12 Jointly develop a monitoring and evaluation workplan that: 1) coordinates monitoring and evaluation activities; and 2) identifies administrative and funding commitments.

7.9C Grande Ronde Subbasin

Water temperature problems throughout the Columbia Basin signal the need to gain experience in solving this problem in an important area such as the Grande Ronde Subbasin.

Environmental Protection Agency and Other Entities

- 7.9C.1 Coordinate design of a demonstration project to evaluate and address water temperature problems in the Grande Ronde Subbasin. Work cooperatively with all relevant entities including model watershed project participants. Complete project design and submit it to the Council by April 15, 1993. After Council approval of the project design, the Environmental Protection Agency, the Council and other relevant entities

secure funding through appropriate sources to implement study plan.

7.9D Lewis Subbasin

PacifiCorp

- 7.9D.1 Subject to Federal Energy Regulatory Commission approval, 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 Federal Energy Regulatory Commission, the flow plan will become a part of this program.

7.10 PROVIDE PASSAGE AND PROTECTIVE SCREENS ON TRIBUTARIES

During the last 50 years, state and federal entities initiated water diversion screening programs and passage improvements in several parts of the Columbia River Basin. Hundreds of screens have been installed on important fish-producing streams. Unfortunately, salmon and steelhead are still being lost in diversions throughout the basin. A large number of diversions, including many on the Salmon and Grande Ronde rivers and other streams that support weak stocks, remain unscreened. In addition, many of the existing screening facilities are in need of maintenance or other improvements.

Installation of new facilities on unscreened diversions and repair or upgrade of older facilities has accelerated since 1992, but many projects remain to be completed. Unscreened or poorly screened diversions result in the loss of many juvenile salmon and steelhead that have survived the rigors of natural rearing only to be killed at the beginning of their journey to the ocean. This effort has a high probability of reducing salmon and steelhead mortality and

will require the use of all available resources for funding, design, construction and installation. Because of the continued need for quick action, it is especially important that the resources of the private sector be used to ensure timely construction and installation of high-priority screens and measuring devices, if such resources are necessary to meet the desired installation time line.

This process is not intended to interfere with the implementation of screening activities that use existing funding mechanisms and programs. Those activities should proceed simultaneously with the process outlined below. As the oversight committee and technical work groups are created, the products developed by these groups should be integrated into the ongoing processes, as well as the implementation planning process (see Section 3.1B).

7.10A Update Priorities and Continue to Fund and Implement an Accelerated Screening and Passage Program

Bonneville

- 7.10A.1 Fund costs associated with operation of the Fish Screening Oversight Committee and technical work groups. These committees should be incorporated into the implementation planning process (see Section 3.1B). The oversight committee should include state, federal (including Bonneville), Council, tribal and irrigation representatives. The committee should provide overall direction, set priorities and ensure oversight of objectives, funding opportunities, standards, biological criteria and evaluation. The technical work groups should include passage experts and other appropriate technical personnel representing federal, state, tribal and irrigation entities. The Yakima Fish Passage Technical Work Groups are to

recommend project priorities within their area of concern to the oversight committee. They also should work with the entity constructing the diversion screens and passage facilities to ensure the facilities are constructed according to the prescribed criteria and that the necessary project evaluation is designed and implemented. In the case of large projects, this may include the following:

- establish written operating criteria;
- develop preliminary designs;
- see that necessary permit processes are carried out;
- make certain private landowner and public concerns are addressed;
- review detailed designs to ensure that biological and engineering criteria are met;
- monitor construction phases;
- monitor operation and maintenance phases in compliance with criteria and recommend corrective actions if necessary; and
- conduct project evaluations.

All Parties

- 7.10A.2 Criteria for design, construction, operation and maintenance of facilities should be based on standards and criteria developed by the National Marine Fisheries Service in concert with agencies and tribes with expertise in the areas of screening and fish protective facilities in the region. Use the existing expertise of federal, state

and tribal entities and others, including the private sector, to accelerate implementation of screening and passage measures. In addition, conduct statistically valid evaluations of screening facilities, as necessary, to ensure that fish are adequately protected and the numbers of adult fish returning to the Columbia River, as a result of this program, are assessed. Evaluation should be coordinated through the implementation planning process (see Section 3.1B).

Fishery Managers

- 7.10A.3 Maintain a prioritized list of tributary screening and passage facility improvements for stream diversions in the Columbia River Basin affecting salmon and steelhead. Improvement can include new facilities and the upgrading and maintenance of existing facilities. The list should also include Columbia River and Snake River mainstem pump diversions. Coordinate this list with the assessment of mainstem diversions in Section 7.10A.6. Priority initially should be given weak stocks, with emphasis on stocks petitioned or listed under the Endangered Species Act in the Snake River Basin. This list should be updated annually by January 31 by the Fish Screening Oversight Committee.

National Marine Fisheries Service, Working with Oversight Committee, Appropriate Technical Work Groups and Bonneville

- 7.10A.4 Identify resources that will be needed to accomplish screening and passage work, and prepare a general operation and maintenance plan, including a schedule, budget, proposed cost-sharing incentive programs and

monitoring and evaluation plans. To accelerate this effort, immediately identify and allocate a budget of at least \$15 million per year, from all available sources, to implement the plan. This expenditure will require increased participation from federal, state and private entities. The presumption is that diversion owners will contribute a significant amount of funding for installation and maintenance of screens. Under current federal law, some federal funds may be available to assist in diversion screening. Sources of additional federal funds, as well as state and private funds, need to be investigated and procured. The plan will also address how ongoing screening and passage programs funded by the Mitchell Act and the states will be comprehensively integrated basinwide. The National Marine Fisheries Service, the oversight committee and Bonneville review this plan with the Council annually by the end of January. As part of the review, report on dollars spent individually by federal, state, private and other entities in the past year and overall, according to the plan. Install all needed screens and passage facilities immediately. Complete them no later than the end of 1996. National Marine Fisheries Service should expedite approval of diversion screening in the Endangered Species Act process.

Bureau of Land Management (Idaho and Oregon/Washington Offices), U.S. Forest Service (Regions 1, 4, 6) and Bureau of Reclamation (Pacific Northwest Region)

- 7.10A.5 Require as a condition of both existing and new water use authorizations, that diversion structures have functional fish screens and other passage facilities for manmade barriers to

salmon and steelhead that meet the criteria referenced above. For existing authorizations, wherever practical, and especially on high-priority diversions, the three agencies, in coordination with the state fish screening programs, should proceed to design and install screens on a multiagency or shared-cost basis, with authorization renewals contingent on reimbursement to the agency, or other arrangements satisfactory to the agency. These screens should meet Fish Screening Oversight Committee criteria. By March 1 of each year the three federal agencies should report on their progress, including the number of such permits, estimated screening costs, resources needed to implement and monitor the program, and a time frame for compliance.

Corps of Engineers

- 7.10A.6 Fund periodic inspections of all underwater diversions in the mainstem Columbia and Snake rivers to determine whether screens that prevent losses of juvenile and adult salmon are installed and operating. Repair, update and, where necessary, install screens on all diversions by December 31, 1995. The presumption is that diversion owners will fund installation and maintenance of screens. The Corps of Engineers, National Marine Fisheries Service and other appropriate entities should use their authority to require expeditious repair or installation of screens if violations are found. Work under this measure should be coordinated with all other measures in this section.

Idaho, Oregon and Washington

- 7.10A.7 Idaho, Oregon and Washington have laws that require the installation, operation and maintenance of fish screens on water diversions. Develop

legislation to obtain greater compliance with fish screen laws in each state. Develop legislation to require forfeiture of associated water rights after three continuous years of unscreened or substandard screened diversions as determined by the state. Report to the Council on this measure by June 30, 1995, and annually thereafter.

7.10B Condit Dam

Condit Dam once had a fish ladder, but the ladder washed out. Therefore, no passage to the upper White Salmon River exists for adult migrants. If fish passage were provided, 30 to 40 miles of spawning habitat would become available above Condit Dam. The Federal Energy Regulatory Commission ordered PacifiCorp to study the feasibility of providing fish passage past the dam. This study, completed in September 1982, determined that passage is feasible. Under the current relicensing proceeding the Federal Energy Regulatory Commission is conducting an environmental assessment of the project. This environmental impact statement will provide a basis for determining the optimum means for providing anadromous fish access to historic range on the White Salmon River.

PacifiCorp

7.10B.1 Subject to Federal Energy Regulatory Commission approval and in consultation with the National Marine Fisheries Service, Yakama Indian Nation, Columbia River Inter-Tribal Fish Commission, Washington Department of Fish and Wildlife, and U.S. Fish and Wildlife Service, implement the alternative that provides the optimum means for anadromous fish to access their historical range in the White Salmon River.

7.10C Enloe Dam

Federal Energy Regulatory Commission

7.10C.1 Require any holder of a license for an operating hydroelectric facility at Enloe Dam to design and construct the hydroelectric facility improvements to be compatible with future installation and operation of upstream and downstream anadromous fish passage facilities. If the Council determines that anadromous fish should be introduced into the Similkameen River, above Enloe Dam, require the licensee to construct and operate appropriate anadromous downstream passage facilities. Upstream passage potentially could provide the region with the opportunity to establish an anadromous fish run throughout the more than 320 linear miles of spawning and rearing habitat of the Similkameen Basin. This could be considered as off-site enhancement or mitigation for mainstem Columbia River anadromous fish losses and would not be the responsibility of the Enloe hydroelectric licensee. Determination of regional responsibility, if any, for upstream fish passage facilities will be decided at a future date.

7.10D Dryden Dam

Bonneville

7.10D.1 Conclude evaluation of the Dryden Dam juvenile fish screen and make necessary modifications by March 1, 1995. Monitor operation of and maintain the screen to ensure that it remains effective.

Federal Energy Regulatory Commission

7.10D.2 If hydropower facilities are later proposed to be added to the Dryden Dam or diversion, require the licensee

to reimburse Bonneville for an equitable portion of the cost of these fish screens and bypass facilities.

7.10E Green Peter Dam

Corps of Engineers

- 7.10E.1 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 should include:
- evaluation of the effect of maximum and minimum flows or combinations of flows on adult steelhead movement;
 - monitoring of steelhead movement in Green Peter and Foster reservoirs to determine whether delays in migration are occurring in the reservoirs; and
 - assessment of spawning and rearing areas above Green Peter Reservoir to determine if alterations that affect spawning and rearing have occurred.

7.10F Willamette Falls

Bonneville and Portland General Electric

- 7.10F.1 Subject to Federal Energy Regulatory Commission approval, jointly install, operate and maintain an adult trapping facility in the Willamette Falls fishway. Funding for the facility should be in the same proportion as the original ratio of federal-to-Portland General Electric funding of the adult fishway.

Portland General Electric

- 7.10F.2 Subject to Federal Energy Regulatory Commission approval, conduct studies to evaluate the juvenile bypass system and screening at the Sullivan Plant at Willamette Falls.

7.10G Clackamas River Dams

Fish and Wildlife Agencies and Portland General Electric

- 7.10G.1 Work cooperatively to investigate and resolve adult fish passage problems associated with Portland General Electric's Clackamas River hydroelectric dams.

7.10H Leaburg and WALTERVILLE Facilities

Eugene Water and Electric Board

- 7.10H.1 Subject to Federal Energy Regulatory Commission approval, design, construct and operate by August 1, 1995, a new right bank fish ladder at Leaburg Dam and a velocity barrier in the Leaburg powerhouse tailrace, or equivalent alternative means to prevent injury and migration delay of adult salmon. Assume full responsibility for annual operation and maintenance of these adult passage facilities. If the Leaburg relicensing application is delayed, take prompt action to amend the existing license to complete the right bank fish ladder on schedule. In the event Federal Energy Regulatory Commission approval is earlier than anticipated in the Eugene

Water and Electric Board's proposed schedule, make a good-faith effort to accelerate completion of the right bank fish ladder.

- 7.10H.2 Subject to Federal Energy Regulatory Commission approval, make improvements to the existing juvenile fish screen cleaning and bypass facilities at the Leaburg Canal Hydroelectric Project by December 31, 1992, and ensure that the fish bypass and screen cleaning systems continue to operate effectively. Ensure that the juvenile fish passage efficiency of the Leaburg screen and bypass system is not reduced when the Eugene Water and Electric Board's proposal to raise the elevation of Leaburg Lake is implemented. Assume full responsibility for annual operation and maintenance of these facilities. 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 Eugene Water and Electric Board has agreed to provide a bypass system.
- 7.10H.3 Subject to Federal Energy Regulatory Commission approval, design and construct a velocity barrier in the Walterville Hydroelectric Project tailrace to prevent the migration delay and injury of adult anadromous fish. The velocity barrier should be completed and operational no later than July 1, 1995. Assume full responsibility for annual operation and maintenance of this adult passage facility. If the Walterville relicense application is delayed, take prompt action to amend the existing license to complete the velocity barrier on schedule. In the event Federal Energy Regulatory Commission approval is earlier than anticipated in the Eugene

Water and Electric Board's proposed schedule, make a good-faith effort to accelerate completion of the Walterville project tailrace velocity barrier.

- 7.10H.4 Subject to Federal Energy Regulatory Commission approval, design and construct a permanent screening and bypass system for juvenile migrants at the Walterville Canal Hydroelectric Project. The juvenile fish bypass facilities should be completed and operational no later than November 11, 1995. Assume full responsibility for annual operation and maintenance of these facilities. If the Walterville relicense application is delayed, take prompt action to complete the screening and bypass facilities on schedule by either preparing and filing a fish passage facility plan with the Federal Energy Regulatory Commission under Article 34 of the existing license or amending the existing license. In the event the Regulatory Commission's approval is earlier than anticipated in the Eugene Water and Electric Board's proposed schedule, make a good-faith effort to accelerate completion of the Walterville juvenile fish bypass facilities. Walterville Canal is operated by the Eugene Water and Electric Board in conjunction with Leaburg Canal. The problems encountered by juvenile migrants at this project are essentially the same as those at Leaburg.

7.10I Foster Dam

Corps of Engineers

- 7.10I.1 Evaluate existing studies and investigate alternative methods of providing adequate downstream fish passage at Foster Dam.

7.10J Marmot Dam

Portland General Electric

- 7.10J.1 Immediately begin consultation with the fish managers on the design of juvenile fish passage facilities at Marmot Dam. Report progress annually to the Council in December.

7.10K Passage into Historic Habitat

Fishery Managers

- 7.10K.1 Where appropriate, determine the feasibility of providing passage above blockages to habitat caused by human development activities. Appropriate habitat includes areas where weak stocks are habitat-limited and, therefore, would benefit from additional habitat. These areas might include parts of the Willamette, Yakima, Grande Ronde and Deschutes basins as well as other subbasins. Submit recommendations for providing passage for Council review and identification of funding sources.

7.11 YAKIMA RIVER BASIN

The Yakima River Basin is located east of the Cascade Range in Washington, where annual precipitation is very low. Irrigation has changed the Yakima River Valley from a near-desert environment to one of the most productive agricultural regions in the country. Valuable agricultural crops are grown there, thanks to a series of irrigation diversion dams, canals and ditches. Three irrigation diversion dams also divert water for hydroelectric generation. However, in a low water year, the demand for irrigation water for farming and ranching still exceeds the water supply. Available water must be allocated among competing uses, and the provision of streamflows sufficient to support anadromous and resident fish historically has received a lower priority. Yet, because the Yakima's fish habitat remains largely intact,

most fish and wildlife experts consider this basin to be one of the areas with the best potential for producing anadromous fish in the Columbia River Basin.

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

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

The Council adopted Yakima River Basin measures primarily as off-site enhancement. Off-site enhancement is a way to compensate for fish and wildlife lost due to development and operation of a hydropower project elsewhere in the Columbia River Basin. Such enhancement is used when it is not desirable or feasible to mitigate the adverse impacts at the hydropower site where the fish were lost. This program's Yakima measures include actions to correct structural problems at irrigation diversion dams, canals and ditches that interfere with the passage of anadromous fish. These are off-site enhancement projects to mitigate the impacts of hydropower elsewhere in the basin.

Measures to provide passage or protection in the lower Yakima River have received priority and are nearly completed. Once the lower-river passage problems are solved, emphasis will be placed on the upper reaches.

Notable progress has been made on the Yakima Basin projects. Screens and ladders have been completed at a number of diversion dams. Other passage projects are well under way

or near completion. The increased fish runs recorded in 1986 underscore the Yakima River's potential as one of the most promising areas for off-site enhancement in the Columbia River Basin.

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

The Council also recognizes the critical importance of the Yakima River's potential for natural propagation and as a system for releasing hatchery fish. An outplanting facility to supplement natural production in the Yakima Basin will be developed in accordance with Section 7.4K.

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

When additional water storage is developed in the basin, a major use of this water should be to protect, mitigate and enhance the basin's anadromous and resident fish and wildlife. Flexibility in water management could be increased through construction of reregulating dams. The Council endorses this as a means to allow the additional stored water to be used for both agriculture and fish enhancement.

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

Funding of many program measures in the Yakima River Basin is part of a cooperative effort involving Bonneville, the Bureau of Indian Affairs, the Bureau of Reclamation and others. The Council anticipates that cooperative funding will continue as provided under Section 3.1C.3, which calls on Bonneville to work with the Council and the federal project operators to identify the most expeditious means for funding measures at federal projects.

7.11A Additional Water Storage

Council

- 7.11A.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 Yakama Indian Nation. The Council will evaluate the results of the Bureau of Reclamation and Washington Department of Ecology study of alternative storage sites and other studies of improved flows for anadromous fish. Based on this consultation and evaluation, the Council will develop measures that identify a site, or a combination of sites, and the amount of storage required. The Council maintains that the stored water should be used primarily to protect, mitigate and enhance anadromous and resident fish in the basin. The Council also will evaluate the use of reregulating dams

to provide maximum flexibility in managing the additional stored water.

Council and Relevant Parties

- 7.11A.2 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.

Relevant Parties

- 7.11A.3 The Council encourages all parties to use water as efficiently as possible in order to satisfy the many needs in the Yakima River Basin, to take any interim steps to improve fish flows in the Yakima River, and to support a program of additional storage incorporating appropriate cost-sharing arrangements.

- 7.11A.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:

- The Secretary of the Interior will encourage the full consideration and incorporation of prudent and responsible water conservation measures in the operations of non-federal recipients of irrigation water from the Yakima Project, where such measures are shown to be economically feasible for those recipients.
- Each Yakima River Basin irrigation district that has entered into a repayment contract or water service contract pursuant to federal reclamation law or to the Water Supply Act of 1958, as amended (43 U.S.C. 390b), will promptly develop a water conservation plan containing definite goals, appropriate water

conservation measures and a schedule for meeting the water conservation objectives.

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

7.11B Passage

Bonneville

- 7.11B.1 After consultation with the fish and wildlife agencies, the tribes and the Bureau of Reclamation, and upon approval by the Council, 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.
- 7.11B.2 Upon approval by the Council, fund a study to determine the feasibility of re-establishing runs of anadromous fish above Cle Elum Dam. If results of the study indicate that restoration is feasible, Bonneville shall fund the construction of fish passage facilities at Cle Elum Dam.
- 7.11B.3 Fund the construction of fish passage facility projects included in the two highest-priority groups established by the Yakima Passage Technical Work

Group approved by the Council. Construction will begin with the highest priority facilities as established by a predesign memorandum and the Yakima Passage Technical Work Group. The Yakima Passage Technical Work Group may substitute projects from lower-priority groups for projects in groups 1 and 2 based on information developed or circumstances encountered during design. The Yakama Indian Nation and the fishery agencies should continue to make efforts to secure cost-sharing funding for the construction of Yakima Basin fish passage facilities. Funding for the two unscreened projects on tribal land should be conditioned on the Yakama Indian Nation adopting a requirement that any future water diversions on tribal land are screened at the time the diversion is made.

7.11C Flows

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

Bureau of Reclamation and PacifiCorp

- 7.11C.1 Upon approval by the Council and in consultation with the Washington Department of Ecology, the Bureau of Reclamation should provide the minimum flows required for fish passage, spawning, incubation and rearing at Prosser and Roza dams and other locations in the basin. The Council encourages PacifiCorp to work with the Washington Department of Ecology, fish and wildlife agencies and tribes to provide

such flows at the Wapatox Project. The Council will specify minimum flow requirements and the location of flow control and monitoring points after evaluating the results of the instream flow studies.

Council

- 7.11C.2 Until the results of instream flow studies are available, the Council will support the establishment of interim flows upon receipt of proposals from the fish and wildlife agencies and tribes, especially the Yakama Indian Nation. Those proposals will identify specific flow control and monitoring locations and information on the adequacy and safety of the recommended flows.
- 7.11C.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, fish and wildlife agencies and tribes.

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Section 8

SALMON HARVEST

Because of the critical status of some salmon stocks and the need to realize the benefits of changes in hydropower system operations and other restoration efforts, the number of salmon harvested must be further limited to allow a sufficient number of adult fish to return to spawn. In addition, the status of some populations is unknown. Until more information is available for these fish populations, conservative harvest strategies are needed. Those salmon that return, called the “escapement,” must do so in large enough numbers to rebuild the populations, not just to sustain current low numbers.

Control of harvest, therefore, is a critical component in building a long-term, sustained increase in runs. That simple concept is the only thing that is simple about harvest. Harvest control is complicated by the fact that regulations fall under a number of jurisdictions, that there are mixed-stock fisheries and that the demand for harvestable salmon generally exceeds the supply.

Harvest has been shaped by decades of negotiations between the United States and Canada and by extensive litigation that has involved ocean, inriver, treaty and non-treaty fisheries.

A 1985 treaty between the United States and Canada provides for international management of stocks that migrate through the waters of both nations. The Pacific Salmon Commission, formed under that treaty, makes recommendations to both nations on the conduct of salmon fisheries. The treaty reduced interceptions of salmon returning to Northwest rivers. Stocks of chinook salmon, particularly upper river bright fall chinook from the Columbia River, benefited from the overall ceiling on chinook harvested in Canadian and Alaskan fisheries.

Importantly, the interception of Columbia River salmon by British Columbia is directly related to the interception of salmon of Canadian origin in U.S. fisheries (Alaska and Washington). Further reductions in the Canadian interception of Columbia River stocks will require northern

Washington and Alaska fisheries to reduce interception of Canadian salmon stocks. Parties to the treaty met in 1994 to discuss revisions. An opportunity to further reduce the interceptions of weak stocks of Columbia River chinook salmon was lost due to a failure to agree on mutual reductions.

The Pacific Fishery Management Council manages salmon fisheries from three to 200 miles off the coast. State regulations that extend to three miles offshore must be consistent with Pacific Fishery Management Council regulations. Since 1980, commercial and recreational fisheries have been constrained in both season length and allowable harvest. Salmon seasons off Alaska are regulated by the State of Alaska and must be consistent with Pacific Salmon Commission recommendations.

The Columbia River Fish Management Plan, developed as part of the agreement reached under *U.S. v. Oregon*, established a process that the Columbia River Treaty tribes and state management agencies use to regulate tribal and non-tribal fisheries in the river. The state of Idaho, the Shoshone-Bannock Tribes and others are not signatories to this agreement. The plan sets specific goals, timetables and methods for cooperative management of salmon and steelhead stocks, including both natural and hatchery fish production and allocation of harvests.

The Columbia River Compact is the forum used to set commercial fishing regulations in the river. Congress ratified the agreement between Oregon and Washington for the regulation, preservation and protection of fish in waters over which the states share jurisdiction. The state of Idaho and the Indian tribes are not members of this compact. While the individual states set their own sport fishing regulations for the river, these regulations must complement previous agreements for conservation and allocation of other fisheries.

All the tribal governments involved in salmon and steelhead harvest have regulations to control and manage the harvest in tribal commercial,

ceremonial and subsistence fisheries. These regulations are coordinated with state regulations and must also be consistent with conservation and allocation agreements.

In this harvest section, the Council makes no claim to regulatory authority. It clearly recognizes the fishery managers' jurisdiction and tribal treaty rights, and no measure is intended to affect or modify these rights. The Council also acknowledges that there has been substantial progress in harvest management over several decades, and that declines in harvest levels have come at considerable economic cost to tribal, coastal and inland communities.

Nevertheless, additional measures are necessary if the region is to meet its long-term goal of biological diversity by rebuilding weak runs and if it is to provide sustainable and adequate harvest levels for tribal, sport and commercial fisheries.

One of the major challenges harvest managers face is that the fisheries in both the ocean and mainstem Columbia River are mostly mixed-stock fisheries (see Section 8.3 for additional discussion of mixed-stock fisheries).

Another difficult and related problem is that there are more demands for salmon for harvest than there are harvestable fish. The fishing capability of commercial fleets is much larger than necessary to take the harvestable surplus of salmon each year. The recreational fishery also has grown over the years and is capable of harvesting large numbers of salmon. The large demand for salmon to harvest puts a great deal of pressure on the management systems to deliver the maximum number of fish for harvest. Inadequate information and budgets, and the variable nature of salmon, the environment and the fishing fleets -- all make it extremely difficult to precisely manage harvest impacts on weak stocks.

In the Columbia River Basin, the problem associated with mixed-stock fisheries results partially from operation of an increasing number of hatcheries. The mixed-stock fishery problem cannot be resolved without implementing a harvest management program that coordinates harvest of production from different areas and also is consistent with both hatchery and natural production. The solution also requires the development and implementation of

complementary programs to increase the productivity and survival of wild and naturally spawning stocks throughout their life cycle. It is the Council's belief that progress in improved stock identification and in technology that permits selective fisheries has the potential for allowing greater harvest of strong stocks and greater protection of weak ones. Regional fisheries interests are particularly urged to press for additional gains in both areas.

The Council has developed measures in this section that call for:

- Development of a program that will help fishery managers identify weak stocks so that they can be afforded better protection in mixed-stock fisheries.
- Improvements in data bases and models used to evaluate and estimate fishery impacts.
- Ongoing review and revision of sport and commercial fishing regulations in areas where weak stocks are found.
- More complete accounting of salmon harvest in general and, in particular, as a bycatch in fisheries for other species.
- Improved law enforcement to reduce illegal taking of salmon, and public education programs that explain the impacts of illegal or wasteful fisheries.
- Development of marking and alternative capture technology that will allow unmarked wild and naturally spawning salmon to be released safely.
- Development of terminal (known stock) harvest opportunities in the Columbia River and tributaries to allow harvest of stronger stocks while minimizing impacts on weak ones.

The Council believes the measures in this section can and should be implemented by the Pacific Salmon Commission, Pacific Fishery Management Council, Columbia River Compact

and other existing state and tribal management entities.

The Council also believes that the state of Idaho and the appropriate Columbia River Basin tribes, if they believe their membership is appropriate, should be included in the Columbia River Compact.

8.1 DEVELOP HARVEST GOALS AND ESCAPEMENT OBJECTIVES

8.1A Management Goals and Escapement Objectives

Fishery Managers

- 8.1A.1 Expedite the development and/or re-evaluation of management goals¹ and spawning escapement objectives.² Harvest should be managed to meet rebuilding targets (see Section 4.3), recognizing the statistical quality of the run forecast and the uncertainties associated with escapement objectives. Failure to establish and manage for spawning escapement objectives will jeopardize Council support for future funding of production and habitat measures in the Council's program.
- 8.1A.2 Revise the Columbia River Fish Management Plan to provide explicit protection for Snake River chinook and sockeye salmon populations.
- 8.1A.3 Revise the Pacific Fishery Management Council's Salmon Plan to specifically

¹ Management goals specify the management intent for the stock and the number of fish needed to fulfill this intent. Management goals also define the population management units that may be evolutionarily significant units, stocks or collections of stocks.

² Escapement objectives specify the number of fish, either as a single number or a range, required to spawn to fulfill the biological requirements of the population management unit and achieve the management goal over the long term. Escapement objectives should incorporate the concepts of minimum viable population and effective population size and accommodate the uncertainty and variability in biological productivity and environmental conditions.

account for needs of listed salmon in the Columbia River.

8.1B Rebuilding Schedules

Fishery Managers

- 8.1B.1 Develop and/or review and revise, as necessary, escapement objectives and rebuilding schedules as stated in Sections 4.3 and 8.1A.1. Harvest managers should especially consider how existing harvest management and legal agreements can be modified to assist with achievement of the rebuilding targets. The development of rebuilding schedules for weak stocks will require the identification and annual achievement of survival targets at a number of stages throughout the life cycle of specific weak stocks.

All Parties

- 8.1B.2 Assist in the development of rebuilding schedules that consider all sources of mortality.

8.1C Consultation

Fishery Managers

- 8.1C.1 Consult with the Council during April of each year on the consistency of harvest management with the rebuilding schedules and escapement objectives of the fish and wildlife program. The consultation will address:
- the extent to which exploitation rates, escapement objectives and management goals were achieved during the previous year's harvest season;
 - the extent to which proposed regulations for the coming season are expected to achieve exploitation rates, escapement objectives and management goals; and

- a status report on management goals, escapement objectives and rebuilding schedules for weak stocks.

8.2 ADOPT EXPLOITATION RATES AND REGIMES

While there is need to reduce harvest to facilitate rebuilding in the short term, there is also an urgency to move forward with salmon marking programs and to develop selective fishing gear and terminal harvest opportunities to increase harvest over the long term while protecting weak stocks of salmon. Fishery managers should look for ways of providing incentives to further reduce harvest and accelerate the shift to selective fisheries. This section provides managers with targets, but does not prescribe means to achieve them. The management agencies should have maximum flexibility to be creative and work with various fishing interests to come up with workable harvest strategies that will meet not only escapement objectives, but also existing and future Indian treaty requirements and non-treaty allocation, economic and social objectives.

Fishery managers should adopt more conservative and adaptive approaches in developing harvest management strategies recognizing the statistical quality of the data and variability of the environment, the fish populations and the seasonal distribution of fishing effort.

8.2A Harvest Management

Management of harvest depends heavily on the ability to forecast the number of fish available to each fishery for a given season. Managers have developed various methods for making these forecasts. However, because of the number of complex factors that determine the population size of any geographic point and the amount of available information, the accuracy of these forecasts is relatively poor. The amount of information, and consequently the accuracy of the forecast, improves as fish approach the spawning ground. Fisheries in the Columbia River are managed with more reliable information on population size than are fisheries in the ocean, for example.

Conversely, the first opportunity to harvest fish occurs furthest away from the spawning ground. The first fisheries, in the ocean, are managed with the least information on fish abundance, while the later fisheries are managed with greater precision. Managers rely on the ability to successively restrict later fisheries to correct for errors in the management of early fisheries.

If the errors in the forecasts are such that the early fisheries harvest at too high a rate for the actual population size, then the in-river fisheries are more heavily restricted. If the errors in the forecast are large enough, it also happens that the spawning escapement suffers and insufficient fish return after harvest to meet spawning goals.

An example of this in the Columbia River is fall chinook. Columbia River fall chinook are harvested in ocean fisheries off the coasts from Alaska to Oregon. Regulations for these fisheries are usually set in the spring prior to the summer harvest season. These regulations are based in part on abundance predictions for various key populations in the areas of the fisheries. The predictions are based on historical information and expectations of year class strength. The fish that remain after harvest enter the Columbia River in August. At this time, managers have an idea of the abundance based on the success of the ocean fisheries. As a result, the Columbia River Indian and non-Indian harvest is set. If the ocean harvest success was not as expected the previous spring, then in river seasons are necessarily restricted. The lower-river, non-Indian fishery occurs first. Prior to the Indian fishery in zone 6, managers have a relatively precise idea of the population size based on dam counts at Bonneville and the success of the ocean and lower river fisheries. If necessary, the Indian fishery might have to be further restricted. The result is that the fishery where managers have the best information on acceptable exploitation rates, the tribal fishery in zone 6, is the most restricted, while the fishery for which managers have the least information, the ocean fishery, is the least restricted. Especially in recent years, managers have overestimated the population size early in the year. The result is either conflict over the management of inside fisheries or the reduction of escapement.

The Council urges that an alternative is to apportion the degree of restriction of harvest based on the amount of information available to manage each fishery. In this case, the ocean fishery would be managed more conservatively to allow for likely error in the forecasts. As the information on abundance improves closer to the spawning grounds, the exploitation rates could be set with increasing precision. Most importantly, the burden of management error is shifted from the resource and its escapement needs, to the managers and harvesters. The result should be more accurate management and a greater probability of meeting escapement needs.

Fishery Managers

- 8.2A.1 Adopt a management approach that more adequately spreads the risk of imprecision and error in predicted run size. Enact more conservative harvest limits on fisheries furthest from the spawning grounds for which information is less adequate.
- 8.2A.2 Implement harvest regimes that protect critical brood stock as part of a comprehensive effort to rebuild specific weak runs. Harvest reductions are of particular importance to protect weak stocks currently in the ocean. Manage harvest as outlined here to help meet escapement and management objectives.
- 8.2A.3 Document how exploitation rates were calculated and develop a standard for expressing exploitation rates that can be used for assessing impacts on future fisheries. Select an appropriate base period for the calculation of historical exploitation rates as a standard to which future exploitation rates can be compared. This information should be made available as part of the unified report called for in this section.

8.2B Sockeye

Fishery Managers

- 8.2B.1 Manage the fisheries to allow only limited tribal ceremonial and subsistence sockeye harvest below the confluence of the Snake and Columbia rivers to facilitate ongoing emergency efforts to rebuild the Snake River population. Commercial fisheries should not be allowed below the confluence until the Snake River sockeye run is rebuilt to a level where the population could support some incidental harvest without jeopardizing rebuilding efforts. The Council also understands that the *U.S. v. Oregon* parties are committed to rebuilding these runs and, when appropriate, will use the *U.S. v. Oregon* Management Plan's emergency modification provisions to assist rebuilding. Relevant parties should consult on the potential to target commercial sockeye fisheries in the Columbia River above the confluence of the Snake River, while respecting tribal treaty rights.

8.2C Fall Chinook

Fishery Managers

- 8.2C.1 Snake River fall chinook have been harvested in numbers too high to allow rebuilding even with a reduction of human-induced mortality at other life stages. In the base period 1984-1990, exploitation rates ranged from 62 percent to 74 percent (averaging 69 percent). Fisheries affecting Snake River fall chinook should be managed to provide harvest at an exploitation rate no greater than 50 percent. These fisheries include those falling under the jurisdiction of the Pacific Salmon Commission and Pacific Fishery Management Council, as well as fisheries within the Columbia River Basin.
- 8.2C.2 The Council strongly urges that fisheries affecting Snake River fall chinook be further reduced below the specified 50 - percent exploitation rate using the measures described below and calls upon fishery managers to aggressively implement these actions. The Council will

closely monitor rebuilding of the fall chinook runs and harvest constraints to ensure that harvest constraints are contributing their appropriate share to rebuilding.

8.2C.3 Establish annually an exploitation rate schedule lower than 50 percent in the near term, over all fisheries affecting Snake River fall chinook. The allowable exploitation rate in any given year should be directly linked to measures of recent productivity and recent and projected escapement. The schedule should aim to restore runs consistent with the Council goal to levels that can sustain spawning escapement objectives and healthy fisheries.

8.2C.4 The Council urges the appropriate state and federal entities to seek significant and immediate reductions in Canadian exploitation rates for Snake River fall chinook through the Pacific Salmon Commission process. Fishery managers will need to work closely with the Pacific Salmon Commission and the Pacific Fishery Management Council to achieve the needed adjustments in ocean harvest of stocks of concern.

8.2C.5 Continue closure of ocean salmon fisheries, which began in 1994, in Pacific Fishery Management Council's area of jurisdiction, as needed to protect severely depressed Snake River fall chinook. Call on Canada and Alaska to implement similar closures in fisheries intercepting Snake River fall chinook.

8.2D Spring Chinook

Fishery Managers

8.2D.1 The Council recognizes the efforts of the fishery managers and harvesters to reduce the catch of upriver spring chinook that began in 1976. Relevant parties should

continue to manage the Columbia River harvest of spring chinook according to *U.S. v. Oregon*, after it is appropriately modified as detailed in 8.1A.2. Keep impacts of the non-treaty inriver fisheries at about 4 percent of the upriver run, the 1987-1991 average.

8.2D.2 Intensify monitoring of ocean fisheries to ensure that exploitation rates are as low as believed and that incidental harvest remains low, about 2 percent or less of the upriver run. Include information on spring chinook exploitation rates in the unified report detailed below.

8.2E Summer Chinook

Fishery Managers

8.2E.1 The Council recognizes that there have been no commercial target fisheries for summer chinook since 1964, and that the tribal ceremonial and subsistence and non-treaty incidental catches of summer chinook have been fewer than 1,000 and 100 fish each year, respectively, since the mid-1980s. Continue to manage for this level of impact until the populations rebuild sufficiently to allow a higher incidental exploitation rate. Subsequently, manage the Columbia River harvest of summer chinook according to *U.S. v. Oregon*.

8.2F Voluntary Harvest Reduction For All Fisheries

Bonneville, Fishery Managers and Commercial Fishers

8.2F.1 Design and implement a "fish bank" program (similar to a farm bank where farmers are paid not to farm) to

temporarily reduce harvest by leasing available fishing permits and/or licenses.

Washington, Oregon, Bonneville and Regional Utilities

- 8.2F.2 Develop and fund a voluntary commercial fishing permit buy-back program for non-treaty Columbia River commercial fisheries. The program should be limited to two to four years. The goals of the program are generally to: 1) reduce fishing capacity on the river; 2) respond to dislocations resulting from more restrictive harvest regulation; 3) encourage shifting to selective and/or terminal harvest practices using improved marking and selective harvest technologies as they are identified and become available; and 4) promote sound management, conservation and protection of the resource. Oregon and Washington should retire any permits bought out under this program, and no substitute permits should be issued in their stead.

Fishery Managers

- 8.2F.3 Reduce harvest level proportionately from that achieved under Sections 8.2B through 8.2E, above. To determine the level of reduction, use historical catch over a specific time or other criteria as the managers deem effective, feasible and fair (for example, use the average documented landings for the previous five-year period).

Bonneville

- 8.2F.4 Develop a compensation plan including criteria for qualifying for and continuing in the program. Continue the program through 1995. Review its effectiveness annually with the Council.
- 8.2F.5 Fund the planning and implementation of the program upon Council approval.

Fishery Managers

- 8.2F.6 Using the *U.S. v. Oregon* or other appropriate harvest management forum, design and implement by January 1, 1996 harvest strategies that will allow weak stocks saved specifically through reductions in fishing capacity or intensity to “pass through” inriver fisheries to the spawning grounds.

8.3 DEVELOP ALTERNATIVE HARVEST OPPORTUNITIES

One of the major challenges harvest managers face is that there are mostly mixed-stock fisheries in the mainstem Columbia River, as well as in the ocean. This means fishers harvest a mixture of hatchery-produced and naturally produced stocks from many different areas of origin. Hatchery-produced fish generally can withstand a higher exploitation rate than most naturally produced fish. However, fishers in mixed-stock fisheries are generally unable to harvest specific stocks selectively. Thus, naturally produced stocks and weaker hatchery stocks are often harvested at rates appropriate for stronger stocks. The result is over-fishing of weaker stocks.

To allow harvest of stronger stocks, some incidental take of weaker stocks is inevitable in most fisheries. Fishery managers use the best available data to estimate incidental harvest under different fishing regimes. Fishing seasons and quotas are then set on the basis of acceptable impacts on weaker stocks.

To speed the rate at which weak stocks rebuild and to provide opportunities to harvest stronger stocks over the long term in the Columbia River, it is essential that development and evaluation of live-catch fishing technologies and known-stock fisheries be started immediately. Opportunities for selective harvest in ocean fisheries are more limited and will depend on better knowledge of the distribution of various stocks in the ocean (see Section 8.4).

8.3A Live-Catch Technology and Known-Stock Fisheries

Bonneville and Appropriate Federal Agencies

- 8.3A.1 To the extent practical, the Council supports enhancement activities geared toward stocks that contribute to adequately managed fisheries. This policy is intended to protect ratepayers from investing in major capital construction facilities that contribute to fisheries where there is harvest at levels exceeding those in this program or where the release of fish would aggravate mixed-stock fishery problems.
- 8.3A.2 Fund the fishery managers and fishers to develop and implement plans to evaluate the feasibility of live-catch fishing technologies and known-stock fisheries by 1995. Include a detailed analysis of incentives to encourage known-stock fisheries, including direct subsidies for known-stock fisheries in lieu of -- not in addition to -- mixed-stock harvest in the mainstem Columbia River. Consult with the Council prior to implementation and annually on progress.
- 8.3A.3 Share the cost on a 50/50 or other mutually agreed basis for the needed research and model development to improve accuracy and precision.

8.3B Selective Harvest Technologies

This measure develops and evaluates capture technologies to increase harvest of abundant fish stocks and minimize effects on depleted salmon stocks. The gear should minimize mortality of fish that are to be released.

Bonneville

- 8.3B.1 Fund pilot projects to demonstrate the feasibility of various methods to selectively harvest abundant stocks while conserving weak stocks. This effort should provide for participation by harvesters in the development of new methods and address such questions as public acceptance of the proposed technology, number and location of possible fishing sites, legislative changes needed to apply the proposed technology and the means of selecting harvesters for participation in the fishery.

8.3C Terminal Harvest Fisheries

This measure calls for identification and development of terminal fishing opportunities to harvest abundant stocks while minimizing the incidental harvest of weak stocks.

Bonneville

- 8.3C.1 Fund a study to evaluate potential terminal fishery sites and opportunities. This study should include: general requirements for developing those sites (e.g., construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest); the potential number of harvesters that might be accommodated; type of gear to be used; and other relevant information needed to determine the feasibility and magnitude of the program, including experimental release of fish.

- 8.3C.2 Devise and carry out a joint strategy to create terminal fisheries operations able to meet all operating costs and repay a portion of capital invested from assessments on increases in fishers' harvest income. The strategy should address: means of accumulating the capital investment necessary to upgrade and expand operations in Youngs Bay and elsewhere; identification of further site opportunities for terminal fisheries and testing feasibility; performance of the underlying economic analysis (costs, projected returns, level of boat assessment required, other income sources) needed to support federal and state investments; and benefits realized in the form of reduced harvest pressure on weak Columbia River salmon stocks. Report to the Council by December 31, 1995, on actions taken and investment capital committed to at least one terminal fishery project of significance.

8.4 STOCK IDENTIFICATION

8.4A Expand Genetic Stock Identification Sampling

Fishery Managers

- 8.4A.1 Develop and implement an expanded genetic stock identification program for monitoring inriver and ocean fisheries as needs are identified. Review the proposed program with the Council by June 30, 1995, prior to implementation.

Bonneville, States and Appropriate Federal Agencies

- 8.4A.2 Ratepayers, states and the federal government should share the cost on an equal or other mutually agreed basis for expanding the program to achieve the desired level of information needed.

8.4B Improve Genetic Stock Identification Data Base

Fishery Managers

- 8.4B.1 Determine the need for further development of a genetic stock identification data base for Columbia River stocks. Evaluate the potential for using DNA "fingerprinting" and other methods to identify chinook, coho, chum, sockeye and steelhead stocks in the Columbia River Basin. Review findings and recommendations with the Council by June 30, 1995.

Bonneville

- 8.4B.2 Fund the genetic stock identification program upon Council approval.

8.4C Marking Hatchery Salmon

The inability to easily identify hatchery fish exacerbates several problems. For example, concerns have been raised that stray hatchery fish may interbreed with wild and naturally spawning stocks, or with other hatchery stocks, with detrimental genetic impacts. To protect Snake River fall chinook, which have been listed as threatened under the Endangered Species Act, it has been proposed that all fall chinook released from hatcheries with histories of significant straying be marked. In addition, it is not generally possible to distinguish hatchery salmon from wild and naturally spawning salmon in mixed-stock fisheries. Finally, because not all hatchery salmon are marked, data on migration patterns, contribution to fisheries and other biological traits that, if known, could be used to improve survival, are limited.

Marking all hatchery salmon has the potential to help solve these problems, making it possible to identify stray hatchery fish and remove them from wild and naturally spawning populations and from other hatchery brood stocks, to harvest hatchery fish selectively, affording some protection to naturally spawning stocks, and allowing better data to be gathered on characteristics of hatchery stocks. However, some important concerns need to be addressed. For example, marking fish is believed to decrease their survival, perhaps

considerably. In addition, conflicts with use of the fin clip to identify coded-wire tagged fish need to be resolved.

Fishery Managers

8.4C.1 Continue to identify and report to the Council concerning hatcheries known to have relatively high rates of straying, whose strays are believed to be a threat to the integrity of wild and naturally spawning or hatchery stocks. Identify, if possible, an acceptable mark for fish from these hatcheries that complements existing marking programs.

Bonneville

8.4C.2 Continue to fund a program to mark all salmon from hatcheries having high stray rates, using the mark determined by fishery management agencies to be acceptable for this purpose, and to evaluate the effectiveness of such marking.

8.4C.3 Fund fishery managers to coordinate with appropriate technical experts to determine the feasibility of marking all hatchery salmon. Scope the marking program and identify alternative uses for the information obtained. The marking program should minimize mortalities caused by marking and meet the following criteria: 1) the mark should be applied without handling individual fish or causing significant stress; 2) the mark should endure throughout the life cycle of the fish; 3) the mark should be readable without killing the fish bearing the mark; and 4) the methods should be inexpensive enough to permit the marking, sampling and processing of a representative sample of recovered marks at a reasonable cost. Conduct this evaluation in conjunction with the evaluation in measure 8.4C.1, above. Specifically, the information should provide answers to questions needed to resolve conflicts between hatchery programs and goals for wild and

naturally spawning fish stocks, and improve hatchery fish survival. Report to the Council by February 1, 1995.

8.4C.4 Share funding of externally marking Willamette River spring chinook to allow identification of adults upon return to the Willamette Basin. Such marking will allow differential harvest of underutilized hatchery fish and identification of the current population size of wild and naturally spawning spring chinook in the basin.

Bonneville and Fishery Managers

8.4C.5 Mark all hatchery-reared chinook by 1995 to facilitate selective harvest in the future, pursuant to findings from the marking feasibility called for in 8.4C.3.

8.4D Improve Stock Abundance Prediction Methods

Fishery Managers

8.4D.1 Develop expanded marking and catch sampling programs as required for ocean and inriver fisheries where Columbia River weak stocks are caught. By May 1, 1995, review with the Council the magnitude and cost-effectiveness of any expansion in the existing marking and catch sampling programs prior to implementation.

Bonneville and Appropriate Federal Agencies

8.4D.2 Share the cost on a 50/50 or other mutually agreed basis for expanding marking and sampling programs to improve precision of additional coverage.

Fishery Managers

8.4D.3 Identify and implement research and model refinements needed to improve pre-season and in-season estimates of abundance and fishery impacts. Report on the planned work to the Council by January 1, 1996 prior to implementation.

Bonneville and U.S. Department of Commerce

8.4D.4 Share the cost on a 50/50 or other mutually agreed basis for the needed research and model development to improve accuracy and precision.

8.4E Assess Genetic Implications of Harvest

Harvest strategies affect not only the quantity of salmon reaching the spawning ground, they can also affect the genetic composition of the surviving fish. The age of maturation is inheritable in salmon, and many, if not most, fisheries are size selective, i.e., larger and older fish are targeted. The result is that fewer adults from older age classes will make up the spawning population.

This has two interrelated effects. Not only are some genetic components of the population eliminated through time, but productivity decreases because smaller fish have fewer eggs. Sustainable salmon populations and fisheries require that fishing strategies and escapement objectives provide comprehensive protection to the salmon populations as genetic resources. The fishery managers need to determine how this might be accomplished. In the interim, exploitation rates should be conservative.

Appropriate Federal Agencies

8.4E.1 Fund the necessary studies, including, but not limited to, literature search, simulation modeling, and monitoring and evaluation of proposed fishing strategies, in order to pursue the goal of reducing genetic impacts of harvest.

8.5 PURSUE OTHER HARVEST MEASURES

8.5A Review Sport Fishing Regulations

State Fishery Agencies

8.5A.1 Re-examine sport fishing regulations, including trout fishing regulations, in weak stock areas and adopt catch-and-release regulations, closures or other measures as needed to protect depressed populations. Periodically review changes in sport fishing regulations with the Council.

8.5B Account for Incidental Harvest of Salmon

Pacific Fishery Management Council and North Pacific Fishery Management Council

8.5B.1 Report to the Northwest Power Planning Council on the incidental harvest of Columbia River salmon in other fisheries under their respective jurisdictions. Review with the Power Council the magnitude of the interceptions and potential for limiting or reducing such interceptions, including the use of guidelines for incidental harvest in those fisheries. Incidental catches should be estimated and the number of salmon caught applied toward the appropriate salmon harvest quota.

8.5B.2 Report on the number and weight by species of catches that are returned to the water or otherwise disposed of in commercial fisheries. As part of the report, make proposals to reduce such waste where it is having adverse effects on Columbia River populations of salmon and steelhead.

8.5C Law Enforcement and Public Education on Impacts of Illegal or Wasteful Fisheries

Tribal, State and Federal Government Agencies, Including the Departments of State and Commerce, as well as Other Public and Private Parties

- 8.5C.1 Use all available authorities to put a rapid end to all high seas drift-net fisheries. The Council commends Congress for its prompt ratification of the United Nations resolution calling for an immediate, general abandonment of drift netting.

Bonneville and Appropriate Tribal, State and Federal Enforcement Agencies

- 8.5C.2 Develop and implement an expanded enforcement program to provide additional protection to Columbia River salmon and steelhead with an emphasis on weak stocks throughout their life cycle. The program should include an educational component for the public. Fund the needed program, and review accomplishments and scope of the program annually with the Council.

8.5D Inclusion of Idaho and Indian Tribes in Columbia River Compact

States and Congress

- 8.5D.1 Enact legislation to include Idaho and appropriate Columbia River Basin tribes, if they deem their membership appropriate, in the Columbia River Compact.

8.5E Unified Reporting of Harvest Data

Reporting of commercial and sport salmon harvest, as well as dam passage information and spawning surveys, is scattered among a variety of jurisdictions. This information is needed by the Council, all of the involved agencies and tribes, and the public, all of whom must expend substantial effort to gather the information each year.

Pacific States Marine Fisheries Commission

- 8.5E.1 Prepare and circulate a unified report by June 1 of each year on harvest and escapement of various salmon and steelhead stocks in the Columbia Basin. Utilize the Coordinated Information System in preparing the report.

National Marine Fisheries Service

- 8.5E.2 Fund the development, printing and distribution of the Unified Harvest Report.

8.5F U.S. and Canada Pacific Salmon Treaty

While the absolute number of Snake River fall chinook taken by Canadian ocean fisheries is small because the population is depressed, it represents a large proportion of the population and the number of Snake River fall chinook harvested. About 40 percent of the ocean harvest of Snake River fall chinook is estimated to be taken in Canadian fisheries. The fisheries also catch large numbers of Washington Coastal and Puget Sound coho that are from stocks that are generally depressed.

The treaty placed a ceiling on relevant Alaskan and Canadian chinook fisheries. That particular portion of the treaty expired in 1992, and chinook

provisions to the Treaty have been negotiated on an annual basis ever since. The negotiations have been proceeding on two tracks. One track deals with management and conservation issues (e.g., chinook harvest ceiling). The second track concerns the equity issue (balancing salmon interceptions so that the country of origin receives the benefits from rebuilding and enhancement efforts) .

The Canadian government has made it clear from the very beginning that progress on the management and conservation issues cannot occur without progress on the equity issue. They believe they are entitled by the treaty to reap the benefits of their fisheries restoration efforts in Canada.

It is generally believed that resolution of the equity issue is going to require the involvement of the Department of State and other senior Administration officials because state-level U.S. negotiators have not been able to agree on harvest reductions in U.S. fisheries. Until those hard decisions are made, Canada can continue to harvest Columbia River and Washington coastal and Puget Sound stocks, perhaps at levels above the ceiling provided in the expired annex of the treaty.

The conservation and equity questions can not be separated. A reduction in the Canadian interception of U.S. weak stocks will be tied to reductions in harvest by U.S. fisheries on robust Canadian stocks. Some of the Canadian stocks being intercepted by U.S. fisheries, such as the Fraser River sockeye, are actually increasing in abundance.

Council

8.5F.1 Consult with the Administration in Washington, D.C. on possible steps to resolve the conservation and equity issues.

8.5F.2 Inform the U.S. State Department that status quo or increasing exploitation rates in Canadian salmon fisheries catching Columbia River fish negates many of the sacrifices and investments being made in the Columbia River Basin restoration efforts. In addition, the federal government trust responsibility for the Columbia River Indian Treaty Tribes is not being met. An important part of the Indian treaties guaranteed tribal fishing rights. For the tribes and other non-treaty fishers in Washington and Oregon, fishing was almost non-existent in 1994 and is likely to remain at very low levels for the foreseeable future.

U.S. State Department

8.5F.3 Intensify efforts in the government-to-government discussions with Canada to resolve the equity issue. Assemble a meaningful equity package for negotiations with Canada. Seek to achieve an agreement on equity and conservation prior to the next harvest season.

Council

8.5F.4 Absent further reductions in harvest in Canadian fisheries, call on the fishery managers to make further reductions in domestic fisheries.

8.5F.5 Consult with fishery managers to see if there are opportunities to increase the production of other stocks to provide a buffer to Snake River stocks in the intercepting fisheries, assuming that harvest ceilings are retained.

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Section 9

MITIGATION FOR ADVERSE EFFECTS OF SALMON AND STEELHEAD MEASURES

9.1 SHARE THE COSTS

Fulfillment of the Northwest Power Act mandate to “protect, mitigate and enhance” the anadromous fish resource of the Columbia River Basin will impose costs throughout the region. All river users will have to share in making sacrifices if significant progress is to be made in rebuilding salmon and steelhead runs. At the same time, maintaining the economic health of the basin also is vital to the Northwest.

The Council intends to work closely with the National Marine Fisheries Service, appropriate state and federal agencies and members of affected groups in its evaluation of these issues. The Council seeks to work cooperatively with these agencies concurrent with, but on a broader scale than that required by the Endangered Species Act. The Council sets an ambitious schedule for a regional mitigation program meant to give as much lead time as possible to state and federal legislators for acquiring needed funding.

In the case of costs borne by the power system, the means of spreading the impact are readily available. In other cases, smaller industries and communities often have no way to spread their costs or pass them along. A regional effort to mitigate should be directed particularly at these groups, including the salmon fishing industry, irrigators, recreational users, navigation interests and their customers. Among the members of affected groups, the level of impacts and ability to bear them will vary widely. In developing mitigation strategies, the Council believes the region should give special consideration to small, family-owned businesses and farms.

In general, the Council takes the position that those who use the river should bear a share of the costs of measures needed to rebuild fish stocks affected by a given use. The Council is aware, however, that many river users based their decisions to invest and engage in economic

activities, including the design of their facilities and practices, on prevailing river management practices. In some instances, designs were based on assurances from federal agencies of “normal” practices, which may no longer be followed under new river operation strategies.

At a minimum, and consistent with the needs of the fish, these users should be afforded a reasonable transition period to adjust from the old ways of doing business to the new. Without such a transition time, costs and dislocations may be unnecessarily harsh. The Council will identify instances where federally granted facility permits did not preserve the full range of specified operating levels for federal reservoirs.

Regional and/or national means for financing the costs of transition should be sought. Favorable terms should be provided, such as extended repayment schedules, buydowns of interest, subordinated debt instruments, loan guarantees or even outright grants-in-aid. Creative approaches, such as using energy savings to finance new, higher-efficiency irrigation pumps, should be explored and implemented.

Any long-term drawdown program must permit: 1) irrigation of crops; 2) sufficient time for irrigators to redesign and replace their pumping systems, extend their pipes or make other changes; and 3) provision of costs for these changes by the region or Congress prior to drawdown.

Regionalizing costs should not mean simply turning to Bonneville as the region’s “deep pocket” for meeting mitigation needs. Such an approach would be neither sufficient for the region’s needs nor equitable to Bonneville’s customers. The states have the means of absorbing some costs, and other mechanisms must be found or devised.

There is an additional federal role to play in mitigation. While most costs should be borne in the region, the Endangered Species Act is federal

legislation, and regional actions to comply with it address national, as well as regional, priorities. In developing mitigation strategies, federal agencies should be assigned an appropriate share of the responsibilities and costs.

9.1A Salmon Recovery Economic Transition and Renewal Panel

States and Tribes

9.1A.1 By March 1, 1995, designate appropriate representatives with experience in economic development and transition issues to form a salmon recovery economic transition and renewal panel. This panel should assemble existing information on the potential community and economic impacts from salmon rebuilding measures. The panel should draw from the work of the National Marine Fisheries Service Economics Task Force, the University Task Force, the System Operations Review, Council staff reports and others. By June 30, 1995, report to the Council the scope of any needed additional information to anticipate the consequences to communities and industries from implementation of the measures in this program. If the gathering of this additional information will cause delay in the schedule below, inform the Council.

9.1A.2 Assemble from tribal and other sources estimates of economic and cultural losses of Columbia River Basin Indian tribes associated with the construction and operation of the federal hydropower system. Identify measures taken to date to mitigate or compensate for these losses.

9.1A.3 By October 31, 1995, develop for Council and regional review strategies to mitigate disproportionate impacts to communities and industries from implementation of salmon rebuilding measures. In

developing these strategies, consider the following issues:

- Proportion of impacts: Develop a standard to distinguish impacts representing a generally equitable share of the region's costs for rebuilding salmon populations from impacts out of proportion to an equitable share of costs. Recommend the application of this standard to the estimated economic and cultural losses to tribes since construction of the federal hydropower system.
- Objectives for mitigation: Define measurable criteria for achieving proposed levels of economic mitigation.
- Scope of mitigation: Address capabilities for defining and mitigating impacts to customers, suppliers and service providers.
- Duration: Address a means to distinguish between interruptions of or shifts in economic activities and permanent losses. Propose strategies to address each.
- Priorities: Address a method to set priorities for assistance with consideration for uncompensated or unmitigated losses to tribes since construction of the hydropower system
- Economic gains from implementation of salmon rebuilding measures: It is likely that some communities and industries will enjoy increased economic activity as a result of implementing salmon rebuilding measures. Propose policies to address the ability of such entities to share in the funding for a regional mitigation strategy.

9.1A.4 Review available funding sources for economic transition and renewal

strategies. Propose alternatives for funding such activities and the needed actions to obtain funding from those sources.

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Section 10

RESIDENT FISH

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

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

As with anadromous fish, reservoir manipulation may interfere with the flows needed for resident fish spawning, incubation, emergence, rearing and migration. In addition, reservoir manipulations impair the environment for spawning, incubation and rearing of some reservoir-inhabiting species. For example, discharging water from a reservoir lowers the reservoir water level, which may deprive fish eggs of the water they need, diminish the food supply, crowd fish into a smaller aquatic living space, and change water temperatures both above and below the dam.

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

interest include kokanee, bull trout, burbot, redband trout and west slope cutthroat trout.

This section of the program addresses resident fish losses caused by hydropower development and operation as well as substitutions of resident fish to compensate for losses of salmon and steelhead in areas permanently blocked by hydropower projects. A major challenge in protecting, mitigating and enhancing resident fish, as well as anadromous fish and wildlife, is assembling a program that resolves potential conflicts among demands for power generation and other resource development activities, the need for flows for anadromous and resident fish, and a healthy reservoir environment for resident fish. The Council is confident that the measures contained herein, and those that will be added over time, will achieve this necessary balance.

Under the Council's program, limits will be developed on the drawdown of certain reservoirs, and minimum flow requirements will be set to protect fish and their habitat. Other measures call for using storage water to maintain appropriate water temperatures, streambed protection, artificial propagation, and a variety of studies on fish habitat and on the impacts of hydroelectric operation. The Council has also approved resident fish substitution projects that will contribute to these efforts.

10.1 RESIDENT FISH GOAL: RECOVER AND PRESERVE HEALTH OF NATIVE RESIDENT FISH INJURED BY HYDROPOWER SYSTEM

The program goal for resident fish is to recover and preserve the health of native resident fish injured by the hydropower system, where feasible, and, where appropriate, to use resident fish to mitigate for anadromous fish losses in the system. Accomplishing this goal will require participation of many parties whose practices now

adversely affect the health of the ecosystem, including, but not limited to, hydropower facility operators. The responsibilities of such operators will take into account the losses and gains at each hydropower project to determine whether net losses have occurred.¹ Credit will be given for past mitigation actions associated with the project. Achieving this goal will necessitate basinwide coordination among all resident fish projects and with other basin activities to ensure consistency with the program's systemwide approach. Preference will be given to resident fish activities that address losses at hydropower facilities for which an assessment of losses and gains is completed and approved by the Council. However, this preference should not affect ongoing activities.

10.1A Mitigation Objectives, Rebuilding Schedules, Survival Targets and Performance Standards

The Council believes that elements of the framework concept outlined in Sections 2 and 4 need to be applied to resident fish as well as to salmon and steelhead. For this reason, the Council calls for the identification of resident fish mitigation objectives and, to the extent appropriate, associated rebuilding schedules, survival targets and performance standards. An effective monitoring program should also be developed. This approach should ensure that resident fish actions taken under the program identify and achieve expected results.

Fishery Managers

10.1A.1 Complete assessments of resident fish losses and gains related to construction and operation of each hydropower facility throughout the Columbia River Basin and submit to the Council for approval by the end of 1995. Use

¹ Gains could include those found at the project site (i.e., in the reservoir or immediately below the dam) and also those found away from the project site (e.g., where reservoir raises the water table in the surrounding area and forms pothole lakes amenable to resident fish production).

existing loss estimates, where available, and prepare assessments in a consistent manner. Include assessment of and proposed crediting approach for ongoing and past mitigation activities at each project. Also identify proposed objectives including, to the extent appropriate, associated rebuilding schedules, survival targets, performance standards and monitoring activities for mitigation of losses at each facility.

Bonneville

10.1A.2 Fund the fishery managers' efforts to complete assessments of resident fish losses throughout the Columbia River Basin.

10.2 IMPLEMENT RESIDENT FISH POLICIES

10.2A Priorities

Relevant Parties

10.2A.1 The Council has the following priorities for Columbia River Basin resident fish. These priorities should be fully considered in addressing resident fish losses related to development and operation of the hydropower system.

- Accord highest priority to weak, but recoverable, native populations injured by the hydropower system, as such populations are identified for the Council by the fishery managers.
- Accord high priority to areas of the basin where anadromous fish are not present.
- Accord high priority to resident fish projects that also provide benefits for wildlife and/or anadromous fish.
- Accord high priority to populations that support important fisheries. This priority applies to introduced and native species, including trout,

sturgeon, kokanee, burbot, bass, perch and others.

10.2B Natural and Artificial Propagation

Artificial propagation is used for increasing or introducing fish populations. But these activities must be pursued carefully, because artificial propagation can detrimentally affect the long-term sustainability of native and introduced species that exist in the area where stocking occurs. Concerns include competition, predation and interbreeding with existing resident and anadromous species, especially native, naturally produced, species. A full discussion of these types of concerns occurs in Section 7.1. The Council believes that many of the actions called for in that section should also be applied to resident fish. These actions are outlined below.

The Council calls on all relevant parties to complete the following measures to address natural and artificial propagation for Columbia Basin resident fish species. Implementation will require a different scope of activities and level of effort depending on the type of propagation being employed.

For instance, a thorough and comprehensive approach to conserving genetic diversity is needed for native species. At the other end of the range, non-native species stocked for harvest without any expectation that they will reproduce naturally have minimal genetic diversity requirements. Within this range lie the genetic diversity needs of non-native populations introduced with the intent to encourage natural production. Considering the range addressed above, implement the following in a manner that avoids unnecessary delay and redundancy. To expedite implementation, where the following are substantially addressed under the National Environmental Policy Act and/or relevant state environmental policy acts, consider that process to be in compliance with this section. In addition, completion dates identified for this section are intended to discourage unnecessary procedural delays.

Relevant Parties

- 10.2B.1 Address resident fish as well as anadromous fish in developing a plan for conserving genetic diversity as called for in measure 7.1D.1. Complete plan addressing resident fish and submit to the Council by June 30, 1995.
- 10.2B.2 Address potential impacts on resident fish, where such impacts exist, in developing basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1. Complete guidelines and submit report to Council by December 31, 1994.
- 10.2B.3 The team of scientific experts that addresses hatchery impact assessment and basinwide hatchery operating guidelines called for in measure 7.2A.5 should address resident fish as well as anadromous fish.
- 10.2B.4 Regional Assessment of Supplementation Project activities called for in Section 7.3A.1, should address resident fish as well as anadromous fish.
- 10.2B.5 Measures addressing new program initiatives called for in Section 7.4A and measures 7.4A.1, 7.4B.1 and 7.4C.1, should apply to resident fish as well as anadromous fish.

10.2C Comprehensive Watershed Management

Good habitat is important for resident fish, just as it is for anadromous fish. The degraded condition of resident fish habitat in the Columbia River Basin often rivals that of anadromous fish. For this reason, the program provisions noted in Section 7.7 (Cooperative Habitat Protection and Improvement with Private Landowners) should also apply to resident fish. The Council believes comprehensive, cooperative watershed management is essential to making good

investments in protecting, mitigating and enhancing resident fish in the basin.

Relevant Parties

10.2C.1 Implement Section 7.7 of this program to also apply to resident fish, including the model watershed provisions, where applicable.

10.2D Project Implementation and Selection

The Council expects that measures listed in the resident fish section of the program will be implemented and that these measures will increase resident fish populations. In this regard, the Council calls for the Annual Implementation Work Plan to include a list of ranked resident fish projects demonstrating that the program is being implemented. Proposed actions that deviate from the program should be clearly marked and an explanation of the need for deviation provided. The Council will evaluate the proposed work plan and, if necessary, will consider amendments to this section to ensure that resident fish measures are implemented

The Council recognizes that over time, the desirability of implementing certain projects may change. Likewise, desirable projects that are not currently foreseeable may become evident over time. Proposals for amendment of the program to address these situations can be submitted to the Council. Each proposed project should address and include:

- documented or agreed upon on resident fish losses attributable to the hydroelectric facility at issue;
- adaptive management principles by defining the anticipated results in terms of hypotheses to be tested (in quantitative terms if possible) and appropriate monitoring and evaluation to determine whether and why those results have been achieved;
- a description of the extent to which the project complements activities of fish and wildlife agencies and tribes;
- compliance with the policies set out in this program;

- likelihood of achieving significant biological results;
- an assessment of trade-offs with anadromous fish and wildlife activities;
- a management plan with sound biological objectives;
- consultation and coordination with interested parties;
- estimated costs and a schedule for implementation and evaluation; and
- information on the extent to which it meets the standards of the Northwest Power Act.

Relevant Parties

10.2D.1 By December 31, 2003, implement resident fish projects currently identified in the program.

10.3 RESIDENT FISH MEASURES

10.3A Hungry Horse Dam Resident Fish Mitigation

Bureau of Reclamation

10.3A.1 To aid reproduction of kokanee in the Flathead River and to aid rearing of other fish species and invertebrates, operate Hungry Horse Dam to provide the following instantaneous flows in the Flathead River at Columbia Falls.

- Flows not less than 3,500 cubic feet per second or more than 4,500 cubic feet per second from October 15 through December 15. The 4,500 cubic feet per second cap may be exceeded if kokanee are not present at the spawning sites. Coordinate with Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes to determine when this restriction may be lifted.
- A minimum flow for incubation of at least 3,500 cubic feet per second

provided 24 hours per day from December 15 through April 30.

- A minimum flow for emergence of 3,500 cubic feet per second provided 24 hours per day during the period from May 1 through June 30.
- A minimum flow of at least 3,500 cubic feet per second provided 24 hours per day from July 1 through October 15 for rearing of bull trout, cutthroat trout and mountain whitefish, and for aquatic invertebrate production.

10.3A.2 Report monthly to the Council the hourly average river flows. Include an estimate of the costs in megawatts and dollars to the hydropower system associated with meeting these flows. Modify the required flows when requested by the Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes for study purposes.

10.3A.3 Implement the integrated rule curves for Hungry Horse Reservoir submitted to the Council in July 1994 by the Confederated Salish and Kootenai Tribes and the Montana Department of Fish, Wildlife and Parks. Limits on drafting set in the curves should be met in all years. However, exceeding the limits for local flood control is allowed provided that the Council, the Confederated Salish and Kootenai Tribes and the state of Montana are notified prior to drafting, and the reservoirs are not incurring additional flood control responsibilities that have historically been provided by other projects. Exceeding the limits for power purposes is also allowed, but is contingent upon approval by the Council, the Confederated Salish and Kootenai Tribes and the state of Montana. Deviations from the limits will require mitigation as prescribed by the tribes and states, approved by the Council and called for in Sections

10.3A.7 and 10.3A.8. Requests to exceed the limits should be submitted at least 60 days prior to drafting below the limits.

The intent of this measure is to improve historic dam operational practices to provide more favorable biological conditions for resident fish in the reservoir and affected river reaches and to help balance conditions for anadromous and resident fish so that the recovery of one is not pursued at the expense of the other.

Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks

10.3A.4 Continue to refine integrated rule curves to limit drawdown of Hungry Horse Reservoir to protect resident fish. Prepare a review of the biological effectiveness of integrated rule curves including recommendations for refinement or continuance of the rule curves. Submit to the Council by September of 2005.

Council

10.3A.5 Review state and tribal summary and recommendations on the biological effectiveness of and implementation costs associated with integrated rule curves. Based on that review, determine if integrated rule curves should be continued as implemented, refined, or terminated.

Bonneville

10.3A.6 Continue to fund studies to evaluate the effect of Hungry Horse Dam operating procedures on resident fish. Prepare a summary of the costs incurred and adjustments made by the power system as a result of implementation of integrated rule curves.

10.3A.7 In years when the integrated rule curves are exceeded for power purposes at Hungry Horse Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by power operations.

Corps of Engineers

10.3A.8 In years when the integrated rule curves are exceeded for system flood control purposes at Hungry Horse Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by system flood control operations.

10.3A.9 If a conflict occurs between maintaining the minimum flows required by Section 10.3A.1 and maintaining reservoir levels required by Section 10.3A.3, consult with the Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks to determine which requirements are preferred.

Relevant Parties

10.3A.10 Treat as elements of this program all resident fish loss estimates identified in the Fisheries Mitigation Plan For Losses Attributable to the Construction and Operation of Hungry Horse Dam prepared by Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes.

Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes

10.3A.11 Implement the mitigation measures in the long-term implementation plan as approved by the Council in March 1993 and in subsequent amendments.

10.3A.12 Initially, limit hatchery supplementation activities called for in the implementation plan to kokanee only. Limit facilities for production of kokanee to those that are temporary and low cost. Use facilities to test the feasibility of increasing kokanee populations in the Flathead Basin. If kokanee populations can meet the criteria for determining success of kokanee reintroduction, as stated in the Hungry Horse Dam Fisheries Mitigation implementation plan, make recommendations to the Council for construction of permanent production facilities, if warranted. Limit supplementation activities for other species to research aimed at development and refinement of supplementation techniques for westslope cutthroat trout and bull trout. Submit recommendations to the Council regarding supplementation of these species based on results of this research.

10.3A.13 Implement habitat improvement projects in the implementation plan to be consistent with maintenance of the genetic integrity of native fishes and protection of species that are endangered, threatened, or of special concern that occur in the improved or newly accessible habitat. This concern is critical where passage over natural barriers is considered.

Bonneville

10.3A.14 Consult with the state of Montana and the Confederated Salish and Kootenai Tribes to explore alternative methods, including a trust agreement, for

financing the long-term, non-operational mitigation features of the implementation plan. Explore cost shares to fund aspects of the implementation plan, especially for projects that mitigate the effects of non-hydropower caused problems (e.g., man-caused passage barriers in reservoir tributaries, fencing of overgrazed riparian areas and sediment control projects). If the parties listed above reach agreement on a suitable method for financing, submit recommendations to the Council for approval. Fund the agreement upon approval.

Council

- 10.3A.15 The determination of losses and appropriate measures contained in the Hungry Horse Dam mitigation plan assumes that the operation of Hungry Horse Dam will be conducted in accordance with practices current as of 1992. Under those practices: 1) reservoir drawdown for power purposes is limited by Section 10.3A.3 of this program; 2) reservoir drawdown for flood control is conducted in accordance with the assignment of project flood control responsibility in effect prior to the 1992 operating year; and 3) no drawdown of the reservoir, other than proportional drafting for the existing water budget, takes place for the purpose of increasing downstream flows to benefit salmon and steelhead. In the event that any significant changes to current practices are undertaken, reopen this determination for the purpose of setting appropriate drawdown limitations to ensure that the mitigation measures contained in the plan remain adequate and effective.

Bonneville and Bureau of Reclamation

- 10.3A.16 Install a selective water withdrawal structure at Hungry Horse Dam to allow for temperature control to benefit

resident fish. Explore cost sharing for the structure.

Bureau of Reclamation; Confederated Salish and Kootenai Tribes; Montana Department of Fish, Wildlife and Parks; and Montana Power Company

- 10.3A.17 Coordinate the Kerr and Hungry Horse dams mitigation programs so that measures taken under these programs are consistent. Address Hungry Horse Dam operational issues in the System Operations Review. Address coordination of non-operational features of these programs in the Hungry Horse Dam resident fish implementation plan.

Bonneville

- 10.3A.18 Fund an Instream Flow Incremental Methodology study of the mainstem Flathead River from the South Fork confluence downstream to the river inlet on Flathead Lake. Include recommendations for seasonal ramping rates and allowable flow fluctuations to benefit westslope cutthroat and bull trout spawners and juveniles, and insect production.

10.3B Libby Dam Resident Fish Mitigation

Corps of Engineers

- 10.3B.1 Develop operating procedures for Libby Dam to ensure that sufficient flows are provided to protect resident fish in the Kootenai River and Lake Koocanusa. Require a minimum flow of 4,000 cubic feet per second. In years of extremely low runoff, provide no less than 3,000 cubic feet per second. Based on the best available historical record, and in consultation with the Montana Department of Fish, Wildlife and Parks; Confederated Salish and Kootenai

Tribes; Kootenai Tribe of Idaho; Idaho Department of Fish and Game; and the Council, include in the operating procedures a definition of “extremely low runoff” that will permit the 4,000 cubic feet per second requirement to be met to the fullest extent practicable. Until new procedures are adopted, operate Libby Dam under existing criteria.

- 10.3B.2 Implement the integrated rule curves for Libby Reservoir submitted to the Council in July 1994 by the Confederated Salish and Kootenai Tribes and the Montana Department of Fish, Wildlife and Parks. Limits on drafting set in the curves should be met in all years, however exceeding the limits for local flood control is allowed provided that the Council, the Confederated Salish and Kootenai Tribes and the State of Montana are notified prior to drafting and the reservoirs are not incurring additional flood control responsibilities that have historically been provided by other projects. Exceeding the limits for power purposes is also allowed but is contingent upon approval by the Council, the Confederated Salish and Kootenai Tribes and the State of Montana. Deviations from the limits will require mitigation as prescribed by the Tribes and States, approved by the Council, and called for in sections 10.3B.5 and 10.3B.6. Requests to exceed the limits should be submitted at least 60 days prior drafting below the limits.

The intent of this measure is to improve on historic dam operational practices to provide more favorable biological conditions for resident fish in the reservoirs and affected river reaches and to help balance conditions for anadromous and resident fish so that the recovery of one is not pursued at the expense of the other.

Confederated Salish and Kootenai Tribes; Montana Department of Fish, Wildlife and Parks; Kootenai Tribe of Idaho; and Idaho Department of Fish and Game

- 10.3B.3 Continue to refine integrated rule curves to limit drawdown of Libby Reservoir to protect resident fish. Prepare a review of the biological effectiveness of integrated rule curves including recommendations for refinement or continuance of the rule curves. Submit to the Council by September of 2005.
- 10.3B.4 Review state and tribal summary and recommendations on the biological effectiveness of and implementation costs associated with integrated rule curves. Based on that review, determine if integrated rule curves should be continued as implemented, refined, or terminated.

Bonneville

- 10.3B.5 Continue to fund studies to evaluate the effect of Libby Dam operating procedures on resident fish. Include a study of the effects of Libby Dam operations on reproduction and rearing of white sturgeon in the Kootenai River assessing, among other things, when and where fish are present, food requirements and sources, effects of pollutants, population recovery and propagation methods. Coordinate this work with Section 10.4. Prepare a summary of the costs incurred and adjustments made by the power system as a result of implementation of integrated rule curves.
- 10.3B.6 In years when the integrated rule curves are exceeded for power purposes at Libby Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by power operations.

Corps of Engineers

- 10.3B.7 In years when the integrated rule curves are exceeded for system flood control purposes at Libby Dam, immediately fund the mitigation of fish losses to the extent those losses are caused by system flood control operations.
- 10.3B.8 If a conflict occurs between maintaining the minimum flows required by Section 10.3B.1 and maintaining the reservoir levels required by Section 10.3B.3, consult with the Montana Department of Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes; Idaho Department of Fish and Game; and the Kootenai Tribe of Idaho to determine which requirements are preferred.

Bonneville and Corps of Engineers

- 10.3B.9 In cooperation with the state of Montana, evaluate and, if beneficial to resident fish, feasible, cost-effective under the Council's power plan, and in compliance with all applicable Montana and federal laws, fund adding three generators at Libby Dam. If feasible, such additions may allow the reservoir to fill during wet years earlier than otherwise and thereby maintain a higher pool level, possibly benefiting fish in the reservoir. Also, project spill could be reduced with benefits for fish in the Kootenai River downstream from the project. Include in the evaluation the following:

- Review the adequacy of existing ramping rates. No more than five generators could be used under any circumstances for peaking or load following. This limit is a result of historic proceedings that addressed this issue at Kootenai Falls and Jennings Rapids.
- Assume that operation of all eight units simultaneously would be strictly prohibited except during declared flood emergencies or for

demonstrated beneficial resident fish flow operations. At no time would the full capacity be available solely for power purposes.

- Operations are assumed to be an efficiency upgrade (i.e., existing non-power constraints would be met, volume releases would not be increased, and peaking and other operations would be constrained as needed to protect the resident fish resource and dependent ecosystems above and below the dam). The dam is assumed to remain a five-turbine project, albeit with operation of the newer turbines instead of the older units, and not as an eight-unit project.
- The project, when modified with additional units, will be expected to comply with present and future non-power constraints. Any additional generation produced by the project as a result of these changes would go to the federal Columbia River power system to be used to offset the investment in the project and other beneficial purposes as determined by the Bonneville administrator.
- Include analysis of costs, and impacts on fisheries, reservoir operations, water use and water quality.

Bonneville

- 10.3B.10 Fund the removal of materials that have accumulated in Kootenai River tributary deltas below Libby Dam as a result of the dam's construction and operation, because these materials interfere with the migration of spawning fish.

10.3C Dworshak Dam Resident Fish Mitigation

Idaho Department of Fish and Game, Nez Perce Tribe, National

**Marine Fisheries Service,
Bonneville, Bureau of Reclamation
and Corps of Engineers**

- 10.3C.1 In consultation with relevant entities, review the following measures and develop recommendations for appropriate actions to mitigate losses of resident fish caused by Dworshak Dam. Address provisions in the program's salmon sections and pertinent results of the System Operations Review in the recommendations. Report the results of this process to the Council within 90 days following adoption of this measure.

**Idaho Department of Fish and
Game and Nez Perce Tribe**

- 10.3C.2 Analyze methods to avoid or minimize entrainment of kokanee at Dworshak Dam including behavioral avoidance devices such as strobe lights, pneumatic hammers, bubble screens and sound generators.
- 10.3C.3 Implement annual mid-water trawling to further define the relationship between the fishery, kokanee densities and the water year.
- 10.3C.4 Implement annual kokanee spawner counts in appropriate creeks.
- 10.3C.5 Implement a genetic inventory in the North Fork Clearwater River drainage to determine the genetic status of the endemic westslope cutthroat trout population including genetic introgression of the westslope cutthroat trout population by introduced rainbow trout. Based on the study, make recommendations regarding further planting of rainbow trout in the North Fork drainage.

Bonneville

- 10.3C.6 Fund Idaho Department of Fish and Game and the Nez Perce Tribe to implement the above measures.

Corps of Engineers

- 10.3C.7 In coordination with appropriate fish and wildlife agencies and the Nez Perce Tribe, fund fish stocking activities in Dworshak Reservoir and in the North Fork of the Clearwater River upstream from the reservoir consistent with the Memorandum of Understanding between the Idaho Department of Fish and Game and the Corps of Engineers. Fund monitoring to determine the effects of the resident fish mitigation program on endemic fish populations, particularly westslope cutthroat trout upstream from Dworshak Dam.

**Corps of Engineers, Bureau of
Reclamation and Bonneville**

- 10.3C.8 Investigate the following in the System Operation Review process: 1) the feasibility of avoiding downward fluctuations in Dworshak reservoir pool level from June 1 through August 31 to prevent dewatering smallmouth bass spawning nests; 2) the feasibility of achieving normal full pool during June, if flood runoff forecasting allows, to avoid rising pool levels and associated temperature depressions in near shore areas when smallmouth bass are spawning; and 3) the feasibility of avoiding reservoir evacuation for winter flood control or hydropower prior to the September 1 date identified in the current flood control operating curve, to promote deposition of terrestrial invertebrates, an important food source for trout and smallmouth bass.

**10.3D Big Fork Hydroelectric
Project Resident Fish
Mitigation**

Pacific Power and Light Company

- 10.3D.1 Continue to operate the Big Fork Hydroelectric Project under provisions included in the project's Federal Energy Regulatory Commission license.

Montana Department of Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes; and Pacific Power and Light Company

- 10.3D.2 Examine mitigation alternatives to address losses of westslope cutthroat trout, rainbow trout, bull trout and kokanee in the Flathead River system caused by the Big Fork Hydroelectric Project.
- 10.3D.3 Continue to work together to ensure coordination of Big Fork Hydroelectric Project operations with Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes fish management objectives.

10.3E Other Projects**Bureau of Reclamation**

- 10.3E.1 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.
- 10.3E.2 Consult with the Oregon Department of Fish and Wildlife and affected irrigation districts to explore the potential for releasing surplus water when it is available from Owyhee, Warm Springs and Beulah reservoirs. Such releases would be made during the non-irrigation season to benefit downstream resident fish.
- 10.3E.3 Operate Grand Coulee Dam and Lake Roosevelt to provide no significant reduction in water retention times for June 15 through the end of September. For flow augmentation purposes, Lake Roosevelt may be drafted no lower than elevation 1,240 feet in May and 1,280 feet in June, July and August. This operation will constrain reductions in water retention times from those currently achievable. Develop additional scientific information on the benefits and need for a water retention time standard and submit to the Council in 1998. The Council will review and refine this measure based on anticipated submissions by the Columbia Basin Fish and Wildlife Authority in early 1995.

Federal Energy Regulatory Commission

- 10.3E.4 To maintain habitat conditions suitable for the survival of resident fish in Georgetown Lake, do not alter future operations of the Flint Creek project from past practices without considering and incorporating the multiple uses of the project, including the needs of the fish.

Montana Power Company

- 10.3E.5 Continue funding an evaluation of the Milltown Dam proposed operating procedures to determine whether they will protect resident fish downstream from the project. Include an analysis of suspended sediments, associated heavy metals and organic pollutants, as well as an evaluation of the potential effect of these pollutants on resident fish. Propose mitigation alternatives to the Council if the investigations reveal that an adverse effect on the fish will result from the proposed operation.

Bureau of Reclamation, Corps of Engineers and Other Project Operators

- 10.3E.6 In consultation with the Council, tribes, and fish and wildlife agencies, use storage, where existing structures allow, to maintain water temperatures within the best ranges for fish habitat.

10.4 STURGEON MITIGATION

Sturgeon were once abundant in the Columbia River Basin. Population levels in some areas of the basin have declined, thereby raising concern about the long-term sustainability of the species. The Council believes that studies and evaluations should be undertaken and completed quickly, and on-the-ground projects identified and implemented as soon as possible to address the needs of this species. In addition, these studies should be coordinated to avoid redundant work and to increase the potential for learning.

10.4A Study and Evaluate Sturgeon Populations

Bonneville

- 10.4A.1 Fund research to determine the impact of development and operation of the hydropower system on sturgeon in the Columbia River Basin. These studies may include: 1) habitat requirements, 2) maintenance of genetic integrity, 3) stock assessment, 4) potential for artificial propagation and 5) migration potential. Specific recommendations for the protection, mitigation and enhancement of sturgeon may be submitted to the Council upon completion of these studies.

- 10.4A.2 Fund the Umatilla Tribe, Nez Perce Tribe, Spokane Tribe and Colville Tribe to implement the sturgeon measures listed below.

Umatilla Tribe

- 10.4A.3 Prepare an evaluation, including a biological risk assessment (see Section 7.3B.1), of potential means of rebuilding sturgeon populations between Bonneville Dam and the mouth of the Snake River.

Nez Perce Tribe

- 10.4A.4 Prepare an evaluation, including a biological risk assessment (see Section 7.3B.1), of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams.

Spokane and Colville Tribes

- 10.4A.5 Perform a three-year base-line assessment of sturgeon in Lake Roosevelt from Grand Coulee Dam to the international border, including the Spokane River arm on the Spokane Indian Reservation. Include estimates of:

current population size, abundance of each age class, age/length frequency, recruitment rate, natural and fishing mortalities, distribution and migration patterns, harvest, life history, habitat usage, environmental factors affecting abundance and an assessment of the potential for artificial propagation. Submit recommendations from these studies to the Council.

10.5 BULL TROUT MITIGATION

Bull trout were once abundant in the Columbia River Basin. Population levels have declined in some areas, thereby raising concerns about the long-term sustainability of the species. The measures below call for studies and evaluations. The Council believes that these studies and evaluations should be undertaken and completed quickly, and on-the-ground projects identified and implemented as soon as possible to address the needs of this species. In addition, these studies should be coordinated to avoid redundant work and to increase the potential for learning.

10.5A Study and Evaluate Bull Trout Populations

Bonneville, Other Federal Agencies, States, Hydroelectric Project Owners and Other Entities as Appropriate

- 10.5A.1 Fund bull trout population and habitat surveys in the Middle Fork Willamette and McKenzie River systems and habitat improvements identified in the surveys to benefit bull trout.
- 10.5A.2 Fund a study of the status, life history, habitat needs and limiting factors for bull trout populations in the Deschutes, Grande Ronde, Hood, John Day and Umatilla subbasins.
- 10.5A.3 Fund the Confederated Salish and Kootenai Tribes and Montana

Department of Fish, Wildlife and Parks to initiate a comprehensive genetic sampling program for bull trout in the Flathead River Basin.

Confederated Salish and Kootenai Tribes and Montana Department of Fish, Wildlife and Parks

- 10.5A.4 Initiate a comprehensive genetic sampling program for bull trout in the Flathead River Basin to provide basic genetic information needed for rebuilding bull trout populations, including the use of supplementation for rebuilding purposes, as well as to identify non-lethal genetic sampling techniques.

10.6 OTHER RESIDENT FISH POPULATIONS

10.6A Rainbow Trout in the Clearwater River

Idaho Department of Fish and Game

- 10.6A.1 Provide information to the Council on whether habitat in the Clearwater River below its North Fork is suitable for rainbow trout. If the habitat is suitable and production of rainbow trout will not conflict with production of chinook salmon, provide a plan to stock the river with rainbow trout. Coordinate development of this plan with the Nez Perce Tribe and the National Marine Fisheries Service.

Bonneville

- 10.6A.2 Fund the program for stocking rainbow trout in the Clearwater River if it is found to be desirable.

10.6B Salmonids and Spiny-Rayed Fish in Pend Oreille River

Corps of Engineers

- 10.6B.1 Fund a study to evaluate the existing and potential salmonid and spiny-rayed fish and their habitat in the Pend Oreille River from Lake Pend Oreille downstream to Albeni Falls Dam. Coordinate this study with Idaho Department of Fish and Game, Washington Department of Fish and Wildlife and appropriate tribes. Submit recommendations based on results of these studies. Upon approval by the Council, fund recommendations.

10.6C Sturgeon and Burbot in Kootenai River

Bonneville

- 10.6C.1 Fund efforts to restore sturgeon and burbot populations in the Kootenai River. These populations are dependent on the productivity of fish habitats in the entire Kootenai River system including the Kootenay River and Kootenay Lake in British Columbia. Coordinate and share the cost of this measure with Canadian fishery managers.

10.6D Kokanee in Banks Lake

Bureau of Reclamation or Appropriate Irrigation Districts

- 10.6D.1 Fund maintenance of the barrier net system at the outlet from Banks Lake into the main irrigation canal to conserve the spawning population of kokanee in the lake.

10.6E Kokanee in Lake Pend Oreille

The Council has called for maintaining Albeni Falls at a level no lower than elevation 2,056, to

provide additional water for Columbia River salmon flows. As noted previously in Section 5.4D.7, the Corps of Engineers should keep the project at or above this level to provide these additional flows.

In addition, the Council recognizes that kokanee in Lake Pend Oreille have for 27 years been on a perilous decline. The Council has been presented with testimony from the fish managers and others that this decline, in all probability, is caused by reservoir drawdown below 2,056 feet. Other parties have suggested the decline could be caused by mysis shrimp, hatchery practices, low primary and secondary production or inadequate stream spawning habitat. The Council is concerned about the cause of the decline and about protecting the substantial ratepayer investment in key programs that have been developed at Lake Pend Oreille in past years. The Council calls for immediate action to address this problem.

Idaho Department of Fish and Game

- 10.6E.1 As part of Columbia River reservoir operation to improve salmon flows and in consultation with fishery managers and other interested parties, submit for Council review prior to implementation a study plan. The plan should investigate the effect of changing water level management of Lake Pend Oreille to benefit kokanee starting in the fall of 1995 as provided in "Studies for the Recovery of the Fisheries in Lake Pend Oreille, Idaho." Initiate the five-year study. Address as a part of the study the role of predators, zooplankton, mysis shrimp and thermal stratification on kokanee production. Determine the role of food availability for all age classes of kokanee. Determine predator abundance. Identify the dynamics of gravel deposit and movement, and monitor the location and quality of spawning gravel. Clean, deposit and/or push gravel into the lake and monitor gravel movement and larval kokanee and zooplankton abundance. Identify opportunities for increased production in Lake Pend Oreille

tributaries. Release various sizes of kokanee at various sites and track survivability. Investigate the feasibility, including biological consequences, of operating Cabinet Gorge Hatchery at capacity and either planting these fish directly into the lake or initiating a net pen rearing program. Document the response of Eurasian milfoil to lake level changes. Investigate potential impacts, conduct an independent survey of potentially impacted residents and determine liability if milfoil becomes established. During the study, monitor kokanee abundance and relate to all causative factors for increases or decreases. Also monitor mysis shrimp abundance, the quality and quantity of shoreline gravels for movement and food availability, predator populations in the littoral zones for impact on larval and juvenile kokanee, and predator populations in all parts of the lake to avoid a possible predator trap. During the term of the study: implement hatchery improvements identified in previous studies on Cabinet Gorge Hatchery while maintaining current kokanee production levels; maintain current harvest levels and policies; and increase law enforcement to protect the kokanee population. Submit results to the Council by December 31, 2000.

Bonneville and Corps of Engineers

- 10.6E.2 Fund the Lake Pend Oreille kokanee study.

10.7 PROVIDE AND EVALUATE USE OF SHORELINE VEGETATION

10.7A Vegetation Plantings

Bonneville, Other Federal Agencies, States, Hydroelectric Project Owners and Other Entities as Appropriate

- 10.7A.1 Fund test vegetation plantings at appropriate reservoirs and evaluate results. Appropriate reservoirs might include Hills Creek, Dworshak, Libby, Hungry Horse and others. Incorporate the results of shoreline vegetation studies at Revelstoke and other reservoirs into this test. Based on the results of the test plantings, fund a feasibility study to identify which hydroelectric projects in the basin would benefit from revegetation improvements. Submit results and recommendations of this feasibility study to the Council by December 31, 1997.

10.8 RESIDENT FISH SUBSTITUTIONS

Salmon and steelhead probably never will be able to return to some areas of the basin because of blockages by dams. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller blocked areas. In its analysis of the contribution of the hydropower system to salmon and steelhead losses (see Council documents 87-15, 87-15A and 87-15B), the Council has addressed the extent to which resident fish substitutions should be used to mitigate losses of salmon and steelhead production in these areas.

The Council has concluded that: 1) mitigation in blocked areas is appropriate where salmon and steelhead were affected by the development and operation of the hydroelectric projects; 2) to treat the Columbia River and its tributaries as a system, resident fish substitutions are reasonable for lost

salmon and steelhead in areas where in-kind mitigation cannot occur; and 3) flexibility in approach is needed to develop a program that complements the activities of the fish and wildlife agencies and tribes and is based on the best available scientific knowledge. For substitution purposes, resident fish may include landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

10.8A Resident Fish Substitutions Policy

Resident fish substitution projects will:

- address unmitigated losses of salmon and steelhead attributable to development or operation of hydropower projects;
- generally occur in the vicinity of the salmon and steelhead losses being addressed; and
- be consistent with program Section 10.2.

10.8B Above Chief Joseph Dam

Bonneville

10.8B.1 Fund the following resident fish substitution activities and projects in the blocked area above Chief Joseph Dam to mitigate partially for salmon and steelhead losses incurred as a result of the construction and operation of Chief Joseph and Grand Coulee dams.

Colville Tribe

10.8B.2 Operate and maintain the resident trout hatchery on the Colville Indian Reservation.

10.8B.3 Evaluate natural production of kokanee above Chief Joseph Dam including Nespelem River, Big Sheep Creek, Alder Creek, Deep Creek, Orapaken Creek, Onion Creek and the San Poil River. The purpose of this measure is to evaluate the

status of naturally producing kokanee, determine what measures are necessary to ensure self-sustaining populations and determine the feasibility of using these fish in the ongoing kokanee hatchery program in this area.

Coeur d'Alene Tribe

10.8B.4 Design, construct and operate a trout hatchery on the Coeur d'Alene Reservation. Implement and maintain habitat improvement projects. Implement a five-year monitoring program to evaluate the effectiveness of the hatchery and habitat improvement projects.

Spokane Tribe

10.8B.5 Operate and maintain kokanee salmon hatcheries at Galbraith Springs and Sherman Creek. Use the Sherman Creek hatchery as an imprinting site and egg collection facility to provide a source of kokanee fry for: 1) stocking into Banks Lake and 2) transferring to Galbraith Springs hatchery for rearing to fingerling size before planting into Lake Roosevelt. Coordinate decisions on hatchery production, stocking and outplanting locations through a three-member committee consisting of one representative each appointed by the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians and the Washington Department of Fish and Wildlife.

10.8B.6 Operate and maintain pilot projects for improving habitat and passage into and out of Lake Roosevelt tributary streams for rainbow trout. The aim of this measure is to emphasize natural production by: 1) facilitating passage of migratory rainbow trout between Lake Roosevelt and its tributary streams; and 2) improving fry and fingerling rearing habitat in these streams.

10.8B.7 Monitor to evaluate the effectiveness of the above measures. Include the following components: 1) a year-round creel census survey to determine angler use, composition and rates of catch, growth and condition of fish; 2) assessment of feeding habits of kokanee, rainbow and walleye and densities of their preferred prey; 3) comparison of rainbow trout adult and fingerling abundance in tributaries before and after habitat and passage improvements are made; and 4) a mark/recapture study designed to assess the effectiveness of different kokanee release and outplanting sites. Focus the study on kokanee migratory tendencies and distribution in Lake Roosevelt after their release and homing back to the outplanting sites during spawning migration. Continue the monitoring program at least through the year 2000.

Kalispel Tribe

- 10.8B.8 Design, construct, operate and maintain a warm water low capital bass hatchery on the Kalispel Indian Reservation.
- 10.8B.9 In collaboration with Washington Department of Fish and Wildlife, design, construct, operate and maintain habitat improvement projects to enhance bull trout and cutthroat trout in three demonstration tributaries of the Pend Oreille River: LeClerc, Cee Cee Ah and Skookum creeks.
- 10.8B.10 Working with the U.S. Forest Service and Washington Department of Fish and Wildlife, remove exotic brook trout in Cee Cee Ah Creek.
- 10.8B.11 In collaboration with Washington Department of Fish and Wildlife, design, construct, operate and maintain water control structures and repair dikes on the Pend Oreille wetlands wildlife mitigation project for the purpose of creating a bass nursery slough. Stock a

portion of the bass production from the Kalispel Tribal hatchery into this slough in an attempt to cut hatchery production costs because fry can prey on natural foods. Screen the water control structures to prevent access by reservoir species that prey on bass fry.

- 10.8B.12 Construct and place artificial cover structures to increase the amount of bass fry winter cover in the Box Canyon Reach of the Pend Oreille River.
- 10.8B.13 In collaboration with the Washington Department of Fish and Wildlife, conduct a four-year monitoring program to assess effectiveness of bull trout and cutthroat trout habitat improvements in tributary streams and hatchery supplementation of largemouth bass in the Pend Oreille River.

Kootenai Tribe of Idaho

- 10.8B.14 Operate and maintain a low-capital sturgeon hatchery on the Kootenai Indian Reservation. With Bonneville, explore alternative ways to make effective use of the hatchery facility year-round.
- 10.8B.15 Survey the Kootenai River downstream from Bonners Ferry, Idaho, to the Canadian border to: 1) evaluate the effectiveness of the hatchery, and 2) assess the impact of water-level fluctuations caused by Libby Dam on hatchery operations for outplanting of sturgeon in the Idaho portion of the Kootenai River.
- 10.8B.16 Perform a five-year base-line assessment of all fish stocks in the Idaho portion of the Kootenai River. Focus on those river reaches historically fished by the Kootenai Tribe of Idaho. Determine the current status of all fish stocks. Identify fisheries enhancement opportunities in the Idaho portion of the Kootenai River. Identify mechanisms to restore or

replace the Kootenai Tribe's historic kokanee, cutthroat trout, bull trout, rainbow trout and burbot fisheries in the tributaries of the Kootenai River. Upon completion of this survey, Kootenai Tribe of Idaho and Idaho Department of Fish and Game submit alternatives for fishery improvement to the Council.

Lake Roosevelt Forum

- 10.8B.17 Implement the rainbow trout net pen rearing program in Lake Roosevelt including: 1) operation and maintenance of 26 existing net pens; 2) procurement, operation and maintenance of 10 additional net pens; and 3) associated research and monitoring. As a condition of Bonneville funding, operation of the net pen rearing program will be coordinated and consistent with appropriate state and tribal fish management policies, including those addressing stock selection and release strategies. In addition, continue voluntary contributions and private sector funding as a cost-share for the net pen rearing program.

Fishery Managers

- 10.8B.18 Identify and study the feasibility of alternatives for preventing resident fish from being swept downstream out of Grand Coulee Reservoir. Alternatives could include sound guidance, light guidance, screens, modified project operations and others. Also, consider the need for hydro-acoustic fish tracking devices at the forebay and turbine intakes of the third powerhouse and at the turbine intakes of the main powerhouse at Grand Coulee Dam. Complete these studies and make recommendations to the Council by December 31, 1996.

Washington Department of Fish and Wildlife

- 10.8B.19 Upon satisfactory demonstration to the Council that there is not a better project in the blocked area above Chief Joseph Dam, determine the most feasible measures for enhancing desirable fish populations in Moses Lake. Include assessment of the current availability and use of spawning, rearing and cover habitats including hydrological and limnological factors associated with each as well as evaluating the age class structure, species composition and competition involved at each.

10.8C Above Hells Canyon Dam

The following resident fish substitution activities and projects in the blocked area above Hells Canyon Dam will partially mitigate for salmon and steelhead losses incurred in this blocked area as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Shoshone-Paiute Tribe

- 10.8C.1 Annually stock catchable and fingerling trout of the appropriate stocks in Duck Valley Indian Reservation lakes and streams.
- 10.8C.2 Review Duck Valley Indian Reservation surface water and groundwater suitability for resident fish production facilities.
- 10.8C.3 Evaluate alternative sources of catchable and fingerling resident fish.
- 10.8C.4 Analyze feasibility of developing an additional lake fishery at Coyote Sink.
- 10.8C.5 Implement, monitor and evaluate resident fish habitat improvement and protective measures at the Duck Valley Indian Reservation. Include the following habitat protection and

improvement measures: 1) management recommendations for reservoir pool levels; 2) reservoir rehabilitation measures for non-game fish and aquatic vegetation control; 3) reservoir inlet and outlet screening; 4) improvement of recreational fishing sites; 5) stream riparian zone restoration by planting vegetation, fencing overgrazed areas and stream bank stabilization; and 6) base-line water quality survey to assess contaminants that may affect trout populations.

- 10.8C.6 Acquire or construct a trout production facility and operate and maintain the facility for the production of trout for stocking on the Duck Valley Indian Reservation and elsewhere. Assess opportunities for joint production strategies with the Shoshone-Bannock Tribe, including the training of tribal members in fish culture.

Bonneville

- 10.8C.7 Fund the Shoshone-Paiute Tribe projects listed above.

Shoshone-Bannock Tribe

- 10.8C.8 Acquire or construct a trout production facility and operate and maintain the facility for the production of trout for stocking on the Fort Hall Indian Reservation and elsewhere. Assess opportunities for joint production strategies with the Shoshone-Paiute Tribe, including the training of tribal members in fish culture.
- 10.8C.9 Implement habitat restoration and enhancement activities in Spring Creek and Clear Creek along the Fort Hall Bottoms located on the Fort Hall Reservation.

Bonneville

- 10.8C.10 Fund the Shoshone-Bannock Tribe projects listed above.

Bonneville, Bureau of Reclamation, Idaho Power Company, Fish and Wildlife Managers

- 10.8C.11 In cooperation with other relevant entities as listed in Section 3.1D, develop and implement the subregional process for the area above Hells Canyon Dam. Immediately meet to identify an approach for developing the subregional process, as well as identify funding responsibilities for developing the process. The process will identify funding commitments for additional resident fish substitution projects by Bonneville, by Idaho Power Company through hydropower project relicensing activities, by the Bureau of Reclamation through operation and management responsibilities, as well as by other appropriate parties. Additional resident fish substitution projects may include propagation and release of kokanee and coho stocks into Lucky Peak and Cascade reservoirs. Include in this process the development of a comprehensive approach to coordinating anadromous fish, resident fish, and wildlife activities. Submit to the Council by December 31, 1994.

10.8D Above Dworshak Dam

Bonneville

- 10.8D.1 Fund the following resident fish substitution actions in the blocked area above Dworshak Dam to mitigate partially for salmon and steelhead losses incurred as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Nez Perce Tribe

- 10.8D.2 Develop, maintain and manage trout ponds within the Nez Perce Indian Reservation including: 1) physical improvement, physical maintenance, fishery monitoring and fish stocking of two existing trout ponds; 2) identification through site inventory and analysis of additional sites suitable for fish pond construction; 3) construction of six to 12 additional fish ponds depending on availability of suitable sites; and 4) physical maintenance, fishery monitoring and fish stocking of the additional fish ponds.

10.8E Above Pelton Dam

Bonneville and Portland General Electric Company

- 10.8E.1 Fund resident fish substitution projects above Pelton Dam on an equal-share basis. These projects will partially mitigate for salmon and steelhead losses in this blocked area as a result of the construction and operation of hydropower projects in the Columbia River Basin.

Warm Springs Tribe

- 10.8E.2 Determine how the crayfish population in Lake Billy Chinook fits into the altered ecosystem. Include specific objectives of determining sex, size composition, growth rate and size at maturity of the crayfish population; size, relative abundance, and seasonal movement of the crayfish population; potential availability as a significant food item, especially for bull trout; and management recommendations.

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Section 11

WILDLIFE

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

The habitat that was lost because of the hydropower system was not just land, it was home to many different, interdependent species. In responding to the system's impacts, we should respect the importance of natural ecosystems and species diversity.

While the development of the hydropower system harmed wildlife, it also resulted in a number of beneficial effects. For example, the creation of reservoirs provided important resting, feeding and wintering habitat for waterfowl. In addition, where reservoir storage is used for irrigation as well as power generation, the irrigation water promoted extensive growth of grass and food that could not otherwise exist in such a dry climate. These areas have provided important habitat for wildlife; on the other hand, a large body of scientific evidence shows that some of the species have not sustained initial population increases. Programs to protect, mitigate and

enhance wildlife affected by hydroelectric development should consider the net effects on wildlife associated with hydropower development.

Although the Northwest Power Act refers to them as "hydropower facilities," the dams serve multiple purposes: hydropower, flood control, navigation, irrigation, recreation and other purposes. Congress encouraged a comprehensive response to the fish and wildlife impacts of dams on the Columbia River and its tributaries, and rejected the piecemeal, fragmented approach that characterized past mitigation efforts. The Council believes the region will benefit from a coordinated approach to wildlife mitigation. At the same time, as Congress specified, consumers of electric power should pay only the cost of measures to deal with the effects of electric power. The Act gives Bonneville the responsibility to allocate expenditures to the various project purposes, in consultation with the Corps of Engineers and the Bureau of Reclamation and in accordance with existing accounting procedures.

The Council's program will address the full impacts of the "hydropower facilities" in the broad sense that Congress intended, including all effects traceable to any of the projects' purposes. Bonneville, in consultation with the Army Corps of Engineers and the Bureau of Reclamation, should allocate implementation costs, and develop any cooperative agreements needed to ensure coordinated and expeditious program implementation.

It is critical, however, that implementation of wildlife measures not be delayed by these allocations. Bonneville funding for the ratepayer share of wildlife mitigation should proceed expeditiously, pursuant to short-term agreements. There is no reason for ratepayer wildlife mitigation in the short term to wait for a determination of the financial responsibility of other project purposes. For the longer term, if there is no agreement on funding allocations,

the federal agencies should work with the Council and the congressional delegation to arrive at a solution.

11.1 WILDLIFE PROGRAM GOAL: FULLY MITIGATE FOR WILDLIFE LOSSES FROM HYDROPOWER IN THE COLUMBIA RIVER BASIN

The goal of this program's wildlife strategy is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by construction and operation of the federal and non-federal hydroelectric system.

11.2 WILDLIFE PROGRAM POLICIES

11.2A Ratepayer Share of Funding

Bonneville

11.2A.1 Through consultation with the Corps of Engineers, the Bureau of Reclamation, Wildlife Managers, state and federal land management agencies, tribes, utilities, the Council and other interested parties, allocate wildlife mitigation expenditures to the various project purposes in accordance with existing accounting procedures. Complete this process by July 30, 1994.

11.2A.2 In consultation with other responsible operators and managers, coordinate ratepayer-funded measures with measures to deal with impacts caused by non-electric power development and operations to develop a comprehensive coordinated wildlife mitigation strategy. The parties

should develop any cooperative agreements necessary to ensure coordinated and expeditious program implementation and should submit them to the Council for review and approval by December 1, 1994. Should the parties fail to develop agreements necessary to ensure coordinated program implementation, the Council will take the actions necessary to ensure such agreements are developed.

11.2A.3 Report to the Council yearly on progress to date on all coordinated wildlife mitigation activities.

11.2B Determine Allocation of Effort

**Bonneville, Corps of Engineers,
Bureau of Reclamation and
Wildlife Managers**

11.2B.1 Using the process described in 11.2A.1, determine the allocation of expenditures by the relevant federal entities needed to achieve full mitigation of wildlife losses attributable to the construction and operation of the federal hydroelectric facilities.

11.2C Definition of Mitigation

Relevant Parties

11.2C.1 For purposes of this program, mitigation is defined as achieving and sustaining the levels of habitat and species productivity for the habitat units lost as a result of the construction and operation of the federal and non-federal hydropower system.

11.2D Mitigation Plans and Agreements

Bonneville and Wildlife Managers

11.2D.1 In developing wildlife mitigation plans and projects, demonstrate the extent to which the plans comply with the following principles:

- Are the least-costly way to achieve the biological objective.
- Have measurable objectives, such as the restoration of a given number of habitat units.
- Protect high quality native or other habitat or species of special concern, whether at the project site or not, including endangered, threatened or sensitive species.
- Provide riparian or other habitat that can benefit both fish and wildlife.
- Where practical, mitigate losses in-place, in-kind. When a wildlife measure is not in-place, in-kind, the habitat units protected, mitigated or enhanced by that measure will be credited against mitigation due for one or more hydroelectric projects.
- Help protect or enhance natural ecosystems and species diversity over the long term.
- Complement the activities of the region's state and federal wildlife agencies and Indian tribes. In particular, state clearly how plans or projects would complement agency and tribal policies or programs to protect or enhance natural ecosystems and species diversity over the long term.
- Encourage the formation of partnerships with other persons or entities, which would reduce project costs, increase benefits and/or eliminate duplicative activities.
- Do not impose on Bonneville the funding responsibilities of others, as prohibited by Section 4(h)(10)(A) of the Northwest Power Act.
- Address special wildlife losses in areas that formerly had salmon and steelhead runs that were eliminated by hydroelectric projects (for example, societal and tribal wildlife losses).
- Address concerns over additions to public land ownership and impacts on local communities, such as reduction or loss of local government tax base, special district tax base or the local economic base; or consistency with local governments' comprehensive plans.
- Use publicly owned land for mitigation or management agreements on private land, in preference to acquisition of private land, while providing permanent protection or enhancement of wildlife habitat in the most cost-effective manner.

11.2E Mitigation Priorities

Bonneville and Wildlife Managers

11.2E.1 Ensure that wildlife mitigation projects implemented in fulfillment of this program are consistent with the basinwide implementation priorities described in Tables 11-1, 11-2 and 11-3, below.

<i>Table 11-1</i>	
<i>Lower Columbia Subbasin Wildlife Mitigation Priorities</i>	
Habitat Types--Target Species	Priority
Riparian/Riverine	High
● Great Blue Heron	
Old Growth Forest	High
● Northern Spotted Owl	
Wetlands	High
● Great Blue Heron	
● Band-tailed Pigeon	
● Western Pond Turtle	
Coniferous Forest	Medium
● Ruffed Grouse	
● Elk	
● American Black Bear/Cougar	

<i>Table 11-2</i>	
<i>Upper Columbia Subbasin Wildlife Mitigation Priorities</i>	
Habitat Types--Target Species	Priority
Riparian/River	High
● Bald Eagle (breeding)	
● Black-capped Chickadee	
● Peregrine Falcon	
Shrub-Steppe	High
● Sharp-tailed Grouse	
● Pygmy Rabbit	
● Sage Grouse	
● Mule Deer	
Wetlands	High
● Mallard	
● Redhead	
Islands	Medium
● White Pelicans	
Agricultural Lands	Low
● Swainson's Hawk	
● Ring-necked Pheasant	

<i>Table 11-3 Snake River Subbasin Wildlife Mitigation Priorities</i>	
Habitat Type--Target Species	Priority
Riparian/Riverine	High
• Bald Eagle (breeding)	
• Bald Eagle (wintering)	
• River Otter	
• Black-capped Chickadee	
• Peregrine Falcon	
• Ruffed Grouse	
Wetlands	High
• Mallard	
Native Grasslands and Shrubs	Medium
• Mule Deer/Elk	
• White-tailed Deer	
• Sharp-tailed Grouse	
Coniferous Forest	Medium
• Elk	
Old Growth Forest	Medium
• Pileated Woodpecker	
Lowland Forest	Low
• White-tailed deer	

11.3 IMPLEMENT WILDLIFE MEASURES

11.3A Identify Measures Based on Losses

Bonneville and Wildlife Managers

- 11.3A.1 Use the loss estimates in Table 11-4, as they may be adjusted by the Council after further deliberation on the Audit of Wildlife Loss Assessments, as the starting point for identifying wildlife measures and developing short-term and long-term wildlife mitigation agreements.

Council

- 11.3A.2 Within one year, adopt final loss estimates.

11.3B Cascade Hydropower Project

Bureau of Reclamation

- 11.3B.1 Within 90 days from the adoption of this program, fund a study to develop statements of wildlife and/or wildlife habitat losses at the Cascade hydro project. These statements shall take into account all existing information pertinent to the project area and shall address both realized and potential positive and negative effects. Loss statements shall be submitted to the

Council for review and adoption into Table 11-4.

11.3C Develop Statements of Habitat Losses and Gains Due to Hydropower Operation

Bonneville

- 11.3C.1 Fund studies to develop statements of wildlife and/or habitat losses and gains caused by the operation of the federal hydropower system. The studies should be designed to identify both direct and indirect operational losses and gains to fish and wildlife habitat and should be based on a written plan designed to promote consistency of results between and among projects and encourage early public and local involvement. To the extent practicable, the studies should rely on the information developed in the System Operation Review. The studies should be submitted for review and adoption into the program on or before December 31, 1996.

11.3D Crediting Existing Mitigation

Council

- 11.3D.1 In consultation with the wildlife managers, tribes, Corps of Engineers, Bureau of Reclamation and Bonneville, determine the amount of credit to be given for existing wildlife mitigation undertaken in association with the federal hydropower projects. The results of the determination shall be submitted to the Council by July 31, 1994.
- 11.3D.2 By September 1994, based on the results of the determination and the adjusted loss estimates (11.3A.1),

initiate an amendment process to amend the wildlife mitigation section of the program.

11.3E Credit for New Actions

Wildlife Managers and Bonneville

- 11.3E.1 Develop a consistent, systemwide method for crediting new wildlife mitigation actions, while reflecting the following principles:
- The Council endorses the use of habitat units as the preferred unit of measurement for mitigation accounting unless parties to an agreement develop another method that, in the Council's opinion, adequately takes into account both habitat quantity and quality adequate to mitigate for the identified losses.
 - The hydropower system must protect, mitigate and enhance wildlife to the extent affected by Columbia River Basin hydropower facilities. This obligation will be discharged when these effects are fully addressed, i.e., when mitigation actually offsets the loss caused by a hydropower facility. Mitigation agreements may predict a certain level of mitigation, as long as provision is made for monitoring and evaluation to determine if the predicted benefits were realized.
 - The Council recognizes that there are inconsistencies throughout the basin in how to determine the amount of credit given for acquisitions of habitat involving the protection of existing habitat. For example, under the Lower Snake Compensation Plan, the Corps has agreed to credit

acquisitions for habitat protection at half of the value given to enhancement-type projects, while in the Washington Wildlife Mitigation Agreement the ratio is dependent on the type of lands (public or private) and whether the mitigation is based on acres or habitat units. The Council calls upon Bonneville and the wildlife managers to jointly develop a consistent, systemwide method for addressing this issue.

- 11.3E.2 The Council recognizes some fish habitat projects provide benefits to wildlife as well as fish. Because of this, the Council calls upon Bonneville and the wildlife managers to develop a method for crediting wildlife benefits from fish projects.

11.3F Short-Term Agreements

Bonneville and Wildlife Managers

- 11.3F.1 To ensure that wildlife mitigation proceeds expeditiously, within 90 days following the adoption of this program consummate interim five-year agreements, similar to the interim Washington Wildlife Mitigation agreement, with the states of Idaho and Oregon and appropriate Indian tribes

Interested Parties

- 11.3F.2 If the parties are unable for any reason to reach agreement within this time frame, then by February 15, 1994, submit to the Council a list of wildlife mitigation projects for implementation. Each October 1, thereafter, submit to the Council a list of wildlife mitigation projects for implementation.

Council

- 11.3F.3 Select and approve those projects to be funded for a given fiscal year.

Bonneville

- 11.3F.4 Upon Council approval, fund the projects approved by the Council.
- 11.3F.5 Continue to fund ongoing wildlife mitigation projects and incorporate them into the interim agreements.

11.3G Long-Term Agreements

Bonneville, Corps of Engineers, Bureau of Reclamation and Wildlife Managers

- 11.3G.1 Within three years following the adoption of this program, develop long-term agreements for all wildlife mitigation. The following elements should be considered and addressed in the development of long-term agreements:

- Clear objectives (e.g., number of habitat units, acres and/or habitat types, sample projects with list of indicator species).
- Demonstration of how the agreement is expected to meet, exceed or fall short of wildlife loss assessments.
- Demonstration that the level of funding provided has substantial likelihood of achieving stated wildlife mitigation objectives.
- Demonstration of consistency with the Council's wildlife rule policies and standards.
- Incentives to ensure effective implementation of the agreement with periodic monitoring and evaluation (including an audit at

least every other year) to ensure progress and document successes and failures.

- Demonstration that the agreements do not impose financial liabilities on states or tribes for third party claims for additional mitigation. State/tribal liability should be limited to good-faith performance of the mitigation agreement and should not include the risk of financial or biological uncertainty.
- Criteria for re-evaluation or reopening to consider whether mitigation actually has been achieved.
- Provisions for public involvement during implementation (e.g., advisory council, hearings, etc.).

Council

- 11.3G.2 Before any agreement is signed, the Council will review the agreement in an open, public process, and determine whether it is consistent with this program.

11.3H Complete and Implement Snake River Compensation Program

The Corps of Engineers is in the final stages of implementing mitigation plans for the Lower Snake River Fish and Wildlife Compensation Plan. The Compensation Plan was authorized by Congress in 1976. The Corps has acquired 97 percent of the acreage called for in the plan and intends to acquire the remaining acreage by September 1994. Final habitat developments on acquired lands will be completed by September 1996. The Council believes that when complete, the wildlife portion of the Compensation Plan developed by the Corps will meet acreage/funding obligations mandated by

Congress. However, based on preliminary findings, the Council is concerned that the plan enacted by the Corps may not fully mitigate the habitat unit losses identified for the Lower Snake River hydroelectric projects. Accordingly, the Council will review the Corps' plan and, as outlined below, amend its program to address unmitigated wildlife losses associated with the Lower Snake River Projects.

Council

- 11.3H.1 Upon submission of the Corps final report, amend wildlife losses and mitigation credit for the Lower Snake River Fish and Wildlife Compensation Plan into the Columbia River Basin program.

Corps of Engineers

- 11.3H.2 Within 90 days following adoption of this program, the Corps will develop a process to more fully involve the Nez Perce Tribe. This involvement will include, if determined possible, funding, the Nez Perce Tribes' assistance and participation in analyzing mitigation credits associated with land acquisition and development under the Lower Snake River Compensation Plan. The Tribe will participate in the coordination of interagency meetings which may be necessary during the final stages of Compensation Plan completion. The Corps will coordinate with the appropriate agencies, tribes, Bonneville and the Council regarding activities related to completing work under the Compensation Plan. A preliminary summary of the losses and mitigation credit for the plan will be submitted to the Council by the end of December 1994.
- 11.3H.3 The Corps will complete wildlife mitigation as authorized under the Lower Snake River Fish and Wildlife Compensation Plan. Upon completion

of all activities in 1996, the Corps will submit a report to the Council documenting the work completed and the mitigation credited in terms of habitat units.

- 11.3H.4 The Corps will report any inconsistencies or delays to the Council regarding implementation of 11.3H.1. and 11.3H.2.

Bonneville

- 11.3H.5 Within 90 days following adoption of this program, report to the Council all costs reimbursed to the U.S. Treasury by Bonneville associated with the wildlife mitigation portion of the Lower Snake River Fish and Wildlife Compensation Plan. The Council will review this information and make further judgments, if appropriate, regarding Bonneville's ability to financially assist the implementation of 11.3H.2.
- 11.3H.6 Upon Council adoption of the loss estimates and the mitigation credit as submitted to the Council in 11.3H.1, fund implementation of the hydropower share of unaddressed mitigation according to Section 11.3F of the program. Highest priority should be given to unaddressed losses sustained by the Nez Perce Tribe and Yakama Indian Nation.

11.4 MONITOR AND EVALUATE WILDLIFE EFFORTS AT FEDERAL DAMS

The Council is interested in ensuring that mitigation actually occurs on the ground and accordingly is providing for monitoring to determine projected benefits to wildlife that result from the program.

11.4A Biennial Monitoring Report and Scientific Review

Bonneville

- 11.4A.1 Fund the coordinated preparation of a biennial monitoring report. The report should compile information on wildlife implementation, habitat units gained, and the status of wildlife populations. The report should reflect broad technical review and input, including the Council. The final report should be submitted to the Council by June 15, every other year.
- 11.4A.2 Fund an independent scientific review group to evaluate the progress and success of wildlife mitigation efforts.

11.5 MONITOR AND EVALUATE WILDLIFE EFFORTS AT NON-FEDERAL PROJECTS

Non-federal hydroelectric projects are licensed by the Federal Energy Regulatory Commission. The Electric Consumers Protection Act of 1986 (ECPA) mandates that the Federal Energy Regulatory Commission give equal consideration to the protection, mitigation of damage to, and enhancement of wildlife in licensing and relicensing decisions.

11.5A Mitigation Considerations in Dam Licensing Decisions

Federal Energy Regulatory Commission

- 11.5A.1 In developing license conditions, take into account to the fullest extent practicable the policies established in this section, and the measures taken by Bonneville and others to implement this section, and Section 12.1A.2 of this program. In particular,

it is important to take into account the mitigation projects at federal projects undertaken pursuant to this section, to ensure that license conditions are consistent with and complement these wildlife mitigation projects and contribute fully and proportionately to regional wildlife mitigation goals.

Council

- 11.5A.2 The Council will monitor the Federal Energy Regulatory Commission licensing and relicensing proceedings and comment or intervene where appropriate.

Table 11-4
Estimated Losses Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Albeni Falls	
• Mallard Duck	-5,985
• Canada Goose	-4,699
• Redhead Duck	-3,379
• Breeding Bald Eagle	-4,508
• Wintering Bald Eagle	-4,365
• Black-Capped Chickadee	-2,286
• White-tailed Deer	-1,680
• Muskrat	-1,756
• Yellow Warbler	+171
Anderson Ranch	
• Mallard	-1,048
• Mink	-1,732
• Yellow Warbler	-361
• Black Capped Chickadee	-890
• Ruffed Grouse	-919
• Blue Grouse	-1,980
• Mule Deer	-2,689
• Peregrine Falcon	-1,222 acres*
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Black Canyon	
• Mallard	-270
• Mink	-652
• Canada Goose	-214
• Ring-necked Pheasant	-260
• Sharp-tailed Grouse	-532
• Mule Deer	-242
• Yellow Warbler	+8
• Black-capped chickadee	+68

Table 11-4 (cont.)
Estimated Losses Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Palisades	
• Bald Eagle	-5,941 breeding
	-18,565 wintering
• Yellow Warbler/	-718 scrub-shrub
• Black Capped Chickadee	-1,358 forested
• Elk/Mule Deer	-2,454
• Waterfowl and Aquatic Furbearers	-5,703
• Ruffed Grouse	-2,331
• Peregrine Falcon*	-1,677 acres of forested wetland
	-832 acres of scrub-shrub wetland
	+68 acres of emergent wetland
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Willamette Basin Projects	
• Black-tailed Deer	-17,254
• Roosevelt Elk	-15,295
• Black Bear	-4,814
• Cougar	-3,853
• Beaver	-4,477
• River Otter	-2,408
• Mink	-2,418
• Red Fox	-2,590
• Ruffed Grouse	-11,145
• California Quail	-2,986
• Ring-necked Pheasant	-1,986
• Band-tailed Pigeon	-3,487
• Western Gray Squirrel	-1,354
• Harlequin Duck	-551
• Wood Duck	-1,947
• Spotted Owl	-5,711
• Pileated Woodpecker	-8,690
• American Dipper	-954
• Yellow Warbler	-2,355
• Common Merganser	+1,042
• Greater Scaup	+820
• Waterfowl	+423
• Bald Eagle	+5,693
• Osprey	+6,159

Table 11-4 (cont.)
Estimated Losses Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Grand Coulee	
• Sage Grouse	-2,746
• Sharp-tailed Grouse	-32,723
• Ruffed Grouse	-16,502
• Mourning Dove	-9,316
• Mule Deer	-27,133
• White-tailed Deer	-21,362
• Riparian Forest	-1,632
• Riparian Shrub	-27
• Canada Goose Nest Sites	-74
McNary	
• Mallard (wintering)	+13,744
• Mallard (nesting)	-6,959
• Western meadowlark	-3,469
• Canada goose	-3,484
• Spotted sandpiper	-1,363
• Yellow warbler	-329
• Downy woodpecker	-377
• Mink	-1,250
• California quail	-6,314
John Day	
• Lesser scaup	+14,398
• Great blue heron	-3,186
• Canada goose	-8,010
• Spotted sandpiper	-3,186
• Yellow warbler	-1,085
• Black-capped chickadee	-869
• Western meadowlark	-5,059
• California quail	-6,324
• Mallard	-7,399
• Mink	-1,437

Table 11-4 (cont.)
Estimated Losses Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
The Dalles	
• Lesser scaup	+2,068
• Great blue heron	-427
• Canada goose	-439
• Spotted sandpiper	-534
• Yellow warbler	-170
• Black-capped chickadee	-183
• Western meadowlark	-247
• Mink	-330
Bonneville	
• Lesser scaup	+2,671
• Great blue heron	-4,300
• Canada goose	-2,443
• Spotted sandpiper	-2,767
• Yellow warbler	-163
• Black-capped chickadee	-1,022
• Mink	-1,622
Dworshak	
• Canada goose-breeding	-16
• Black-capped chickadee	-91
• River Otter	-4,312
• Pileated Woodpecker	-3,524
• Elk	-11,603
• White-tailed deer	-8,906
• Canada goose-wintering	+323
• Bald eagle	+2,678
• Osprey	+1,674
• Yellow warbler	+119

Table 11-4 (cont.)
Estimated Losses Due to Hydropower Construction
(losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Minidoka	
• Mallard	+174
• Redhead	+4,475
• Western grebe	+273
• Marsh wren	+207
• Yellow warbler	-342
• River otter	-2,993
• Mule deer	-3,413
• Sage grouse	-3,755
Chief Joseph	
• Lesser scaup	+1,440
• Sharp-tailed grouse	-2,290
• Mule Deer	-1,992
• Spotted sandpiper	-1,255
• Sage grouse	-1,179
• Mink	-920
• Bobcat	-401
• Lewis' woodpecker	-286
• Ring-necked pheasant	-239
• Canada goose	-213
• Yellow warbler	-58

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Section 12

FUTURE HYDROELECTRIC DEVELOPMENT

Much of this program has focused on mitigating damage done to Columbia River Basin fish and wildlife by hydropower development and operations in the past. But the future is equally important. The Corps of Engineers and the Bureau of Reclamation continue to study the need for additional federal hydroelectric projects and to plan for new development in the basin. The Federal Energy Regulatory Commission has many permits and applications pending for hydroelectric development in Idaho, Oregon, Montana and Washington. Many of those applications and permits are for projects throughout the Columbia River Basin. Dozens of small or medium-sized hydroelectric projects are proposed for tributary drainage basins that contain important anadromous fish habitat. However, most new hydroelectric development will be accomplished by private or non-federal public entities licensed by the Federal Energy Regulatory Commission.

Many of the proposals are for hydroelectric projects that would produce less than 5 megawatts of electricity. Although individual small projects may have no significant adverse effects on the fish and wildlife resources of the basin, the cumulative effects of such development throughout a river basin could be quite harmful. These cumulative effects need to be taken into account fully.

The Council estimates that 4,600 stream miles of Columbia River Basin salmon and steelhead spawning and rearing habitat have been lost to development, not including losses of migration routes and of resident fish and wildlife habitat. Minimizing further habitat loss is especially important in view of the Council's goal of doubling salmon and steelhead runs in the Columbia River Basin consistent with system policies (see Sections 2 and 4). Development in critical fish and wildlife areas leads to divisive and expensive conflicts that the Council believes can be avoided through resource planning.

The Council finds that future hydroelectric developers in the basin should be required to mitigate harm to fish and wildlife and has adopted

program measures calling for such mitigation. New hydroelectric development has the potential to cause further damage to the basin's fish and wildlife resources as well as to negate ongoing Council efforts to remedy damage caused by the existing hydropower system. Federal agencies also should assess and mitigate the cumulative effects on fish and wildlife of multiple hydroelectric projects.

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

12.1 FUTURE HYDROELECTRIC DEVELOPMENT

12.1A Conditions

Federal Energy Regulatory Commission, Corps of Engineers, Bureau of Reclamation and Bonneville

- 12.1A.1 Do 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:

- consultation with the fish and wildlife agencies and tribes and the Council throughout study, design, construction and operation of the project;
 - specific plans for flows and fish facilities prior to construction;
 - the best available means for aiding downstream and upstream migration of salmon and steelhead;
 - flows and reservoir levels of sufficient quantity and quality to protect spawning, incubation, rearing and migration;
 - full compensation for unavoidable fish losses or fish habitat losses through habitat restoration or replacement, appropriate propagation, or similar measures consistent with the provisions of this program;
 - assurance that the project will not inundate the usual and accustomed fishing and hunting places of any tribe;
 - 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
 - assurance that all fish protection measures are fully operational at the time the project begins operation.
- 12.1A.2 Do 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:
- consulting with the wildlife agencies and tribes and the Council throughout study, design, construction and operation of the project;
 - avoiding inundation of wildlife habitat, insofar as practical;
 - timing construction activities, insofar as practical, to reduce adverse effects on nesting and wintering grounds;
 - locating temporary access roads in areas to be inundated;
 - constructing subimpoundments and using all suitable excavated material to create islands, if appropriate, before the reservoir is filled;
 - avoiding all unnecessary or premature clearing of land before filling the reservoir;
 - providing artificial nest structures when appropriate;
 - avoiding construction, insofar as practical, within 250 meters of active raptor nests;
 - avoiding critical riparian habitat (as designated in consultation with the fish and wildlife agencies and tribes) when clearing, riprapping, dredging, disposing of spoils and wastes, constructing diversions, and relocating structures and facilities;
 - replacing riparian vegetation if natural revegetation is inadequate;
 - creating subimpoundments by diking backwater slough areas, creating islands and nesting areas;
 - 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);
 - improving the wildlife capacity of undisturbed portions of new project areas (through such activities as managing vegetation, reducing disturbance, and supplying food, cover and water) as compensation for otherwise unmitigated harm to wildlife and wildlife habitat in other parts of the project area;
 - 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;

- funding operation and management of the acquired wildlife land for the life of the project;
- granting management easement rights on the acquired wildlife lands to appropriate management entities; and
- collecting data needed to monitor and evaluate the results of the wildlife protection efforts.

12.1A.3 Ensure that all licenses for hydroelectric projects or documents that propose, recommend or otherwise support hydroelectric development explain in detail how the provisions of Sections 12.1A.1 and 12.1A.2 will be accomplished or the reasons why the provisions cannot be incorporated into the project.

12.2 PROTECTED AREAS

From the inception of this program, the Council has supported the concept of protecting some streams and wildlife habitats from hydroelectric development, where the Council believes such development would have major negative impacts that could not be reversed. Beginning in 1983, the Council directed extensive studies of existing habitat and has analyzed alternative means of protection. In 1988, the Council concluded that: 1) the studies had identified fish and wildlife resources of critical importance to the region; 2) mitigation techniques cannot assure that all adverse impacts of hydroelectric development on these fish and wildlife populations will be mitigated; 3) even small hydroelectric projects may have unacceptable individual and cumulative impacts on these resources; and 4) protecting these resources and habitats from hydroelectric development is consistent with an adequate, efficient, economical, and reliable power supply. The Council, relying on these studies, designated certain river reaches in the basin as “protected areas,” where the Council believes hydroelectric development would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity or their habitat.

River reaches to be protected are those reaches or portions of reaches listed on the “Protected Areas List” adopted by the Council on August 10, 1988, and subsequently. For each river reach listed on the Protected Areas List, the fish and wildlife to be protected are those on the list. The Council will supply a copy of the Protected Areas List to any party free of charge.

12.2A Protect Areas From New Hydropower Development

The following are not affected by protected areas:

- any hydroelectric facility or its existing impoundment that as of August 10, 1988, had been licensed or exempted from licensing by the Federal Energy Regulatory Commission;
- the relicensing of such hydroelectric facility or its existing impoundment;
- any modification of any existing hydroelectric facility or its existing impoundment; and
- any addition of hydroelectric generation facilities to a non-hydroelectric dam or diversion structure.
- **Transition projects:** The Council recognizes that there exist, as of August 10, 1988, applications for hydroelectric projects that are in various stages of completion before the Federal Energy Regulatory Commission. In many cases the applicants have made substantial investments and have completed, or nearly completed, agreements with all interested parties, including state fish and wildlife agencies. The Council recognizes that the Federal Energy Regulatory Commission may be obligated to complete its processes on these applications, but expects where possible that this measure will be taken into account to the fullest extent practicable.

The Council recognizes that there may exist preliminary permits or applications for licenses or exemptions for

hydroelectric projects at sites which were not previously within protected areas but which may be included within protected areas as a result of amendments approved by the Council. An important purpose of protected areas is to encourage developers to site projects outside protected areas. The Council therefore exempts from the effect of an amendment that designates a previously unprotected area as protected, any project for which the developer had obtained a preliminary permit or filed an application for license or exemption prior to the date on which the Council entered rulemaking on the amendment. However, it is the Council's intention that the Federal Energy Regulatory Commission give full consideration to the protection of fish and wildlife resources located at these project sites and provide suitable protection and mitigation for such resources in the event that a license or exemption is approved.

- Effect on water rights and riparian areas:** This measure should not be interpreted to authorize the appropriation of water by any entity or individual, affect water rights or jurisdiction over water, or alter or establish any water or water-related right. The Council does not intend this measure to alter or affect any state or federal water quality classification or standards, or alter any management plan developed pursuant to the national Forest Management Act, 16 U.S.C. 1601, et seq., or the Federal Land Policy Management Act, 43 U.S.C. 1701, et seq., except to the extent planning decisions are directly related to hydropower licensing and development. Nor should this measure be interpreted to alter, amend, repeal, interpret, modify, or conflict with any interstate compact made by the states. If this measure is found by a court or other competent authority to conflict with any other interstate compact, this measure will terminate with respect to the area involved, without further action of the Council.

This measure applies to river reaches, or portions of river reaches, and to river banks or surrounding areas only where such areas would be directly affected by a proposed hydroelectric project. In adopting this measure, the Council has not attempted to balance all the factors that may be relevant to land management determinations.

Bonneville Power Administration

- 12.2A.1 Do not acquire power from hydroelectric projects located in protected areas. The Council believes that the Long-Term Intertie Access Policy's reliance on protected areas is consistent with the Council's power plan and fish and wildlife program as they apply to fish and wildlife in the Columbia River Basin. The Council continues to recommend that Bonneville adopt a similar policy with respect to protected areas outside the Columbia River Basin.

Federal Energy Regulatory Commission

- 12.2A.2 Under the Northwest Power Act, the Federal Energy Regulatory Commission, and all other federal agencies responsible for managing, operating, or regulating federal or non-federal hydroelectric facilities located on the Columbia River or its tributaries are required to take protected area designations into account to the fullest extent practicable at all relevant stages of decisionmaking processes. The Council recognizes that the Federal Energy Regulatory Commission makes licensing and exemption decisions for nonfederal projects, and does not expect that the Commission will abandon its normal processes with regard to projects located in protected areas. Rather, consistent with Section 4(h)(11) of the Northwest Power Act, the Council

expects that the Federal Energy Regulatory Commission will take the Council's judgment into account, and implement that judgment in licensing and exemption decisions unless the Federal Energy Regulatory Commission's legal responsibilities require otherwise.

12.3 ADDITIONAL PROTECTIONS AND CONSISTENCY OF HYDROPOWER DEVELOPMENT

12.3A Cumulative Effects

Federal Project Operators and Regulators

12.3A.1 Review simultaneously all applications or proposals for hydroelectric development in a single river drainage, through consolidated hearings, environmental impact statements or assessments, or other appropriate methods. This review shall assess cumulative environmental effects of existing and proposed hydroelectric development on fish and wildlife.

12.3B Ensure Consistency With This Program

Federal Energy Regulatory Commission

12.3B.1 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.

12.3B.2 Provide the Council with copies of all applications for licenses (including license renewals, amendments and exemptions) and preliminary permits in the Columbia River Basin so that the Council can comment in a timely manner on the consistency of the proposed project with this fish and wildlife program. This provision is not intended to supplant review of such applications by the fish and wildlife agencies and tribes.

Federal Land Managers and Federal and State Fish and Wildlife Agencies

12.3B.3 Incorporate pertinent elements of the fish and wildlife program in the terms and conditions they apply to projects exempted from licensing under Federal Energy Regulatory Commission exemption procedures. The Council also requests federal land managers to incorporate this program into their permit procedures related to hydroelectric development on lands they manage.

Corps of Engineers, Bureau of Reclamation, and any Other Federal Agency Studying or Proposing Hydroelectric Development in the Columbia River Basin

12.3B.4 Provide opportunity for Council review and comment.

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Section 13

AMENDMENT PROCESS

Congress gave the Council one year to develop an initial program that would address the complex and long-term technical, legal, economic and political problems associated with the effects of hydroelectric power development on fish and wildlife in the Columbia River Basin. Since the initial program was adopted in 1982, the Council has conducted four comprehensive amendment processes (1984, 1987, 1991-1993, and 1994) and more than 15 issue-specific amendment processes. While these amendment processes require time and energy, they are essential if the program is to adapt to new information and changing conditions.

By law, the Council must open the program for review at least once every five years, and in connection with major revisions to the power plan. The Council also may amend the program at any time on its own motion. Such a motion either may be initiated by the Council itself or may be in response to the petitions 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.

Whether an amendment is proposed by the Council or another entity, amendments to the program must satisfy the requirements of the Northwest Power Act.

13.1 FUTURE AMENDMENTS

13.1A Amendment Proposals on the Council's Own Motion

Council

13.1A.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 described in Section 13.1D.

Relevant Parties

13.1A.2 Any party may request that the Council consider a program amendment on its own motion, by submitting an amendment application as provided for in Section 13.1C. The Council may, at its discretion, choose whether or not to consider such a program amendment. If the Council chooses not to consider a program amendment, the amendment application will be returned by the Council and may be resubmitted during the next review period under Section 13.1B.

13.1B Mandatory Review

The Northwest Power Act requires the Council to review the Northwest Conservation and Electric Power Plan at least every five years and to request recommendations to amend the Columbia River Basin Fish and Wildlife Program "prior to the development or review of the plan, or any major revision thereto." The Council may, at its discretion, request recommendations to amend the fish and wildlife program, or any portion of it, more frequently than every five years and independently of revisions to the power plan.

13.1C Form of Recommendations

Council

13.1C.1 The Council will prepare application forms specifying requirements for information for recommendations to amend the program. Interested parties may use these forms, or may submit recommendations in letter form. In either case, amendment recommendations should contain the following information:

- A proposed amendment to the program, showing new language proposed to be added and existing language proposed to be stricken;
- A detailed description of how the proposed amendment would satisfy the standards of Sections 4(h)(5)-(6) of the Act, including:
 - a. how and to what extent the recommended measure would protect, mitigate or enhance fish or wildlife, including: 1) a description of the techniques proposed; 2) an estimate of the expected biological benefits (in measurable terms, if possible); and 3) a plan for determining whether the expected benefits are achieved;
 - b. how the fish and wildlife involved have been affected by the development, operation and management of hydropower facilities in the Columbia River Basin;
 - c. a description and analysis of all available scientific knowledge related to the proposed amendment;
 - d. an estimate of the costs, losses of power and impact on rates, if any, that would result if the amendment were adopted; and
 - e. a plan and schedule for funding and implementing the proposed amendment.
- A verification of the facts stated in the application, signed by the person who prepared the application and the person authorizing the application; and
- 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.

13.1D Council Review

Council

- 13.1D.1 The Council will review and propose action on each application for amendment accepted for consideration. In considering the applications, the Council will consult with appropriate power managers, operators and regulators, fish and wildlife agencies, tribes and Bonneville customers; will provide public notice and an opportunity for comment (in writing and at public hearings) on the proposed Council actions; and will otherwise adhere to the requirements of the Act.
- 13.1D.2 Following public comment and consultation, the Council will act on each recommended amendment by:
- adopting it; or
 - adopting it with modifications based on the comments and consultations; or
 - rejecting it for failure to conform to the statutory standards for program elements.
- 13.1D.3 The Council will act on each recommended amendment within one year of receipt.

13.1E Protected Areas Amendments

Council

- 13.1E.1 Upon submission of a state or tribal comprehensive plan or state or tribal river basin or watershed plan, the Council will promptly initiate amendment proceedings and carefully consider amending this measure to

reflect appropriate portions of the state or tribal plan. With regard to resident fish and wildlife, The Council will recognize that individual state and tribal interests are particularly strong.

- 13.1E.2 The Council will consider other amendments to this measure in accordance with Section 13.1.

Relevant Parties

- 13.1E.3 Any party may file a petition with the Council to change the designation of a river reach as protected or unprotected or to change the reason for a protected designation.
- 13.1E.4 Before filing a petition with the Council, the petitioner must notify the appropriate state agency and consult with that agency regarding the change in designation.
- 13.1E.5 Petitions must contain the following:
- The location of the affected river reach, including the reach number as listed in the Council's protected areas data base.
 - A statement of the facts showing the anticipated benefits and the anticipated detriments of the project.
 - An explanation of how the project will affect the Council's plan and program, or, if outside the Columbia Basin, how the project will affect the plan or relevant state and tribal comprehensive plans.
 - An explanation of how the petitioner has determined that the project will achieve exceptional fish and wildlife benefits.

- A summary of consultations the petitioner has had with relevant fish and wildlife agencies and Indian tribes regarding the petition, and the responses of the agencies and tribes.

13.1F Promising New Ideas for Improving Salmon Survival

The Council has called for additional flows, augmented transportation, drawdown studies, evaluations of several possible changes in power system operations and other ways to improve passage survival. Success of any of these measures is uncertain. Other ideas may be as promising. The Council has also called for new fish marking techniques, methods for selective harvest and investigation of the use of sound to divert salmon away from turbines. The Council is concerned that these new ideas might be lost in the debate over existing measures or allowed to languish. This measure is intended to provide an expedited process to encourage innovative approaches to improving salmon survival, especially in the mainstem.

Bonneville, Corps of Engineers and Bureau of Reclamation

- 13.1F.1 Accept and, if necessary, solicit proposals from all sources to improve passage and other aspects of salmon survival.
- 13.1F.2 Screen and evaluate such proposals on an expedited basis and promptly present promising ideas to the Council.

Council

- 13.1F.3 The Council will review promising ideas on an expedited basis, with input from fishery managers, and determine whether or not development of these ideas should be pursued. Upon Council approval, development should be promptly funded.

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Section 14

DISCLAIMERS

Disclaimers

Nothing in this program will:

- affect or modify any treaty or other right of an Indian tribe;
- authorize the appropriation of water by any federal, state or local agency, Indian tribe or any other entity or individual;
- 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;
- alter, amend, repeal, interpret, modify or conflict with any interstate compact;
- 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;
- affect the validity of any existing license, permit or certificate issued by any federal agency pursuant to federal law; or
- otherwise conflict with the savings provisions in Section 10 of the Northwest Power Act.

Scope

This program applies solely to fish and wildlife, including related spawning grounds and habitat, located on the Columbia River and its tributaries. Nothing in this program alters, modifies or affects in any way the laws applicable to rivers or river systems, including electric power facilities related thereto, other than the Columbia River and its tributaries, or affects the rights and obligations of any agency, entity, or person under such laws.

Validity

If any provision of this program or the application of any provision is held invalid, no other provision of this program or its application will be affected as a result.

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Findings on the Recommendations for Amendments to the Anadromous Fish Portions of the 1994 Fish and Wildlife Program December 15, 1994

In *Northwest Resources Information Center v. Northwest Power Planning Council*, the U. S. Court Of Appeals for the Ninth Circuit remanded the Strategy for Salmon to the Council to provide, in the program, written findings for any recommendation that the Council rejected in the Strategy for Salmon process.

After the Strategy for Salmon process was completed, but before the Court issued its order in *Northwest Resources Information Center v. Northwest Power Planning Council*, the Council had already: incorporated the Strategy into the *1994 Columbia River Basin Fish and Wildlife Program*; issued a request to the fish and wildlife agencies, tribes and interested parties to submit recommendations for amendments to that program; and, in August 1994, received such recommendations. After receiving the Court's opinion, the Council consulted with the fish and wildlife agencies, tribes and other interested parties regarding the advisability of requesting new recommendations in light of the opinion. The fish and wildlife agencies and tribes were virtually unanimous in urging the Council to proceed to address the August 1994 recommendations as soon as possible, and not to request new recommendations. Based on this advice, the Council determined to proceed with the recommendations already received. Because these recommendations addressed the same issues raised in the Strategy for Salmon recommendations, the Council determined that it could respond to the court's remand when it acted on the August 1994 recommendations.

Accordingly, in this section of the program, the Council provides written findings explaining its disposition of all recommendations received in August 1994. Where the Council rejected a recommendation, or any part of one, the Council has explained how the rejection comports with section 4(h)(7) of the Northwest Power Act. The Council has also reviewed the record in the Strategy for Salmon process, and determined that the findings set out below address all of the issues remanded to the Council. These findings, together with the Responses to Comments, also satisfy the federal Administrative Procedure Act's requirement of a statement of the "basis and purpose" of the amendments.

Note: Some of the section numbers in the 1994 program have changed as a result of this amendment process. Old sections have been deleted, new sections added, and section numbers reorganized in certain instances, especially in Sections 3-5 and 7. In these findings, the section references in the headings, in the summaries of the recommendations and the summaries of the draft amendments and comments refer to the 1994 program before amendment. The section references in the findings (identified by a bold face **Finding**) are to the final program as amended.

SECTION 1: INTRODUCTION

Program Section(s): 1.1 (introductory text)
Source: CRITFC
Recommendation No.: 1-1

Recommendation: The Columbia River Inter-Tribal Fish Commission (CRITFC) recommended adding two paragraphs to the introductory text of Section 1, to emphasize an immediate need to make "serious changes" in the hydro system and to state briefly the immediate, interim and long-term goal CRITFC recommended that the Council adopt into Section 4.

Finding: The Council did adopt in modified form CRITFC's recommended three-tiered program goal at Section 4.1, and the Council has altered the introductory language of Section 5 to note the need for urgent action to respond to the historic low returns of salmon populations. Thus the Council is of the opinion that it has largely adopted this recommendation.

Program Section(s): 1.2C (role of the Council and other agencies)
Source: CRITFC
Recommendation No.: 1-2

Recommendation: CRITFC recommended adding a paragraph to Section 1.3C to call for the Bonneville Power Administration (BPA) to negotiate an agreement to transfer the administration of its Fish and Wildlife Program "to an entity created by the Columbia Basin federal and state fish and wildlife agencies and Indian tribes, or in the absence of such an entity, to the United States Fish and Wildlife Service." CRITFC's recommendation explained that the transfer would be a reasonable part of BPA's effort to develop itself into a more competitive utility, would avoid the conflicts of interest inherent in BPA's operations, and would minimize the duplicative implementation efforts of the fish and wildlife agencies and tribes and BPA. CRITFC further recommended that BPA should secure a commitment from the implementing entity to carry out the Council's fish and wildlife program, add a condition to the transfer agreement that requires a thorough monitoring and evaluation of results tied to specific rebuilding targets; and ensure that the agreement holds the implementing entity accountable for results, perhaps with the assistance of independent audits.

The Council received a number of public comments on this recommendation. The Columbia Basin Fish and Wildlife Authority (CBFWA -- the coordinating body for all the region's state and federal fisheries agencies and tribes), CRITFC, the Shoshone-Bannock Tribes, and the Confederated Salish-Kootenai Tribes all approved of the idea of transfer. These tribes and tribal groups particularly emphasized their preferred option of a transfer to an entity created by the fishery managers. The Upper Columbia United Tribes (UCUTs) were more emphatic on this point: They did not support transfer of implementation from BPA to the Fish & Wildlife Service in the event the agencies and tribes cannot form an entity, on the grounds that the Fish and Wildlife Service "has historically neglected the UCUT Tribes." The UCUTs also did not support the transfer unless it occurred in accordance with guidelines approved by the UCUTs. The UCUTs stated that BPA must reduce its internal program management costs and that BPA's process costs are way too high, but the UCUTs doubted that transfer will actually reduce process and costs.

On the other hand, a number of commenters, especially from the utility community, opposed the concept of transfer, expressing particular concern that to transfer funding responsibility to the agency or agencies that would then also receive the funds to do the work would be a conflict of interest, and that transfer would interfere with authorities and responsibilities assigned to BPA under the Northwest Power Act (Douglas County PUD, Chelan County PUD, Pacific Northwest Generating Cooperative or PNGC, Corps of Engineers, Direct Service Industries or DSIs). The Corps of Engineers added that it wondered why the Council would consider transfer to the Fish and Wildlife Service when NMFS is the primary federal agency with responsibility for management of anadromous fish. With regard to the requirements of the Act, PNGC commented most completely, stating that Congress intended the Act to be implemented by Bonneville and the federal operators, that under the Act measures are to be funded by Bonneville and included in its annual budget submitted to Congress, that Congress required Bonneville and the Federal operators to balance their responsibilities to meet both power purposes and fish and wildlife purposes, and that transfer to an entity with no regional power responsibilities under the act would "subvert this balancing objective."

BPA commented that the administrative structure for implementation was not an appropriate measure for inclusion in the program, and that BPA was willing to work with the Council to improve the manner in

which the program is implemented. BPA stated that it was willing to consider transferring implementation under three conditions: (1) the entities that distribute or spend BPA ratepayer money should have a stake in BPA's financial health; (2) these entities should have financial incentives and be accountable for producing efficient, measurable results; and (3) the agreement should create certainty with respect to the level of BPA funding over the term of the agreement. BPA noted that the recommendation submitted to the Council did not explain how all three concepts would be satisfied.

Finding: The Council adopted the CRITFC recommendation, with modifications, as an amendment to Section 1.2C. The recommendation called for BPA to "negotiate" an agreement to transfer its fish and wildlife program; the Council's measure calls for BPA to "explore the potential for improving program implementation through an" agreement for transfer. The Council is mindful of BPA's responsibilities under the Act and of BPA's concern for its funding integrity. This is why the Council's measure, and the recommendation, did not simply call for a transfer, but for an exploration and negotiated agreement for transfer whereby BPA and the fishery managers satisfy, if possible, the concerns of both groups while acting consistent with BPA's obligations under the Act. The Council made this point more clear by its language, which focuses on the primary point of improving program implementation. The Council's measure included additional implementing language and called on BPA to report to the Council by mid-1995 either with the provisions of such an agreement for Council review and approval or with an assessment of the status of negotiations if an agreement has not been reached.

Program Section(s): 1.1 1.2C, 1.3A, 1.3C, 1.4
Source: PNUCC
Recommendation No.: 1-3

The Pacific Northwest Utilities Conference Committee (PNUCC) recommended a number of changes to Section 1 to reflect some of PNUCC's concerns about the program. The Council adopted in modified form a portion of these recommended amendments and rejected the rest, for the reasons explained below:

Section 1.1 (introductory text/funding targets)

Recommendation: PNUCC recommended the deletion of the last paragraph of Section 1.1 to eliminate the funding targets for resident fish and wildlife. In another recommendation (No. 2-1), PNUCC also recommended deleting the more expansive version of the funding target provision in Section 2.2F.

The Council adopted these funding targets in a past rule-making to ensure that resident fish and wildlife mitigation is funded at an approximate percentage of BPA's fish and wildlife budget, responding to comments from resident fish and wildlife managers that funding for the resident fish and wildlife measures had proceeded at too low levels in the past. A comment received during this rulemaking from the UCUT Tribes strongly supported the Council's adoption of the 15 percent program funding target for resident fish and 15 percent for wildlife, as in their view consistent with good biological sense for the Columbia River ecosystem and to balance the Council's role under Act to protect anadromous fish, resident fish and wildlife.

Finding: On this record, the Council rejected this recommendation as less effective than what has been adopted in ensuring the protection, mitigation and enhancement of resident fish and wildlife, 16 U.S.C. § 839b(h)(7)(C), and as not complementing the activities of the federal and state fish and wildlife agencies and appropriate Indian tribes, 16 U.S.C. § 839b(h)(6)(A). The Council rejected the companion recommendation for Section 2.2F for the same reason.

Section 1.2C (role of the Council and other agencies)

Recommendation: PNUCC recommended adding a paragraph to Section 1.2C that would have the Council coordinate the existing Scientific Review Group/Independent Scientific Group with the “Salmon Oversight Committee” recommended by the Snake River Salmon Recovery Team, assuming NMFS accepted the recommendation in its Recovery Plan. The recommendation also stated that “[t]he Council will incorporate the recommendations of the Salmon Oversight Committee in this program.”

In comments received by the Council, the Yakama Indian Nation stated that the Council should give high deference to the implementation recommendations of the agencies and tribes and that the Salmon Oversight Committee proposed by Recovery Team should not share duties with the Independent Scientific Group or other Council planning or review bodies unless selection of the Committee is subject to the review and agreement of the parties described in Section 3.2B.2 of the program (which describes the ISG’s policy group, created by input from the Council, BPA and the fishery managers). The Yakama Nation stated that in this and other areas, the Recovery Team and its recommendations do not have the confidence of fish and wildlife managers. The UCUTs opposed any new scientific review groups or planning or oversight authorities unless other, similar groups are eliminated first.

William Stelle, Regional Director of NMFS, stated in a consultation comment that NMFS is planning generally to follow the Recovery Team’s recommendation and establish a “Scientific Oversight Committee” “to provide independent scientific advice concerning the priorities and effectiveness of salmon and other fish and wildlife recovery measures.” Stelle also stated that NMFS is planning to establish a Columbia River Basin Steering Committee to oversee the implementation of NMFS’ Snake River Salmon Recovery Plan. Stelle expressed hopes that these two groups would coordinate their activities with the Council and vice versa.

Finding: The Council adopted this recommendation in part. Section 3.2D acknowledges that the Recovery Team has recommended the formation of the Salmon Oversight Committee and that NMFS might follow that recommendation in some fashion. This section also suggests that the Independent Scientific Group itself could serve the needs of both the Council and NMFS, and that whatever NMFS decides as to policy and scientific oversight, the Council intends to work with NMFS to coordinate these functions. The Council rejected the suggestion that it “incorporate” recommendations of the Salmon Oversight Committee. Recommendations may only be considered under the terms of 16 U.S.C. § 839b(h). Whatever groups are established by NMFS will, of course, be free to submit recommendations to the Council for adoption into the program, which the Council will consider under the standards of the Act. This finding also applies to a similar recommendation made by PNUCC to amend Sections 3.1 and 3.2B, noted below.

Section 1.3A, Bullets 4, 5 and 6 (principles governing costs/research priorities/monitoring and evaluation/water budget evaluation)

Recommendation: In Section 1.3A the Council noted the economic and cost analysis principles set forth in the Act and then noted that “[t]he Council has taken specific steps in the following program areas to further the economic principles set down by Congress,” followed by a list of these program areas. PNUCC recommended changes in the description of some of the points on the list to correspond to other concerns and changes recommended by PNUCC for other portions of the program. With regard to existing Bullet 4 on “Research priorities,” PNUCC deleted the existing language and replaced it with a paragraph that calls for the research priority for the cost effectiveness analysis to shift to “[o]btaining biologically valid survival data in each life cycle of anadromous fish, in particular juvenile survival through the Columbia River system,” that states that this life-cycle data “will provide the foundation of the research necessary for the adoption and implementation of all measures relating to river flow, passage, bypass screens, spill and transportation. For example, prior to any additional flow measures, the relationship between flow, velocity, juvenile salmonid travel time and survival (if any) must be determined.” With regard to Bullet 5, “Monitoring and evaluation,”

PNUCC similarly sought to shift the focus for the cost effectiveness analysis from changes in run sizes to benefits at each life-cycle stage. And with regard to Bullet 6, "Water budget evaluation," PNUCC recommended deleting the existing language and replacing it with a new paragraph to emphasize need to "reexamine" the value of the water budget and flows for fish and to balance power and fish concerns.

Finding: This section of the program consists of simple statements that partly summarize activities called for elsewhere in the program. The Council values PNUCC's editorial suggestions for this section and gave them serious consideration as policy suggestions for other portions of the program. The Council believes that many of the concerns expressed here by PNUCC are incorporated in the program in various ways -- e.g., the Council has stated in Section 5.0 that there is a need to continue testing the hypothesis concerning the relationship of flows to fish survival, and the Council has called in Section 1.8 for continued consideration of the proper balance between fish and power concerns. The Council also disagrees with other views expressed in the PNUCC recommendation, e.g., that the Council must conclusively determine the nature of the uncertain flow-survival relationship before taking further action, as discussed in Section 5 of the program and in the findings for Section 5. The Council saw no reason to revise Section 1.3A to reflect these points. Recommended editorial changes, especially to language that simply summarizes other portions of the program, do not by themselves constitute recommendations for measures that protect, mitigate, and enhance fish and wildlife, 16 U.S.C. § 839b(h)(5), and the Council may reject these recommendations on this basis.

Section 1.4 (Council commitments)

Recommendation: PNUCC recommended one deletion and one addition to Section 1.4, which is a short summary of Council commitments expressed elsewhere in the program. PNUCC recommended deleting the reference to avoiding upriver impacts "as much as possible, and to monitoring and evaluating them should they occur." The recommendation would make the program state simply that the Council is committed to avoiding upriver impacts. PNUCC stated that the purpose of the recommendation is to avoid the need to mitigate the up-river impacts of lower river mitigation measures. And, PNUCC recommended adding a new paragraph stating that "[T]he Council is committed to base mitigation decisions on the scientific evidence and to test, demonstrate, and evaluate the biological effectiveness of all measures in this program. The Council is also committed to comparing and evaluating the economic costs of all measures in this program. At this time, the Council makes no presumption that any one restoration method (e.g., downstream passage options) is preferable to another."

Finding: The Council did not adopt either of these recommendations. Again, these are editorial or policy suggestions and not recommendations by themselves for measures to protect, mitigate and enhance fish and wildlife, and they may be rejected on that basis. 16 U.S.C. § 839b(h)(5). And again, that is not to say that the Council did not consider these suggestions seriously. Concerning the first issue, the Council has taken steps, such as the upper-river reservoir constraints in Section 10, to minimize the up-river impacts of measures designed to benefit salmon in the lower river. But, it is impossible in this complex and carefully coordinated system to take action in one part of the system and have no impacts on other portions. The Council remains committed to avoiding or minimizing these impacts consistent with its legal obligation to protect, mitigate and enhance resident fish and wildlife, to act consistent with the legal rights of appropriate Indian tribes and to complement the activities of up-river agencies and tribes. The Council believes it is critically important to monitor program implementation to ensure that adverse impacts up-river are indeed minimized. Concerning the second issue, the Council is of the opinion that it does make its decisions with an understanding of the best available scientific knowledge, which is very uncertain on many key issues, and that the Council is committed to evaluating the effectiveness of measures and comparing the costs of alternative measures. For costly program measures that take years to implement - such as reservoir drawdowns - the Council has determined that it is reasonable and prudent planning to call for design, engineering and construction work to

proceed on the basis of the information currently available, with “milestones” in the years ahead when the issue of actual implementation can be revisited to consider the impact of new information.

Program Section(s): 1.2C (role of the Council and other agencies) and
1.2D (lessons of the past decade)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: The Corps of Engineers recommended a minor editorial change to Section 1.2C to expand a reference to an action plan to make sure it is “a stand-alone, dynamic document in matrix form which identifies CRBFWP measures and schedules and correlates CRBFWP measures with other regional documents and studies.” The Corps also recommended a revision to the second paragraph of Section 1.2D to state that Pacific salmon return from the ocean after “one to five years, mostly one to three” (not “three to five years”).

Finding: The Council did not adopt the first recommendation, which is not by itself a recommendation for a measure to protect, mitigate and enhance fish and wildlife. 16 U.S.C. § 839b(h)(5). The same is true of the second recommendation. The Council did revise Section 1.2D to state that Pacific salmon return from the ocean after “one to five years, usually three to five,” which is the current scientific understanding.

SECTION 2: SYSTEMWIDE GOAL AND FRAMEWORK

Program Section(s): 2.1B, 2.2B, 2.2F, 2.2G
Source: PNUCC
Recommendation No.: 2-1

The Pacific Northwest Utilities Conference Committee (PNUCC) recommended a number of changes to Section 2. The Council adopted portions and rejected portions of these recommendations, for the reasons explained below:

New Section 2.1B (systemwide goal/independent life-cycle survival assessment)

Recommendation: PNUCC recommended adding a new Section 2.1B calling for the Council, the Bonneville Power Administration and “Other Parties” to fund “independent, third party scientific evaluations to obtain accurate baseline survival data in all stages of the life cycles of anadromous fish, particularly juvenile spring/summer and fall chinook and sockeye salmon” and to fund the development of “methods to obtain accurate survival data” if necessary. PNUCC further recommended language calling for the fishery managers to “[m]ake available the required numbers of salmon necessary to obtain the baseline survival data called for.”

Finding: The Council took the following steps, in response to this recommendation and to other recommendations and comments: First, in the draft rule, the Council proposed a different Section 2.1B, adding the Council’s voice to others calling on Congress to authorize the National Academy of Sciences to prepare a report “describing and analyzing the changes in the Columbia River ecosystem brought about by human development activities and the effects these changes have on efforts to rebuild salmon, steelhead, and other fish and wildlife populations in the basin.” The Council received a number of comments noting that the

NAS study has been authorized and is in process, and so the proposed program measure should be deleted (e.g., Columbia Basin Fish and Wildlife Authority or CBFWA, the Upper Columbia United Tribes or UCUTs, Bonneville Power Administration or BPA, Chelan County PUD). These comments were often, though not always, joined with an expression of support for the NAS report. The Council did delete this measure, and anticipates the completion of the report. Second, the Council revised and expanded Section 7.1A.1 calling for BPA to fund an evaluation of “survival, ecology, carrying capacity and limiting factors” in each area of the salmon life-cycle, “tributary, mainstem (including reservoirs), estuary, plume, near shore ocean and marine.” The NAS report and the survival/carrying capacity study should provide most or all of the baseline data sought by this PNUCC recommendation. The Council concludes that the measures it has adopted and the reports in progress are the functional equivalent of the research and evaluation recommended by PNUCC and are better adapted to existing activities and measures and thus more effective in assisting in the protection, mitigation and enhancement of fish and wildlife. 16 U.S.C. §§ 839b(h)(2)(C), (5), (7)(C).

Section 2.2B (assess program measures)

Recommendation: PNUCC recommended changes in Section 2.2B, which called on the Council to periodically assess program measures to identify conflicts and assess trade-offs in the basin. PNUCC recommended additional language to make clear that the assessment of trade-offs will include conflicts “between measures designed to benefit a particular species or target group of species” because “[s]uccessful fish and wildlife mitigation efforts can easily be reversed by conflicting actions. As such, appropriate management policies will be developed to minimize the adverse effects of activities in other stages of a species’ life cycle to ensure that the region realizes the benefits of mitigation activities.”

Finding: The Council did not adopt the recommendation. The Council intends by the existing program language to periodically assess every type of potential trade-off and conflict identified in the program. Nothing in the existing language precludes the kind of assessment expressly called for by PNUCC.

Section 2.2F (target funding for resident fish and wildlife mitigation)

Recommendation: PNUCC recommended deleting most of Section 2.2F to eliminate the funding targets that ensure resident fish and wildlife mitigation is funded at certain percentage of BPA’s fish and wildlife budget. PNUCC recommended deleting the summary version of this provision at Section 1.1, discussed above.

Finding: The Council explained above, as part of its response to Recommendation 1-3 from PNUCC, why it rejected this recommendation.

Section 2.2G (funding for actions that address transboundary species)

Recommendation: PNUCC recommended deleting Section 2.2G, which provides that if and when fishery managers on both sides of the U.S./Canada border can agree on measures or projects that will benefit both U.S. and Canadian populations, BPA and the fish managers should include funding terms in the agreement whereby the U.S. ratepayer funding is in proportion to U.S. benefits. PNUCC recommended deleting this section on the grounds that the Council “cannot obligate U.S. dollars to Canadian interests.”

Finding: The Council did not adopt this recommendation. PNUCC’s recommendation is clearly less effective in protecting, mitigating, and enhancing fish and wildlife than is the existing language, since PNUCC’s would simply preclude the possibility of funding such activities. 16 U.S.C. § 839b(h)(7)(C). The Council disagrees with PNUCC that there can never be circumstances in which ratepayer money may be

appropriately used in this manner. Whether any such circumstances exist will be determined when specific measures and projects are proposed to the Council and BPA for approval, implementation and funding.

SECTION 3: COORDINATED IMPLEMENTATION, RESEARCH, MONITORING AND EVALUATION

Program Section(s): 3.1, 3.1A.1, 3.1B, 3.1D, 3.2B, 3.2E, 3.2F
Source: PNUCC
Recommendation No.: 3-1

The Pacific Northwest Utilities Conference Committee (PNUCC) recommended a set of specific amendments to Section 3 that can be grouped into six categories: (1) consult with the “Salmon Oversight Committee” recommended by the Snake River Salmon Recovery Team; (2) modify the role of the Basin Oversight Group; (3) strengthen the Council’s commitment to accountability and cost-effectiveness; (4) delete the implementation planning process; (5) delete the subregional process; and (6) delete a redundant Section 3.2F. The Council adopted some of these recommended amendments, although the Council did not usually adopt PNUCC’s specific language, and rejected others, as described below:

Consult with “Salmon Oversight Committee”

Recommendation: PNUCC recommended changes to two provisions to call for consultation with and reliance on the “Salmon Oversight Committee” recommended by the Recovery Team:

Section 3.1 (coordinate implementation of fish and wildlife program). PNUCC recommended adding an introductory paragraph to Section 3.1 calling for the Council and NMFS to coordinate the existing Scientific Review Group/Independent Scientific Group with the Salmon Oversight Committee recommended by NMFS’ Recovery Team. As with PNUCC’s recommendation for Section 1.2C, the recommended language here states that the Council will “incorporate” the recommendations of the Salmon Oversight Committee. This recommendation also states that the Council “will rely heavily on the existing scientific review group.”

Section 3.2B.1 (independent scientific evaluation). PNUCC also recommended adding language to Section 3.2B.1, which describes the nature and role of the Independent Scientific Group, stating that the ISG “will coordinate with NMFS’s Salmon Oversight Committee, recognizing the Salmon Oversight Committee is responding to similar questions for the listed salmon species.”

Finding: A finding regarding the recommendation for coordination with oversight and steering committees planned by NMFS has already been made above, in response concerning PNUCC’s recommendation for Section 1.2C (part of Recommendation No. 1-3). In addition, Section 3.2B.1 already indicates that the development of the Independent Scientific Group will begin with the Scientific Review Group.

Modify the role of the Basin Oversight Group

Recommendation: Section 3.1A.1 (Basin Oversight Group). PNUCC recommended revising Section 3.1A.1 to replace the existing Basin Oversight Group with a “forum” that will “ensure the integration of all regional fish and wildlife programs.” The forum is to consist of “policymakers from the state and federal implementing entities, utilities and other interested parties;” “utilities” has been expressly added to the list of participants in the Basin Oversight Group. The specific directions concerning the meeting and reporting requirements for the Basin Oversight Group have been deleted. PNUCC explains that this change is necessary because “[r]egional coordination at the policy level . . . is essential” and the Council’s program must be part of a “larger integrated effort.”

The only comment received by the Council directly related to the Basin Oversight Group was from the Northwest Forest Resource Council, which commented that the concept of the group has some merit, as it could help address concerns raised throughout the region about lack of coordination on salmon recovery efforts; such a group would have to have non-agency participation and be balanced.

Finding: Section 3.1A already allows broad representation on the Basin Oversight Group, and calls for all other committees to report to it. In addition, new Section 3.1A.2 calls for additional efforts to coordinate the Council’s work with the basin’s fish and wildlife managers and their programs. While utility representation on the Basin Oversight Group is perfectly permissible, the Council rejects the recommendation to specify membership beyond implementing agencies as a less effective way of protecting, mitigating and enhancing fish and wildlife. 16 U.S.C. 839b(h)(7)(C).

Council’s commitment to accountability and cost-effectiveness

Recommendation: PNUCC recommended amendments to two provisions, amendments that PNUCC believed would strengthen the Council’s commitment to accountability and cost effectiveness:

Section 3.1B (implementation and monitoring). PNUCC recommended adding a subsection to Section 3.1B to emphasize the Council commitment to a “cost-effective, efficient and results-oriented” program that sets the “regional standard for performance and accountability.” PNUCC’s recommendation stated three specific features of this commitment: (1) a mitigation scorecard in the annual Implementation Report “which clearly shows the costs of each project and the biological benefits and progress toward the mitigation goals in consistent, quantifiable units;” (2) prioritizing of all measures, including research and overhead; and (3) efforts to end “duplicative processes.” As will be noted further below, PNUCC also recommends the deletion of all but one of the existing measures in Section 3.1B and all of Section 3.1D, essentially replacing the implementation planning process and subregional process with the cost-effectiveness accounting standard recommended here.

Section 3.2E.1 (prioritization and cost-effectiveness). PNUCC also recommended replacing the existing general statement in Section 3.2E.1 that the Council will review program measures for purposes of prioritization, cost-effectiveness and biological effectiveness with the following directive to “Bonneville, Others, Council:” “Develop criteria for measuring the cost-effectiveness of the program and of individual projects. Evaluate the cost-effectiveness of each project annually. Include a cost-effectiveness rating in the mitigation scorecard and in annual monitoring report. Discontinue projects and programs that do not meet the cost-effectiveness test.”

The Council received a number of comments on cost-effectiveness review criteria and methodology. The Columbia River Alliance, the Public Power Council and the Direct Service Industries (DSIs) agreed with PNUCC that the key to maintaining an economical and reliable hydroelectric power system while protecting

and recovering weak salmon and steelhead stocks was to make management decisions that reflect basic cost-effectiveness criteria. The Alliance submitted with its comments, "Profiles in Cost-Effectiveness: Analyzing the Biological Benefits and Economic Costs for Snake River Salmon Recovery Measures," by Darryll Olsen and James Anderson (November 1994), analyzing the cost-effectiveness of various mainstem measures and also describing its cost-effectiveness methodology. The report noted that resource managers and political leaders need to confront squarely the fact that actions rendering poor and uncertain biological benefits do not make for good economic decisions and that the benefits of cost-effectiveness analysis for recovery plans are twofold: First, agency recovery planners are faced with the need to prioritize recovery measures. Second, cost-effectiveness analysis can prevent "overstatement" of the costs of any recovery plan under the ESA and increase social and political acceptance by minimizing economic costs and by optimizing for the highest rate of biological benefit per dollar spent. One particular manifestation of the Alliance's cost effectiveness analysis was a chart comparing the costs of salmon recovery measures per adult fish returned. The DSIs commented that the Council's program would itself benefit from such a chart that compared, in dollars per fish, the cost of the measures comprising the various flow options; the DSIs further commented that analysis often indicates that actions with the highest cost-effectiveness are also the actions with the lowest cost and which can be most immediately implemented.

The Lincoln County, Montana (Libby) Board of County Commissioners suggested adding another set of criteria to the review of costs and benefits - the Council should estimate costs and benefits accruing to each of four basin states under pre-1991 conditions, 1992-93 conditions and under a preferred alternative for 1994 and beyond. Benefits should be accounted for in areas of navigation, flood control, hydropower, recreation, fisheries and water supply, and the Council must seek equity in sacrifices asked for in region. The Commissioners seriously question the current proportion of sacrifices.

Indian tribes, state agencies and environmental groups took a different approach to cost and cost effectiveness analysis. The Save Our Wild Salmon coalition submitted an "Economic Framework" analysis as part of its wild salmon restoration plan, which emphasized the various benefits to the economy of healthy salmon populations and healthy watersheds. The coalition believed these benefits are understated in most cost analyses, that "investments" in salmon restoration should not just be thought of as costs. The coalition's analysis described the "costs" of various salmon recovery options and explained how those costs are not excessive compared to other taxpayer and ratepayer subsidies and investments in hydropower, the commercial agricultural infrastructure, the aluminum industry power supply, etc. The analysis also suggested various ways costs and the cost analyses can change by changing the way the power system is operated and the Bonneville Power Administration's other costs are managed. The Columbia River Inter-Tribal Fish Commission (CRITFC) also submitted general comments about the nature of salmon recovery costs and cost-effectiveness review. CRITFC argued that many cost analyses and cost-effectiveness reviews ignore the fact that "[s]ubsidies to natural resource exploiters are costing millions of dollars of tax payers money and additional losses from denied income from fisheries and ESA related costs." They provided a number of examples of federally subsidized activities (logging, grazing, irrigated agriculture, aluminum production) which, in their view, could be curtailed or factored into an analysis to offset the costs of salmon recovery measures, such as drawdown operations or habitat restoration.

The Idaho Department of Fish and Game (IDFG) submitted costs analyses and comments that mostly emphasized IDFG's position that there are errors in the Corps of Engineers' and the Council's approach to the cost analysis of structural changes in the hydropower system. IDFG's consultant also offered his table showing the cost-effectiveness of various options, to counter the different cost-effectiveness charts of the Columbia River Alliance and others. Regarding the Council's use of a preliminary cost-effectiveness analysis developed by the Environmental Defense Fund (EDF) for use in selecting flow augmentation measures, IDFG believes it would be unduly rigid for the Council to require this or any other particular cost effectiveness methodology, especially where the methods are largely undefined.

Finding: The Council has adopted provisions for monitoring, evaluation, prioritization and cost-effectiveness in implementation (see Sections 3.1B, 3.1C, 3.1E, 3.2, 3.3). These provisions call for, among other things, an annual program monitoring report based on the Coordinated Information System and an annual program evaluation report to “evaluate progress toward the rebuilding schedules, performance standards, and other goals and objectives of the program.” Pursuant to Section 3.2E.1, the Council’s review of the program will include not only evaluation of biological effectiveness but also evaluation for cost effectiveness and prioritization. In addition, the Council has added language to Section 5.2A calling for an additional, specific cost-effectiveness review of alternative sources for additional salmon flows in the Snake River and for further review and refinement of the promising EDF cost-effectiveness methodology for future analysis of structural and non-structural water measures. These provisions provide for sufficient cost-effectiveness review as recommended by PNUCC.

The Council did not adopt PNUCC’s particular recommendations insofar as they would essentially tie all monitoring and evaluation to a pre-specified approach to cost-effectiveness analysis, as a less effective way of protecting, mitigating and enhancing fish and wildlife than the approach that is already in the program, 16 U.S.C. § 839b(h)(7)(C). In addition to cost-effective implementation, the existing program measures are aimed at systematic learning and the effective integration of all implementing agencies in the implementation planning process, especially the fish and wildlife managers, and thus better complement the activities of the fish agencies and tribes, 16 U.S.C. § 839b(h)(6)(A), (7)(B). The provisions in the program preserve flexibility in evaluation and allow for analysis and evaluation to take the form or forms that the evaluators and the Council find to be useful, given the nature of the information and the circumstances, rather than specifying the analysis in advance. Given the wide divergence in approach to cost-effectiveness analysis, as outlined in the summary of comments and which reflects differing assumptions about the nature of costs and benefits, it is not prudent to specify any one particular approach or set of criteria.

Delete the implementation planning process

Recommendation: Section 3.1B (implementation and monitoring). PNUCC recommended deleting most of Section 3.1B to delete the implementation planning process. PNUCC explained that this change is necessary because BPA is redefining how it will implement the Council’s program and may replace the implementation planning process. Thus the Council’s program must remain flexible to accommodate BPA’s new program.

Finding: As noted above in the findings on Section 1, in response to other recommendations, the Council has called for BPA and the fishery managers to explore the potential for improving program implementation through an agreement to transfer the administration of Bonneville’s fish and wildlife program to an entity formed by the fish and wildlife managers. Once it is clearer whether and how this proposal will be addressed, the Council can consider amending the program. The Council did not otherwise amend this section of the program because the issue is in flux. While it is not possible to say what form the process will take in the future, the Council believes it would be unwise to abandon the old process before the new implementation process is in place.

Delete the subregional process

Recommendation: Section 3.1D (subregional process). PNUCC recommended deleting all of Section 3.1D to eliminate the subregional planning process. PNUCC explained that this process needed to be deleted for the same reason as the implementation planning process.

Finding: The Council does not agree that the possible transformation of the implementation planning process will render the subregional planning process obsolete or in any way make it less important. To the contrary, in response to other recommendations and comments, especially from the agencies and tribes, the Council adopted measures that make subregional planning an even more important part of the implementation process. These recommendations and comments are described in the findings on Section 7, as they relate to the issue of subbasin planning for production and habitat improvements. The Council thus rejected PNUCC's recommendation to delete the subregional process because it would fail to complement the activities of the fish managers, who strongly supported the subregional process, 16 U.S.C. §§ 839b(h)(6)(A), (7)(A), and would be a less effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. §§ 839b(h)(7)(C).

Delete a redundant Section 3.2F

Recommendation: Section 3.2F (streamlining implementation). PNUCC recommended deleting Section 3.2F, which calls for an independent consultant to report on ways to reduce process, on the grounds that it duplicates Section 3.1E.1 (management review).

Finding: The Council adopted PNUCC's recommendation to delete the repetitive section from the 1994 program. (Note: Section 3.2F in the amended program is a renumbered section.)

Program Section(s): **3.1B.1 (implementation and monitoring)**
Source: **Corps of Engineers**
Recommendation No.: **5-3**

Recommendation: The Corps of Engineers recommended revising Section 3.1B.1 to state expressly that the Corps is a participant in implementation planning process.

Finding: The existing language of Section 3.1B.1 includes the Corps within the category of "river operators." Notwithstanding that the Council did not try to specify all the participants in the implementation planning process, the Council recognizes that the Corps plays a key role in implementation and in this process.

Program Section(s): **3.2 (monitoring and evaluation)**
Source: **CRITFC**
Recommendation No.: **3-2**

Recommendation: The Columbia River Inter-Tribal Fish Commission (CRITFC) recommended replacing all of Section 3.2 with CRITFC's version of an "effective monitoring and evaluation" program to evaluate both the program as a whole and specific measures. The purpose of the recommended evaluation process will be to "identify ineffective actions so that the Program can be modified accordingly and ensure that the Council systematically improves its knowledge," and to "determine if fish runs are being rebuilt and thereby measure progress toward the Program's production goals." An effective evaluation process requires that each Council measure include "measurable objectives that can be directly translated into the Program's

production goals in terms of increased adult fish runs, increased habitat capacity, or increased survival rates at specific life stages.” Besides clearly defined goals and objectives, the evaluation process requires a “close correspondence between the Program objectives and the evaluation objectives” and an organized set of baseline information. The “core information needed for monitoring and evaluation” is to be supplied by the Coordinated Information System (CIS) project. The Council will be responsible for overall program evaluation, while the fishery agencies and tribes will be responsible for evaluating specific projects. BPA will fund the evaluation process.

In proposed implementing measures, the recommendation calls on the Council to develop and run the overall program evaluation process, including, among other things, the creation of a “Program Evaluation Group (PEG) staffed primarily by the Council but with assistance from appropriate entities, project staff, or individuals.” The duties of PEG will include, among others, “to refine and elaborate the Council’s fish losses analyses to allocate the relative contributions of various human activities to fish losses at appropriate levels of resolution; to regularly review Program measures for prioritization according to biological effectiveness, contribution to the doubling goal, urgency, proper sequencing, and cost-effectiveness.” The fishery managers are then called upon to develop a monitoring and evaluation plan that includes, among other things, the monitoring of key indicator populations, the development of new methods for monitoring and evaluating population numbers, status, and vulnerability, and the development of “tools to measure the biological integrity of habitat.”

By recommending the deletion and replacement of all of existing Section 3.2, CRITFC would eliminate the independent scientific group, the analytical models coordination process, and the other monitoring and evaluation procedures in the existing program. These procedures directly and specifically involve the participation of independent scientists, BPA, the Corps, etc., as well as the fishery managers, in efforts to review and refine program implementation and coordinate not just monitoring and evaluation but also research in a situation of much scientific uncertainty. One purpose served by CRITFC’s recommendation is to give the fish agencies and tribes greater control over the development, coordination and implementation of the monitoring and evaluation and the assessment of scientific uncertainties.

The Council received a number of comments in support of a better monitoring and evaluation program, some in favor of CRITFC’s proposal to place the fishery managers in the firmest control of monitoring, evaluation and scientific assessment; some in favor of continued emphasis on independent scientific evaluation. The Columbia Basin Fish and Wildlife Authority (CBFWA) generally supported the CRITFC recommendation. CBFWA said the Council should establish a monitoring program to address both progress toward rebuilding goals and individual indicator stocks, as identified by the Council. The general principles to govern the monitoring program should include: projects to help reduce uncertainties; priorities that reflect systemwide analysis of major uncertainties; BPA and the Corps’ funding to be consistent with key uncertainties; knowledge to be reviewed by fish managers and made available to others; fish managers will participate in development and implementation of monitoring program; BPA and other project operators will fund monitoring; and projects are to be coordinated with activities of others. Fish managers should evaluate the program, instead of an independent scientific group, although the fish managers should continue to work with the Scientific Review Group, the independent scientific group established by BPA as part of its implementation and funding process. Fish managers also should prepare an annual monitoring report based on coordinated information system data. Finally, fish managers should submit a list of indicator stocks to Council by the end of 1994, along with a proposal for a program to monitor them, including appropriate technology. The Oregon Department of Fish and Wildlife (ODFW) stated more emphatically than CBFWA that while the program needs to be scientifically evaluated, the evaluation should be conducted by region’s fishery managers. The Council should hold fishery managers accountable for objective and credible evaluation of benefits of program implementation, and the development of specific biological objectives will be part of an effective evaluation program by fishery managers.

BPA commented that the program must include a credible, comprehensive and long-term monitoring and evaluation program with the opportunity for adaptive management and measurement of progress toward regionally prioritized goals annually or regularly. The monitoring and evaluation program should be coupled with a rebuilding framework by incorporating measurements of biological benefit and relating those measurements to biological objectives and to costs in a cost effectiveness evaluation. The Council should set clear, measurable goals and timelines for resolving critical uncertainties, as well as for biological outcomes. The Chelan County PUD commented generally in support of the need to learn from implementation through rigorous evaluation measures adopted in the face of scientific uncertainty, that “[m]ore rigorous procedures are needed to truly study the efficacy of program measures,” and evaluations need to include test and control comparisons in the study design. Mark Reller of the Montana Council staff, commenting as the State of Montana’s representative on the Snake River Drawdown Committee and alternate member of the Fish Operations Executive Committee (FOEC) stated that the Council should not call for implementation, especially of major system changes, until a monitoring and evaluation program is in place and ready to function.

As noted above, William Stelle, Regional Director of NMFS, stated that NMFS is planning generally to follow the Recovery Team’s recommendation and establish its own “Scientific Oversight Committee” “to provide independent scientific advice concerning the priorities and effectiveness of salmon and other fish and wildlife recovery measures.”

Finding: In adopted revisions to Section 3.2, especially Section 3.2A.2, the Council calls for the Council staff to perform the evaluation role CRITFC recommended (although the Council did not adopt the PEG name). That is, the Council, in consultation with the fishery managers, will prepare an annual program evaluation report to “evaluate progress toward the rebuilding schedules, performance standards, and other goals and objectives of the program.” The report will be based on the annual monitoring report from the Coordinated Information System, and it is the fishery managers who play the primary role in compiling the monitoring data for the CIS and producing the monitoring report. The Council further revised Sections 3.2A, 3.2B, 3.2D, 3.2F, 3.3, and 4.3C to incorporate a number of monitoring and evaluation measures and concepts that CRITFC recommended. For example, revisions and additions to Section 4.3C incorporate, in somewhat modified form, CRITFC’s specific recommendation to have the fishery managers develop a coordinated program to monitor key indicator populations. In addition, the portion of the recommendation calling for the evaluation group “to refine and elaborate the Council’s fish losses analyses to allocate the relative contributions of various human activities to fish losses” is already covered by the Section 3.2C.2, which calls on the Council to “[r]efine and elaborate analyses of the relative contributions of various human activities to fish mortality.” These aspects of the recommendation were accepted.

The Council rejected the recommendation to put the fishery managers more fully in charge of evaluation, and to delete all reference to or use of independent scientific evaluation. The Council believes that a credible monitoring and evaluation program is absolutely essential if the salmon rebuilding program is to be sustainable over the long term. To be credible, monitoring and evaluation must be competent, independent, and it must be seen to be free of institutional bias. The fish and wildlife managers have unquestioned scientific expertise in this area and should and will play a key role in the monitoring and scientific evaluation of the program. But, the fishery managers play an even more key role in recommending and implementing the fish and wildlife measures that must be evaluated. They cannot bring the kind of independence to monitoring and evaluation that will be needed, as NMFS also recognized when it stated its intention to involve a Scientific Oversight Committee in recovery efforts. No matter how competent their science, the fisheries managers, if they alone controlled the evaluation of the program, would be perceived as bringing institutional bias to this work. An independent scientific group, with members who lack institutional links to the fishery managers or to the river operators and utilities, will bring a measure of outside perspective that will not

replace or supplant the authority of the fishery managers, only supplement and assist the fishery managers' efforts. Thus the Council has rejected this part of the recommendation on the grounds that (a) the adopted provisions are a more effective way to protect, mitigate and enhance fish and wildlife and to assure that program evaluation is based on the best available scientific knowledge, 16 U.S.C. §§ 839b(h)(7)(B), 7(C), and (b) given that NMFS is one of the fishery managers, and NMFS has indicated that part of the evaluation process should include independent scientific evaluation, it can be said that the Council's similar approach does complement the activities of a key federal anadromous fishery manager.

CRITFC's monitoring and evaluation program recommendation included general language about the role and use of measurable objectives, an issue that was repeated in various forms in the comments. The role of biological objectives, measurable objectives and similar concepts and terms is discussed below, in findings on Section 4.

SECTION 4: SALMON AND STEELHEAD GOAL AND FRAMEWORK

Biological objectives/biological framework

Section 4 establishes a biological framework for the entire anadromous fish portion of the program. It includes an overall program goal and population rebuilding targets, and it also provides a process for developing additional biological targets, objectives and standards to assist further in program development and evaluation of rebuilding efforts.

One of the most contentious issues during this rulemaking has been the meaning and role of "biological objectives," a term used in the Act in an apparently ambiguous fashion, and the debate itself has the most relevance to the developing framework in Section 4. This part of the findings is intended to explain and respond to this debate, analyzing the issue in the context of the recommendations received by the Council in this rulemaking process and in the last, in 1991.

The Council last amended the anadromous fish portions of its fish and wildlife program in 1992, in what the Council called the Strategy for Salmon. In *Northwest Resource Information Center v. Northwest Power Planning Council*, 35 F.3d 1371 (9th Cir. 1994), the U.S. Court of Appeals for the Ninth Circuit remanded the Strategy for Salmon after faulting the Council for failing to incorporate into the program written findings responding to the recommendations submitted to the Council in 1991 to initiate that amendment process. The Court also questioned whether, among other things, the measures the Council adopted were sufficiently tied to "biological objectives." Thus one of the main areas of concern in this amendment process has been the issue of "biological objectives" -- what are they, what does the Act require of the Council in this regard, and what do the recommendations received by the Council in 1991 (the remanded Strategy for Salmon recommendations) and 1994 contain in the way of biological objectives?

This section of the findings is intended to address these issues. The Council has analyzed both what the 1991 and 1994 recommendations contain and what the Act requires. This has been an iterative process -- the nature of the recommendations received indicates a particular meaning and role for "objectives" and "biological objectives" in the program as of this date. The language of the Act is consistent with the Council's sense that what it has received in its recommendations is sufficient for the Council to take action in response, and that the Act does not require, although it certainly permits, something broader and more comprehensive than what the Council has received in recommendations.

Some commenters, primarily from utility groups, major utility customers, and agricultural industry groups, have suggested that the Council must adopt a comprehensive set or framework of separate, distinct, quantifiable biological objectives for the entire salmon life-cycle and the entire program before the Council may adopt or even propose measures. The Council did not receive any recommendations for such a fully developed framework in 1991 and 1994, and neither the Act nor the Court's opinion support the position that the Council must either wait until it receives such recommendations or develop the specific, quantified framework independently before it may consider program measures. Developing such a comprehensive biological framework could be a good policy, and so the Council has outlined a framework in Section 4 and called for the fishery managers and others to develop and recommend the framework when possible. But the adoption of such a framework is not a legal prerequisite for Council action. Whether or not the larger framework exists, the Act fully supports the Council's decision to adopt measures on the basis of what it has received in recommendations -- biologically-based operational objectives for the hydropower projects and qualitative, narrative explanations of the biological objectives or purposes underlying proposed measures.

1. The Act: recommendations, objectives and biological objectives

The Act itself does not define the terms “objectives” or “biological objectives.” Nowhere in the Act is the Council directly instructed to develop a comprehensive set of distinct, quantified “biological objectives” to support the whole of the program. Instead, the Act’s circumscribed use of the term “objectives” (in one provision) and “biological objectives” (in two provisions) indicates a more focused relationship between objectives and the development and operation of the hydroelectric projects and a much less specific or technical meaning for the general term biological objective. The Ninth Circuit did not closely scrutinize the relevant language of the Act or the legislative history of this particular topic. The one statement by the Court that may be the most consistent with the language of the Act, as will be explained below, is the Court’s observation that biological objectives “relate the biological needs of fish and wildlife to the operations of the hydropower system.” *NRIC v. Northwest Power Planning Council*, 35 F.3d at 1391. More important, the Court provided some guidance to the Council that is central to understanding this issue in the present context: (1) the Act requires that program development be largely a recommendations-driven process; (2) broad program goals and rebuilding targets without timelines are not adequate by themselves in the face of more specific recommendations for objectives, especially from agencies and tribes; (3) the Council must give deference to the biological expertise of the agencies and tribes in the identification of biological objectives; and (4) if the agencies and tribes are united in their view that the best available scientific knowledge indicates that, to use the Court’s example, a water particle travel time target is an appropriate biologically-based objective for project operations, the Council may not second-guess that judgment without a very solid explanation, based in the standards of the Act, as to why it is rejecting the recommendation.

A. Recommendations

Perhaps the most important message in the Ninth Circuit’s opinion was its reminder to the Council that the “recommendations” called for in Section 4(h)(2) (16 U.S.C. § 839b(h)(2)) are to be the basis for program development. Section 4(h)(2)(A) provides for the Council to request from the state and federal fish agencies and tribes recommendations for “measures” to protect, mitigate and enhance fish and wildlife “affected by the development of any hydroelectric project on the Columbia River and its tributaries.” Section 4(h)(2)(B) then calls for recommendations for “establishing objectives for the development and operation of such projects on the Columbia River and its tributaries in a manner designed to protect, mitigate, and enhance fish and wildlife.” (Section 4(h)(3) provides that others may submit these types of recommendations as well.) This means that in the Act’s first mention of the concept of “objectives,” as part of the central building block in the program development process, Congress tied the concept of objectives directly to the development and operation of the hydroelectric projects. Congress did not call for the agencies and tribes to recommend comprehensive, quantified, distinct biological objectives that relate to or encompass the whole biological life-

cycle of fish and wildlife or that concern aspects of the program unaffected or indirectly affected by project operations. The aspects of hydroelectric project development or operation that affect fish and wildlife are the projects' effects on flows, passage, reservoir size and levels, water temperatures, and the like. Objectives that express how these project characteristics should affect or not affect fish and wildlife are what the plain language means by the objectives to be recommended for inclusion in the Act.

Thus the language of Section 4(h)(2) calls for recommendations for what can be called "operational" objectives, that is, objectives for the operation of the hydroelectric projects. These operational objectives must, of course, be biologically based -- that is, have a biological purpose or objective as their basis which can express or implicit in the actual language of the objective. That the operational objectives must be biologically based is required by the fact that the objectives must be designed to "protect, mitigate, and enhance fish and wildlife," Section 4(h)(2)(B), and be supported by "detailed information and data," Section 4(h)(3), and by the fact that program measures derived from the recommendations must "protect, mitigate and enhance fish and wildlife" and "be based on, and supported by, the best available science," Sections 4(h)(5), 4(h)(6)(B). This point is true, of course, for every recommendation, whether for a measure or an objective, whether related directly to the mainstem hydropower projects or to "related spawning grounds or habitat." All recommendations, and thus all measures in the program, must have a biological basis, purpose or objective, whether implicit in the language of the measure or stated expressly, in narrative terms or quantitative.

From this analysis, two critical points are clear: First, the only "objectives" actually called for in the recommendations process are objectives narrowly tied to hydropower project development and operations. If program development must be tied closely to the recommendations process, it is too great a leap to read the rest of the Act as containing a mandate to the Council to develop, independently, a more comprehensive set of separate, distinct, quantifiable biological objectives. Second, all recommendations, for objectives and for measures, must be biologically based, that is, have a "biological objective" in the common sense meaning of the term, even if not expressly stated in the language of the measure or operational objective. The recommending party and the Council must be able to identify this biological objective or purpose and evaluate whether the recommended measure actually serves this purpose (and, as will be discussed below, whether some other measure serves it better or at a lower cost).

The recommendations received by the Council in 1991 and 1994 are consistent with this reading of the Act, as will be demonstrated below. That is, the Council received, mostly from agencies and tribes and environmental groups, a set of biologically-based operational objectives for the hydropower projects. The Council also received a few other specific goals, objectives, and standards for other parts of the program, but mostly it received recommendations for measures that either included a narrative or qualitative statement of biological purpose or "biological objective" right in the recommended measure or that had an implicit biological purpose or objective stated more clearly in the explanation submitted with the recommended measure. Nothing in the Act prevented recommending parties from recommending a more comprehensive set of distinct, quantified biological objectives for all or large parts of the program, which the Council would have had to evaluate and adopt or reject under the standards of the Act. The Council did not receive any such recommendations, and the Act neither requires the Council to wait until it does or allows the Council to develop these independently.

B. Standards for program measures

The term “biological objective” appears twice and only in Section 4(h)(6), which lists a set of standards for the Council to consider as it adopts measures. One use of the term is in Section 4(h)(6)(C), which provides that the Council will “utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost.” Section 4(h)(6)(C) does not direct the Council to develop biological objectives. Instead it calls for a least-cost comparison of two measures assuming that biological objectives already exist by virtue of the recommendations process. It seems quite odd to conclude that Section 4(h)(6)(C) is an indirect mandate to the Council to develop a full array of specific, distinct, quantified biological objectives for the entire program and to evaluate all measures against this framework before taking any action. If Congress had intended the Council to start its work with the development of such a complex and uncertain framework of “biological objectives,” we would expect to see a clear expression of that requirement in the Act and its legislative history.

A better way to read this section to be consistent with the rest of the language in the Act (especially the language describing the recommendations process), and the way the Council understands this section, is to conclude that the “biological objectives” referred to in Section 4(h)(6)(C) are the biological bases or purposes underlying recommended measures, again, whether implicit or expressly stated, whether narrative or quantified by the recommending parties. These must be “sound” biological objectives in that they must be supported by data and information and reflect the best available scientific knowledge.

The other mention of the term “sound biological objectives” is in the “sufficient flows” standard in Section 4(h)(6)(E)(ii). More precisely, this section states that the Council is to include in the program measures for anadromous fish that will “provide flows of sufficient quality and quantity between such [hydroelectric] facilities to improve production, migration, and survival of such fish as necessary to meet sound biological objectives.” Here again, Congress did not conceive of or mandate biological objectives in any broad or comprehensive way. Instead biological objectives are only expressly relevant to survival improvements related to the changes in the flows provided between the hydroelectric projects.

The sufficient flows provision in Section 4(h)(6)(E)(ii) already includes a general biological objective -- sufficient flows are needed “to improve production, migration, and survival” of anadromous fish. And as noted above, Sections 4(h)(2), (3), (5), and (6)(C) together demonstrate that all measures, for flows and for other activities, must have an underlying biological objective or purpose. And, it is clear from Section 4(h)(2)(B) that agencies and tribes and others may recommend biologically-based operational “objectives” for operation of the hydropower projects, which obviously includes flow measures. Thus why did Congress insert the explicit reference to measures “to meet sound biological objectives” in, and only in, the flows section? This section can be read to state that the Council cannot adopt flow measures without basing them on explicitly stated biological objectives or biologically based operational objectives, although there is no indication that these objectives must be numerical or quantified instead of qualitative or narrative. This means that while the recommending entities and the Council have some leeway under the Act for other aspects of hydropower operations, if flow measures are recommended, the Council cannot adopt the flow recommendations without express (and “sound”) biological objectives.

Congress did not explain why it chose to mandate explicit biological objectives only for flows (if indeed that is what Section 4(h)(6)(e)(ii) means). Various comments in the legislative history indicate that Congress understood that the issue of increased flows for fish would be the most contentious of all issues, pitting the agencies and tribes -- considered in the legislative history to be the repository of biological expertise and biological interest -- against the hydro projects’ other users in the most acute way. To ensure that the Council arrived at flow decisions for anadromous fish based on biology, and to ensure that the Council provided an express form of proof that the flow decisions were based on biology and not other

considerations, Congress emphasized that flow decisions must be explicitly related to biological objectives. In fact, the documentation function, along with their possible use in a program evaluation process, may be the main functional purpose of biological objectives.

Thus the Act indicates that the Council should expect to receive and consider recommendations for biologically-based objectives for hydroelectric project operations and development, instead of an elaborate and comprehensive quantified biological framework for the whole program. All recommendations and measures must be biologically based, that is, have a biological objective, but that biological objective may be qualitative or narrative in nature and may be implicit in the measure. The recommending entities are free, of course, to recommend more comprehensive, distinct numerical objectives. The Act does not require the Council to hold off from adopting measures to protect, mitigate and enhance fish and wildlife until it receives such a set of objectives.

This conclusion is entirely consistent with the Act's action-forcing language: Congress, legislating in atmosphere of great urgency, directed the Council to promptly develop the first fish and wildlife program in its first year of its existence (before the power plan), requesting the first set of recommendations "promptly" after the Council was established. The recommendations were to be submitted 90 days after the request. See Sections 4(d)(1), 4(e)(2), (3)(F), 4(h)(1)(A), (2), (3). Measures were to be based on the "best available scientific knowledge," a term intended to convey (as explained in the House Commerce Committee report) that the Council was to act quickly to develop a program to reverse serious population declines even in the face of imperfect data and scientific knowledge. Congress obviously did not intend for the Council to develop a complex, separate, comprehensive biological framework before or along with the program measures. The action-forcing language is consistent instead with an interpretation of the Act that requires a less systematic set of biologically-based objectives for hydro project development and operations, the area of great emphasis in the Congressional comments on the fish and wildlife provisions, and biological purposes or objectives underlying all measures.

2. 1991 and 1994 Recommendations

In 1991 (and 1994) the Council received only a very few recommendations actually calling on the Council to adopt express objectives or biological objectives. The nature of the recommendations received is entirely consistent with the analysis of the Act set forth above, and vice versa: Almost all these recommendations called for specific, physical, operational objectives for the hydropower projects, which were submitted with statements (mostly qualitative) of the biological purpose or objective that was the basis for the operational objective and with an explanation of the scientific analyses justifying the link between the operational objective and the biological purpose. The Council also received a few recommendations that asked for amendments to the program goal or for specific population rebuilding targets, that discussed the issue of biological objectives in general terms, or that recommended that the Council adopt biological objectives without recommending any specific objectives. To summarize the recommendations:

A. 1991 Recommendations

(1) Travel time and flow objectives and other hydro project objectives. State and federal fishery agencies, lower river treaty fishing Indian tribes and environmental groups recommended in 1991 that the Council adopt water particle travel time objectives through the mainstem Columbia and Snake Rivers, for these reasons:

In 1990 the Columbia Basin Fish and Wildlife Authority (CBFWA), the collective voice of the region's state and federal fish agencies and tribes, proposed a mainstem flow regime intended to produce flows of 300,000 cubic feet per second (300 kcfs) through the full reservoirs of the lower Columbia and 140

kcfs through the full reservoirs of the lower Snake (while at the same time calling for up-river reservoir levels to be held to a high level to protect resident fish in those reservoirs). In February 1991, CBFWA supported the flow proposal with its “Biological and Technical Justification for the [CBFWA] Flow Proposal.” In that report, CBFWA explained that its members' review of the existing biological information indicated that the migration speed (or “travel time”) of juvenile salmon through the lower river and to the estuary was of vital importance to the survival of the fish, that there was a close correlation between water particle travel time and fish travel time through the lower river at all flows levels, and that the higher water velocities and thus decreased travel times realized by flows much higher than the current system normally produced would maximize salmon survival.

CBFWA did not submit its particular flow proposal to the Council as a recommendation, partly due to uncertainty as to whether these particular flow regimes could be achieved and whether there was a better way to accomplish the same purpose. Neither CBFWA nor its members backed away from their expressed understanding of the need for and association of high water velocities, decreased water particle travel time, increased juvenile migration speed and decreased juvenile migration time, and increased survival. For recommendations to the Council, what many of the agencies and tribes, and a set of environmental groups, did was convert the CBFWA flow proposal and flow justification report into a set of travel time objectives for the hydropower system.

This is illustrated by the recommendations submitted by the Idaho Department of Fish and Game. IDFG submitted a coordinated group of recommendations, and the central pivot to that coordinated set of measures was a specific recommendation that the Council adopt a travel time objective for mainstem hydro project flow operations. More precisely, IDFG stated that the Council should establish

“a biological objective of decreasing fish travel time from the point of origin to below Bonneville Dam to as near the pre-dam condition as practicable. This biological objective is measured by the physical parameter of water particle travel time, which is directly related to fish travel time. To reach the biological objective, water particle travel times are established for the river reaches from the head of Lower Granite reservoir and the head of Wells Dam reservoir to Bonneville Dam for spring and summer migrating fish. These water particle travel time objectives are set forth in Table 1. These travel time objectives represent daily average river velocities.”

“Table 1” referred to this table listing “[w]ater particles travel times, as determined by the reservoir replacement method, at given CBFWA flow proposal flows:”

	McNary Dam to Bonneville Dam days	Wells Pool to McNary Dam days	Lower Granite Pool to McNary Dam days
January	23.3	20.1	54.6
February	23.3	20.1	54.6
March	23.3	20.1	39.2
April 1-15	7.5	8.5	12.0
April 16-30	6.2	8.1	8.9
May	6.2	8.1	8.9
June 1-15	6.2	8.1	8.9
June 16-30	9.3	10.2	14.9
July 1-15	9.3	10.2	14.9
July 16-31	11.6	11.7	22.7
August	11.6	11.7	22.7
September	23.3	28.9	34.8
October 1-15	23.3	28.9	34.8
October 16-31	23.3	15.0	34.8
November	23.3	15.0	34.8
December	23.3	20.1	34.8

IDFG presented information arguing that there was not sufficient water available in the upper Snake to produce CBFWA's 140 kcfs flows through the full reservoir pools of the lower Snake and thus produce the desired water velocities and water particle travel times to meet the objectives. IDFG proposed drawing down the reservoir levels in the lower Snake, whereby a lesser amount of water and lower absolute flows would produce equivalent water velocities and travel times. For this reason IDFG made clear in its drawdown recommendation that the "objective for the lower Snake River is intended to provide river velocity equivalent to a flow of 140 kcfs through full reservoirs."

Others who recommended the same travel time objectives were not as prescriptive in focusing on reservoir drawdowns, willing to allow the Council to craft the best possible combination of flow augmentation and reservoir drawdowns to produce the needed velocities and travel times. All of the environmental groups took this position. Three coalitions of groups -- the Northwest Conservation Act Coalition (NCAC), Northwest Environmental Defense Center (NEDC) and others, and the Northwest Resource Information Center (NRIC) and others -- submitted variations on the same travel time objective theme, all of them including the same travel time objective table submitted by IDFG. The Natural Resources Defense Council's (NRDC) 1991 recommendation consisted mainly of a set of water management recommendations for flow augmentation. But NRDC stated that the Council's first priority should be to get rid of its existing Water Budget water volume approach and adopt instead "a biologically based travel time objective and a system of minimum flows capable of meeting that objective," also phrased as a "biologically based objective for smolt travel time." NRDC did not specify any particular travel time objective; instead it simply referred for justification and specific to CBFWA's "Biological and Technical Justification for the [CBFWA] Flow Proposal." NRDC also stated that the travel time objective and improved flows were intended to serve two general biological goals: "(1) fish must be able to migrate safely downstream in the rivers; and (2) wild salmon must be protected and genetic resources maintained."

The U.S. Fish and Wildlife Service (USFWS), the Oregon Department of Fish and Wildlife (ODFW) and the Columbia River Inter-Tribal Fish Commission (CRITFC) took the same tack in 1991 -- they recommended the Council adopt travel time objectives; they did not recommend particular flow measures.

USFWS, for example, did not recommend any particular flows, flow augmentation measures, or water management measures, stating instead:

“We recommend that the Council establish a biological objective of decreasing transit time of juvenile anadromous fish from their point of origin to below Bonneville Dam and for adult fish during their upstream migration. We recommend that this objective be expressed in terms of water velocities or water particle travel times for the river reaches from the head of Lower Granite reservoir and the head of Wells Dam reservoir to Bonneville Dam for the entire period of juvenile and adult salmon and steelhead migration. Water particle travel time and water velocity are recommended as the units of measure rather than flow because actions that augment flows or reduce the cross-sectional area of the reservoirs and increase water velocities can be expressed in the same terms.

“We recommend that the Council include in its deliberations consideration of water velocities and water particle travel times equivalent to the flow levels in the flow proposal of [CBFWA] in order to ensure that a range of alternatives are considered. These levels are also consistent with the system strategies for mainstem fish migration recommended in the Integrated System Plan.”

Like USFWS, ODFW’s 1991 recommendation was really a recommendation to adopt a set of objectives or targets, not specific measures, although ODFW’s set of objectives was much more extensive than what the FWS recommended:

First, with regard to downstream migration of spring/summer chinook, ODFW recommended using water particle travel time as a “tool” (later also labelled as an “objective” and as a “target”), as follows:

“We believe the linkage between reduced downstream travel time and survival for spring and summer chinook and sockeye is sufficiently established that the council should select specific water particle travel times as one of the tools to increase downstream juvenile survival of those stocks. The best available information demonstrates that reduced water particle travel time, and hence reduced fish travel time, results in increased fish survival.”

For fall chinook downstream migration, ODFW integrated travel time with flow and temperature concerns:

“With regard to fall chinook juvenile migrants, we believe increased flow will reduce the amount of time these fish are exposed to detrimental temperature levels. The value of increased flow to fall chinook downstream juveniles is two fold: first in reducing ambient water temperature and second in reducing the exposure time to undesirable temperatures and predation by reducing fish travel time.”

ODFW did not recommend any particular travel time objectives for spring/summer or fall chinook, although the agency did state that “[t]he travel times specified should insure that, when combined with other program measures, the production goals of the [ISP] are achieved.” ODFW recognized that the “travel time targets might not be achieved in the early years” or in every year, yet it was important for the Council to set the targets anyway and that “[t]o meet the travel time targets, the Council should adopt specific actions to achieve the objectives over time.” Finally, ODFW emphasized the flexibility of setting travel time objectives instead of specific flows or flow targets or other specific measures.

With regard to fall chinook, ODFW also recommended the adoption of a set of what it variously labelled “measures,” “goal” and “objectives.” This included a population rebuilding target which is discussed further below, and two migration improvement standards: “increase average downstream juvenile survival by 75 to 100 percent” and “increase upstream survival of adult fish by 25 percent. The department believes the major obstacles to upstream migration are temperature, flow and problems at passage facilities. At a starting

point, the Department believes that maintaining a temperature of 68 degrees or less in the Snake will reduce observed pre-spawning mortality.”

Like USFWS and ODFW, CRITFC’s 1991 recommendation for the mainstem flows section of the program focused on objectives, not measures. The only specific objective recommended concerned water temperatures -- a 62-degree F objective during migration season. The rest of the recommendation stated general biological or operational objectives or standards that could function either as the objectives against which to evaluate measures and/or as the general biological underpinning to more specific objectives that would then be used to evaluate measures. More precisely, CRITFC recommended the following, written to correspond to the language of Section 4(h)(2)(B) of the Act:

“The following standards are intended to serve as objectives for the operation of hydroelectric projects on the Columbia River and its tributaries in a manner designed to protect, mitigate, and enhance fish and wildlife. Specific measures to improve downstream survival must be evaluated in the context of these standards and be consistent with them. At and between each hydroelectric project on the Snake and Columbia Rivers, such measures must:

1. Decrease smolt migration travel time to the estuary to avoid residualism, exposure to predation, and adverse water quality impacts (e.g. water temperatures exceeding 62 degrees F).
2. Reduce water temperatures during adult and juvenile migrations when temperatures exceed 62 degrees F.
3. Increase water velocities to aid smolt migration.
4. Be consistent with the rebuilding strategies specified in the Integrated System Plan.
5. Protect substantially all juvenile migrants, particularly the progeny of naturally spawning adults (e.g. protection for only the middle eighty percent of the migration presents unacceptable risks to naturally spawning populations).
6. Not degrade upstream migration of adult anadromous fish.
7. Be sufficiently flexible to accommodate changing management needs for fish protection.
8. Allow real time management by the tribes and fishery agencies.
9. Be readily verifiable with measurable criteria for annual operations.
10. Account for real time (daily and hourly) migration needs.”

CRITFC stated that it was recommending standards rather than actual measures “[i]n the interest of fostering regional dialogue and consensus.”

While CRITFC did not recommend a specific travel time or flow objective, it did state, in the explanation for its recommendation, that the best available scientific information for the Council to consider as it wrestled with these objectives included CBFWA’s Biological and Technical Justification for the [CBFWA] Flow Proposal, the Council’s passage model and its System Planning Model and the parameters and justifications for the models, and the Fish Passage Center annual reports, because “eight years of

implementing the Water Budget [has] provided a substantial amount of experience with regard to the efficacy of measures to improve flow for downstream migrants.”

(2) Program goal and population rebuilding targets. In 1987 the Council adopted an overall interim program goal to double the salmon and steelhead populations in the basin. In 1991, Oregon Trout recommended a companion “Biological Goal:” “To maintain genetic resources of salmon and steelhead in native, naturalized, and artificially propagated populations with no irreversible losses for genetic diversity resulting from management interventions or inactions.” Oregon Trout also recommended that the Council begin a process to develop more specific production and escapement objectives and effective populations sizes to implement this goal.

CRITFC recommended a similar addition or revisions to the program goal: “The conservation and rebuilding of wild and natural fish runs is accorded priority.” CRITFC recommended a subregional planning process and a Program Evaluation Group to flesh out specific objectives and standards.

Finally, ODFW recommended establishing interim aggregate population rebuilding targets (which the program did not then have), at least for fall chinook, recommending an interim target of achieving a spawning escapement level of at least 1000 to 1500 fall chinook adults above Lower Granite Dam within four brood cycles. With spring/summer chinook, ODFW stated that while it had not undertaken an analysis of those populations as it had the fall chinook, it “proposed that the goal of such an analysis would be an escapement of 25,000 naturally spawned spring chinook and 20,000 naturally spawned summer chinook as previously identified in *U.S. v Oregon* discussions.”

(3) Other recommendations for specific objectives, standards and biological objectives. The Council received little else in the nature of discrete or express operational or biological objectives in the 1991 Recommendations. Certainly, no entity recommended any version of a comprehensive set of discrete, quantified biological objectives for all phases of the program. The recommendations that the Council did receive are as follows:

CBFWA recommended adoption of the Integrated System Plan. The central features of the ISP, in the view of CBFWA, were the “900 projects or activities, which together with changes in mainstem survival, are estimated to produce the additional 2.5 million adult salmon and steelhead necessary to reach the interim doubling goal.” The doubling goal is a very general, if measurable, biological objective itself, and the ISP may have contained more specific “biological objectives” beyond the doubling goal to the extent the plans contained subbasin adult return numbers, estimated increases in smolts (or spawning habitat) per subbasin and other objectives intended as subordinate objectives or goals on the way to the doubling goal.

The Bonneville Power Administration (BPA) recommended an adult fall chinook temperature “objective” of “68 degree F or below during the major portion of the adult fall chinook migration, i.e., late August to mid-October.” The Pacific Northwest Utilities Conference Committee (PNUCC) recommended a set of flow augmentation measures based on a couple of flow targets. One was a recommendation “to increase mid-Columbia flow levels to a weekly average of 160 kcfs to assist flows in the lower Columbia” after May 31 (with a cap at 3.45 million acre feet total augmentation), and the other was “[t]arget flows of 85 kcfs at and below Lower Granite Dam for 46 days (April 15 through May 31).”

Assuming that harvest rate reductions are biological objectives, PNUCC also recommended a 50 percent reduction in the harvest of all Columbia River salmon and a reduction in the river harvest rate of fall chinook “to 27 percent which is equal to a 50 percent reduction of the 1990 harvest rate.” More germane to biological objectives, PNUCC also recommended as part of its harvest recommendation package that the Council “[e]stablish “stock specific escapement goals for all naturally spawning stocks by 1993.” BPA

recommended that the Council incorporate into the harvest section of the program the interim escapement goals at Bonneville and Lower Granite Dams developed in the *U.S. v Oregon* process, and that the Council begin a process to develop “biologically-based escapement goals” for these runs to replace the interim goals borrowed from *U.S. v. Oregon*.

Finally, PNUCC and the Forest Service submitted recommendations for discrete objectives that related to habitat. PNUCC recommended two general habitat “objectives:” “Target zero net loss of watershed and riparian habitat in areas used by naturally spawning weak stocks,” and [t]arget rehabilitation of 50 percent of existing degraded watershed and riparian habitat in areas used by naturally spawning weak salmon stocks by the year 2000.”

The Forest Service submitted a habitat improvement plan for the South Fork of the Salmon River, which included, as did many recommendations (for all parts of the program), general narrative statements of the biological goal and objectives of the recommended measures. That is, the Forest Service stated a general goal “to increase the quality and quantity of summer chinook salmon and summer steelhead habitat with an emphasis on increasing the survival of wild and natural stocks.” “Project objectives” were “to increase summer chinook and steelhead production by reducing sediment loading, cleaning spawning gravels, eliminating migration barriers, and providing habitat diversity. Attainment of these objectives should result in increased juvenile rearing densities and smolt production of summer chinook and summer steelhead.” The Council’s analysis of what the Act means by its use of the term “biological objective” in Section 4(h)(6)(C) corresponds to this type of general statement of the biological goal or purpose of a recommended measure, whether stated explicitly in the recommended measure or implicit in the measure but included in the explanation submitted with the recommended measure. It is not legally necessary for a recommending entity to go beyond this level, and most do not, though they can if they choose recommend developing the biological objectives to a more specific and quantified level.

And in the rare case of the Forest Service’s habitat recommendation for the South Fork Salmon River, this is precisely what occurred. The Forest Service went beyond the general narrative language of biological benefit to include charts with more specific, numerical objectives, apparently derived from data provided for the subbasin plan development process for the Integrated System Plan. For various stretches of the South Fork Salmon River and smaller tributaries and for two larger tributaries, the Sesech River and its tributaries, and the East Fork Salmon River and its tributaries, the charts stated the quality of habitat, the density of summer chinook and summer steelhead smolts per square mile, the potential smolt capacity, and the estimated increase in the number of smolts that could be obtained by improving fair and poor habitat to excellent habitat. These numbers could be seen as specific, measurable biological objectives.

(4) Qualitative statements of biological purpose or general discussions of biological objectives in the 1991 recommendations. Most 1991 recommendations that made use of the term “biological objective” or “objective” somewhere in the recommendation or in the explanation of the recommendation used the phrase to mean the general if usually implicit purpose or biological goal of the action (as opposed to a power or recreation or other purpose). Another type of recommendation included a similarly general, non-numerical biological objective in the recommended measure, without specifically using the label “biological objective” or “objective.” Still another set of recommendations specifically asked the Council to begin the development of a set of specific biological objectives, usually based on a general biological goal or objective. And, of course, some of the recommendations combined these approaches (such as, for example, many of CRITFC’s). Examples include:

The Bureau of Reclamation recommended that it develop and implement three demonstration water conservation projects in tributary habitat areas. The Bureau’s proposed program language said nothing about a biological objective. In the accompanying explanation -- in the section of the form asking the

recommending party to “describe alternative means which would achieve the same biological objective as the proposed amendment” -- the Bureau stated that “[t]he biological objective of the proposed demonstration projects is to improve habitat quantity and quality in tributaries used by anadromous fish for spawning, rearing, and migration.” Similarly, the Bureau stated, in the explanation for its recommendation to devote 90,000 acre-feet of uncontracted storage to flow augmentation, that “[t]he biological objective of the proposed amendment is to use water accruing to existing uncontracted storage space in the Snake River basin to improve water velocities, smolt and adult travel times, and water quality in the lower Snake and Columbia Rivers.”

The Environmental Defense Fund recommended that the Council “revise [the] hydrofacility operation rules to include wild migratory fish objectives and constraints.”

As noted above, CRITFC’s general mainstem flow recommendation was a combination of one quantified objective (temperature) with a number of general narrative biological objectives that could be the basis for the evaluation of measures, for the development of more specific objectives, or both. Most of CRITFC’s 1991 recommendations were of this general nature, often expressed along with recommended measures. In other examples relating to flows and passage, CRITFC recommended a set of flow augmentation efforts specifically “to improve passage conditions of juvenile fall chinook.” At various mid-Columbia dams, CRITFC recommended specified project operations and passage improvements facilities to “alleviate juvenile downstream passage mortalities” and “reduce juvenile turbine mortality.” Specified improvements in collection facilities at Lower Granite were needed to “reduce predation” and “reduce direct and indirect mortality to juvenile salmonids.”

With regard to hatchery production, CRITFC called for the evaluation of and reprogramming of the existing hatcheries so that production programs and actions were consistent with the conservation and rebuilding of wild and natural populations, with the development of “conservation, restoration, mitigation [and] harvest objectives.” And as one part of the evaluation process, “[a]ll hatchery programs will be evaluated in terms of adult production (e.g. total numbers and biomass of adult fish harvested and spawning escapement) and efficiency ratios (e.g. biomass of adults produced per unit biomass of smolts released).” CRITFC stated that the immediate objective for its recommended supplementation program was to increase the number of smolts in a set of subbasins as set forth in the subbasin plans of the Integrated System Plan; increases in adult returns were the ultimate objective although numbers were not specified.

With regard to habitat, CRITFC recommended a number of mostly general habitat objectives and standards, as well as processes for developing and/or reviewing habitat objectives and standards. In 1994 CRITFC superseded those recommendations with a much more specific set of habitat objectives and standards, discussed below.

PNUCC recommended a process to develop escapement and production objectives, while also recommending a general development process for subbasin biological objectives. With regard to this latter recommendation, PNUCC recognized that the ISP “provided biological objectives for some stocks in some tributaries, but additional work is needed to develop consistent, biologically sound objectives for all stocks.” PNUCC recommended that the “group of independent scientists” established in Section 703 (of the 1987 program) develop “an interim set of biological objectives for the program,” with the expectation that these objectives would “specify the minimum number of adult salmon for each stock needed to occupy currently available spawning habitat in each tributary” and also establish “[m]inimum broodstock needs for each artificial production facility.”

Finally, the Forest Service recommended the following set of habitat “objectives:” “[m]aintain existing salmon and steelhead habitat quantity and quality in Columbia River basin subbasins,” “[r]estore

degraded salmon and steelhead habitat in Columbia River Basin subbasins,” “[m]anage all activities in the Columbia River Basin subbasins that affect production of salmon and steelhead on a watershed basis,” and “[g]ive priority to habitat for critical stocks.” The Forest Service then proposed a process whereby the Council would develop more specific objectives, standards and criteria for habitat improvement.

B. The Council’s Response to the 1991 Recommendations in the Strategy for Salmon

On a record based on these recommendations, and on comments received in response to the recommendations and to draft amendments, the Council made the following decisions for the Strategy for Salmon, briefly summarized:

Program goal. The Council amended its program goal to state that the population doubling goal should be achieved without loss of biological diversity. The Council took this step in response to the recommendations and comments of Oregon Trout, CRITFC and others, in response to the increasing level of scientific knowledge about the value for genetic and biological diversity and the threat to that diversity in the basin, and in response to the mere fact of the Endangered Species Act listings and what that would mean for anadromous fish management.

Aggregate population rebuilding targets. In response to the recommendation from ODFW and comments from many, the Council adopted interim aggregate population rebuilding targets for Snake River stocks: 50,000 adult spring chinook; 20,000 summer chinook, and 1000 fall chinook.

Travel time objectives. The Council declined to adopt the recommended travel time objectives, for a number of reasons that to the Council called for caution and more deliberation. First, the Council determined that the high flows needed to achieve the objectives could not be produced in the immediate term in any but the very highest of water years and that to try would end up violating other requirements of the Act. The Council called for a presumptive path toward reservoir drawdowns, but whether those could be implemented and provide equivalent survival benefits was uncertain. Also, the precise relationship between flows, velocity, water particle travel time, fish travel time, and survival was (and is) highly uncertain and contentious. The Council chose to use a general rebuilding analysis and passage model that estimated the flow/survival relationship in terms acceptable to the agencies’ and tribes’ viewpoint of the relationship, and used that analysis to determine that the Council’s immediate flow measures were insufficient. But the Council judged that further debate and analysis were needed before the Council could commit to a specific understanding of that relationship as would be represented by adopting the recommended travel time objectives.

Biological rebuilding framework. In response to the recommendations from ODFW, PNUCC and others and from other comments and circumstances (including the ESA listings), the Council proposed in its Phase Three amendments the adoption of a comprehensive biological rebuilding framework for the weak Snake River stocks, proposing both the skeleton of the framework and some of the specific numbers. This included the interim aggregate population rebuilding targets for Snake River spring, summer, and fall chinook plus some proposed percentage increases in survival for the various stages in the life-cycle of the different stocks. Comments received by the Council overwhelmingly indicated that while the framework was a good idea, more time was needed to develop its particulars. Thus in the Strategy for Salmon, the Council retained only the interim aggregate rebuilding targets, while placing the skeleton of the proposed rebuilding framework in Appendix A and calling for the fishery managers and others to begin fleshing it out in 1993-1995.

The ISP and subbasin plans. The Council did not adopt the ISP and the subbasin plans, and thus did not adopt the subbasin plan population objectives. The subbasin plans had been developed

in significant part to accomplish the population and harvest objectives of the Columbia River Fisheries Management Plan from the *U.S. v. Oregon* harvest litigation. The addition of the ESA listings and process brought new perspectives and problems that had to be addressed in the subbasin planning process. Thus the Council called for the existing subbasin plans to be used as the underlying resource documents in identifying particular habitat and production measures and for the revision and adoption of subbasin plans through the development of the biological objective framework noted above and the subregional planning process.

Harvest escapement objectives. For similar reasons the Council chose not to adopt particular escapement objectives to guide harvest management. The Council agreed that developing escapement objectives should benefit harvest management and the management of other human activities affecting salmon and called for their development as part of the development of the rebuilding framework.

In the Ninth Circuit, the petitioners' challenges to the program focused narrowly on the adequacy of the Council's flow measures. The environmental groups and the Yakama Indian Nation in particular challenged the Council's decision not to adopt the travel time objectives recommended by agencies and tribes and by environmental groups. The Court refrained from an actual substantive holding that the Council erred in not adopting these recommendations, holding instead that the Council's findings of rejection were not sufficient to satisfy the Act. But the Court noted that it was disturbed by the Council's rejection of what seemed to be a nearly consensus recommendation of the fish agencies and tribes that the best available scientific knowledge indicated the need for and benefits of establishing water particle travel time targets as an expression of an appropriate biological objective for project operations. The Court also concluded that the doubling goal and the aggregate rebuilding population targets were both too broad and lacking in timelines to represent a fair expression in the program of what the agencies and tribes recommended.

C. 1994 Recommendations

Just prior to the Court's opinion the Council received the 1994 recommendations. The Council thus began the process of analyzing the 1994 recommendations coupled with its analysis of the Court's opinion, what the Act requires of the Council with regard to biological objectives, and the remanded 1991 recommendations. The 1994 recommendations in general repeat the 1991 recommendations in nature -- a host of specific operational objectives for the hydro projects from agencies and tribes and environmental groups (this time, flow targets and velocity objectives took the place of travel time objectives), a recommended revision to the program goal, recommended measures that came with qualitative, narrative statements of their biological purpose or objective, and little else. No entity recommended a developed comprehensive biological rebuilding framework. The recommendations were as follows:

(1) Flow targets, velocity equivalent objectives and other hydro project operation objectives. The lower river tribes, the state fishery agencies and the environmental groups continued to recommend that the Council set objectives for flows in the lower Columbia and Snake River, based on the same understanding of the relationship between flows, velocities and survival set forth in CBFWA's 1991 Biological and Technical Justification for its flow proposal. The recommendations for 1994 were particularly derived from the Detailed Fishery Operating Plan (DFOP) produced in late 1993 by the fish agencies and tribes. (Note that the up-river agencies and tribes along the Columbia River subsequently commented during the Council's 1994 rulemaking process that they did not support the Columbia flows that would be produced for anadromous fish under DFOP because of the effect on up-river reservoir levels and thus on resident fish in those reservoirs.) The recommended objectives are now expressed as flow targets and velocity equivalents and not travel time objectives, but the underlying basis and purpose has not changed.

(i) Columbia River flow targets. CRITFC recommended (Recommendation No. 5-2) the DFOP Columbia River flow regime to provide the following minimum flow targets at The Dalles, in first, second and third year critical year declarations:

April 15-30	300, 260, 220 kcfs
May	300, 260, 220
June 1-15	300, 260, 220
June 16-30	250, 250, 200
July	200, 200, 200,
August 1-15	160, 160, 160
August 16-31	160, 160, 160

In addition to the DFOP targets, CRITFC recommended a minimum flow of 120 kcfs at the Dalles in September.

ODFW (5-8) recommended the same April-August flow targets, though not the September target. The same is true for NRDC and its coalition partners (5-4).

(ii) Snake River velocity equivalent objectives, flow targets and volume objectives. In line with its 1991 recommendation, IDFG (5-9, 5-10) recommended a velocity equivalent objective for the lower Snake River, as follows:

“The biological objective of the Snake River drawdown is to achieve river velocity equivalent to a flow of 140[,000] cubic-feet per second through full reservoirs in all but low flow years.”

[This is the only self-labelled “biological objective” in the 1994 recommendations.] The environmental group Idaho Rivers United (5-6) similarly called for drawdowns and flow augmentation in the Snake “to produce the equivalent velocity created by 140,000 cfs at full pool.”

Matching the sliding-scale flow targets in the Columbia River, ODFW (5-8) recommended a companion set of April-August minimum flow targets for the Snake at Ice Harbor. More precisely, ODFW called for flow measures to “[a]chieve water velocities equivalent to the following flows at full pool:”

April 16-30	140, 100, 85 kcfs
May	140, 100, 85
June 1-15	140, 100, 85
June 16-30	85, 65, 50
July	80, 60, 50,
August 1-15	50, 50, x
August 16-31	50, x, x

Flow targets in columns marked with an “x” are to be “determined through in-season management decisions.”

CRITFC (5-2), on the other hand, did not recommend flow targets in the Snake. Instead, it recommended what it called “flow augmentation volume objectives” in the Snake River from April 15 through September:

The total volume to be made available for augmentation increases from 4.3 million acre feet in 1995, to 4.874 million acre feet in 1996, to 4.914 million acre feet in 1997 and 1998, broken down as follows: From Dworshak, in all these years, 1.5 million acre feet April 15 to July 1; 1.0 million acre feet from July

through September. From Brownlee, in all years, 110,000 acre feet in May, and 137,000 acre feet in July. In August, 50,000 acre feet in 1995, 100,000 in 1996, and 140,000 in 1997 and 1998. In September, 100,000 acre feet in all years. From the Upper Snake, 1.427 million acre feet in 1995 and 1.927 million acre feet in 1996-1998 to be available between April 15 and September 30.

NRDC recommended the same augmentation volumes as did CRITFC, except that the August volume called for from Brownlee in 1996 and after is 100,000 acre feet (CRITFC went to 140,000 acre feet in 1997 and 1998). NRDC did not, however, call the augmentation volumes “objectives.”

(iii) FPE/bypass/spill. CRITFC, ODFW, NRDC and Idaho Rivers all recommended bypass/spill objectives or standards. Thus ODFW recommended “[p]rovid[ing] spill to achieve 80 percent Fish Passage Efficiency [FPE -- percentage of fish passing inriver that do not go through the turbines] at each Snake River project within the guidelines of the state’s water quality agencies April 15-July 31 and at each Columbia River project May 1-August 31 as specified in the 1994 DFOP.” NRDC and its coalition partners and Idaho Rivers similarly recommended that the Council adopt spill as the “primary means of dam passage” and that it call for “enough spill (primarily at night) to attain 80 percent FPE.”

CRITFC's recommendation differed to this extent: (a) CRITFC characterized the standard more clearly as a bypass performance standard, not a “spill” standard [i.e., bypass to 80 percent FPE; spill to that FPE level because it cannot be met by current bypass systems]; CRITFC called for a 90 percent standard for summer migrants; and CRITFC specifically added a recommendation for “spill to achieve an 80 percent FPE for the entire migration of early releases (March) of hatchery salmon.”

(iv) Upper-river reservoir drawdown constraints. The Montana Department of Fish, Wildlife & Parks and the Confederated Salish-Kootenai Tribes recommended (beginning in the Council’s 1993-94 Phase Four resident fish rulemaking, and carried over to this process), biologically-based “integrated rule curves” to protect environmental conditions for resident fish and wildlife in the Hungry Horse and Libby storage reservoirs in Montana. The central purpose of the integrated rule curves is to prescribe reservoir levels under various conditions below which the reservoirs will not be drawn for power production or to provide flows for lower river anadromous fish. Similar reservoir constraints have been recommended for Lake Pend Oreille and proposed in a comment for Grand Coulee.

(2) Program goal recommendation. As noted above, in the program amendments in 1992, the Council adopted an interim, overarching biological goal for the anadromous fish portion of the program: to double the number of salmon and steelhead in the basin without loss of biological diversity. CRITFC (Recommendation No. 4-2) recommended a refinement of this program goal, creating a three-phase program goal (or three goals in sequence) to “address short, medium, and long-term progress to be achieved in mitigating for hydrosystem losses,” in which doubling of the basin’s salmon and steelhead population became the middle phase. The three phases of the system-wide goals were:

1. Immediately halt the declines in existing salmon populations and begin rebuilding by 2000;
2. Further rebuild populations to an aggregate level equal to the doubling goal by the year 2030; and
3. Rebuild populations to a level that will fully mitigate for losses caused by development and operation of the hydropower system by 2194.

CRITFC’s recommendation also included language calling on the Council to consult with the fishery managers and adopt “phased, qualitative and quantitative performance standards by March 31, 1995, to

implement the goals of this program.” The performance standards are to be used in the annual program evaluations and at the time of program amendments, and to be revised as progress is made.

(3) Other recommendations for objectives, standards and biological objectives. As in 1991, the Council received few other recommendations for biological objectives. No entity recommended a comprehensive biological framework. What the Council did receive:

CRITFC (in Recommendation No. 7-3) also recommended a Tribal Restoration Plan consisting of nearly two dozen subbasin plans containing smolt release targets and adult return “harvest objectives” numbers for each subbasin. The subbasin plan recommendation is discussed more fully in the findings on Section 7; the lack of agency and tribal agreement on these plans led the Council to call for further refinement of the plans in the next year.

For the habitat section of the program, CRITFC recommended (7-2) a new habitat program goal and a whole series of new habitat objectives, policies and performance standards, some of them quite specific. To the extent that specific standards for water temperatures, sediment, cobble embeddedness, etc. can be called “biological objectives,” the CRITFC recommendation contained these. The recommendation also contained broader, more general, biologically-based and qualitatively expressed objectives, goals and policies for habitat protection activities. The habitat standards are also discussed more fully in the findings on Section 7.

Finally, with regard to harvest, PNUCC this time recommended that the Council adopt the escapement goals established by the Snake River Salmon Recovery Team. This recommendation is discussed more fully below in Section 8; the Council rejected this recommendation due to the opposition of the fishery agencies and tribes, calling instead for the development of these objectives as efforts continue to develop a comprehensive rebuilding framework.

Thus with the exception of CRITFC’s subbasin plan numbers and habitat standards and PNUCC’s harvest escapement objectives, which are dealt with elsewhere, the 1994 recommendations for specific, discrete types of objectives presented the Council with nothing more than a set of hydro project operational objectives or standards.

(4) General discussions of biological objectives in the 1994 recommendations. The recommendations in 1994, as in 1991, also included general statements of biological purpose or objective, a few general discussions of biological objectives, or general calls for the Council to develop biological objectives. For example, CRITFC recommended (5-(2)) an evaluation and then the adoption of measures to meet the goal “to move the river hydrograph back toward historical timing and duration” in order “to reestablish critical mainstem and estuarine floodplain habitat.”

CRITFC (3-2, 4-(2)) also coupled its revised program goal with a call to the Council to adopt more specific population rebuilding performance standards and with a monitoring and evaluation program where eventually “each Council measure and each project funded by the Program should have measurable objectives that can be directly translated into the Program’s production goals in terms of increased adult fish runs, increased habitat capacity, or increased survival rates at specific life stages.” The recommendation did not state where these objectives are to come from or who is to develop them, nor the extent to which the Council can adopt measures and monitor and evaluate the program without the objectives. Also calling for the development of a biological objective framework was NRDC and its coalition partners. In the middle of its Columbia flow target recommendation (5-4), this group recommended:

“By January 1995, the fishery agencies and Tribes will develop a framework for biological objectives to guide salmon restoration actions in the mainstem Columbia and Snake. This framework will

include salmon rebuilding schedules, survival improvement targets for each life-cycle phase, and performance standards to achieve those improvements (e.g., travel time/flow/velocity objectives for smolt-to-ocean survival improvements). By January 1996, the fishery agencies and Tribes will identify detailed objectives to be adopted by the Council.”

In the area of habitat, CRITFC combined its specific and general habitat objectives and standards with a recommended process for the development of additional objectives and standards and their use and review (7-(2)). The Forest Service's habitat recommendations (7-6) included a number of statements to the effect that the Service is developing habitat objectives and standards in its various PACFISH, President's Forest Plan, Eastside and Upper Columbia River Basin EISs, etc. processes and that the Council should essentially defer to these as the land management objectives and standards for the national forests.

Finally, part of PacifiCorp's explanation for its recommendation (7-10) to reopen consideration of the passage issue at Condit Dam revolved around the lack of biological objectives:

“The present wording in the Fish and Wildlife Program calling for passage at Condit Dam is inconsistent with this standard [i.e., Section 4(h)(6)(C)] because no clear biological objectives exist for salmon and steelhead production in the White Salmon River. The White Salmon River Subbasin Plan, which did contain biological objectives, has been repudiated by the agencies. The Columbia River Fisheries Management Plan, which calls for the release of 1.45 million hatchery spring chinook into the lower White Salmon River, appears to conflict with a natural production goal. Without biological objectives, it is impossible for the Council to identify a least cost alternative for achieving them.”

(PacifiCorp repeated this position in its 1994 comments. PacifiCorp's Condit Dam recommendation is discussed more fully below, in Section 7).

D. Comments on the 1994 Recommendations and Draft Amendments

The Council's draft rule included CRITFC's three-tiered program goal in a set of alternative approaches to a biological framework for the program, alternatives largely without specific objectives or numbers. One of the alternatives, Alternative E, was based on a framework developed by agency and tribal personnel and submitted to the Council in response to a consultation request. The Council's proposed amendments also included mainstem options that incorporated the specific mainstem operational objectives (the flow targets, FPE standards, etc.) recommended. The draft also included the subbasin plans and the habitat performance standards recommended by CRITFC. The Council received extensive comments on the issue of biological objectives, on the recommendations and on the draft rule.

With regard to CRITFC's recommended change to the program goal, CBFWA included CRITFC's three-tiered goal in CBFWA's program re-write comment. One issue that was not clear from CRITFC's recommendation was the role of the other half of the Council's existing program goal -- rebuilding population numbers without loss of biological diversity. In CBFWA's program re-write, CBFWA's statement of the “specific goals” included only the three-tiered goal noted above, but the text of CBFWA's explanation of the program goal continues to speak of the “challenge of balancing the need to increase the number of fish in the Columbia while maintaining and enhancing biologic diversity” and the need to “adhere to the principles that conserve biological diversity,” which need not be incompatible with population increases. CRITFC submitted comments restating its support for the three-phased goal, but its comment was silent on the biological diversity issue. The Yakama Indian Nation stated explicitly that the salmon and steelhead goal should be to double the runs, that maintenance of biological diversity is not properly a goal, it is a biological objective, or one means to reach the program goal; that it may not be possible to rebuild upriver salmon and steelhead runs

without losing some biological diversity; and thus that the Council should remove “without loss of biological diversity” from the goal statement. Many other commenters, led by Oregon Trout, commented that the program’s biological framework must include the program goal of maintaining genetic or biological diversity, as well as more specific objectives that express that goal, such as smolt age, age at maturity, rare alleles, run timing and distribution.

Concerning the third tier or phase or goal recommended by CRITFC - fully mitigating for the losses caused by the hydropower system - a number of commenters stated that full mitigation for losses caused by the hydropower system is not attainable and not required or supported by the Act; this goal is not attainable given that 50 percent of the historic habitat in the mainstem Snake and tributaries and 500 miles of the upper Columbia and tributaries historic habitat has been permanently removed by hydroelectric and flood control developments, because of reductions in the carrying capacity of the existing river, and because of resident fish substitutions (e.g., PNGC, Chelan County PUD, Northwest Forest Resource Council, Mark Reller, Montana representative on Snake River Drawdown Committee and FOEC). PNGC added the only additional comments on the proposed revision of the goal. It supported the first tier of the revised goal, and expressed conditional support of the second tier of the goal “to further rebuild to a level that will support a commercial and sport harvest, but only in so far as that harvest is restricted to what is biologically prudent to maintain a genetically diverse naturally spawning population.” These goals, especially the second, are “aspirational.” “Failure to achieve this second goal at a reasonable cost should not be understood as failure of the Program. . . . There is no requirement in the [Act] to provide desired harvestable levels of fish to support the fishing industry.” PNGC did not support the third tier of the goal, stating that goals or statements implying a requirement to “restore” hydropower-related fish losses are not supported anywhere in the Act or its legislative history; “[i]f restoration was to have been a statutory obligation, Congress would have stated this, particularly given the magnitude of the costs and efforts required to do so.”

Concerning the other recommendations and issues, the comments received from the agencies and tribes were consistent with the approach they had been taking in the 1991 and 1994 recommendations. CBFWA incorporated into its program re-write, which it submitted as a comment, all of the flow targets, velocity equivalent objectives, flow augmentation volume objectives, FPE standards and reservoir constraints recommended by its various members. With regard to the rebuilding framework, and besides adopting CRITFC's three-tiered goal, CBFWA provided little more than some introductory explanations and definitions for the program, stating, for example, that “[b]iological objectives are identified under section 4(h) . . . as a necessary component of the Council’s program,” and that biological objectives are “intended to provide a standard against which to compare alternative measures and should not necessarily constrain the Council to a single course of action,” an “important contrast with success indicators which are specific to the measures.” “Biological objectives” was defined as statements “describe fish population attributes (e.g. number, age composition, survival) or environmental attributes necessary to achieve protection, mitigation and enhancement of fish and wildlife resources of the Columbia River Basin.”

CBFWA also stated that similar work is going on in the ESA process. In October 1994, as part of the settlement process in the *Idaho v. NMFS* ESA litigation, a Biological Requirements Work Group (made up of state, federal and agency fisheries scientists) produced a Progress Report to NMFS titled, “Analytical Methods for Determining Requirements Of Listed Snake River Salmon Relative to Survival and Recovery,” which the Group recommended for use as part of process of developing jeopardy standard. CRITFC, ODFW, Idaho and Save Our Wild Salmon all requested that the Council place this report in the administrative record and make use of it in developing the biological objective framework for the program, without much guidance as to how to use it. The report is quite technical in its focus on the problems of endangered stocks and the ESA process, so it is not precisely relevant to the Council's mandate and this rulemaking. And it did not contain anything resembling a discrete set of biological objectives for the Council's program. It did, however, describe the nature and direction of the agencies and tribes’ continuing work in this area. As will be noted in

more detail below, the analytical methods described in the report included a historical approach to developing population profiles and objectives that may prove useful in future development of the framework.

CBFWA further stated that it would continue to work on the framework and would try to supplement its comments by the end of the Council's consultation period, December 6, 1994. CBFWA did submit additional comments at this date, as will be discussed below.

CRITFC basically repeated what was in its recommendation and in the sketchy biological framework requested from the agencies and tribes by the Council at the time the Council proposed the draft amendments and sent out for public comment as a rebuilding framework Alternative E. Most of its comments were general definitions and principles, but CRITFC did go further in the comments by identifying certain specific targets and standards in the CRITFC recommendation as "biological objectives" that had not been labelled so before. The CRITFC framework included:

Goals - defined as "[t]angible statements of the governing purposes for adopting and implementing the Fish and Wildlife Program." As noted above, CRITFC again stated the three-tiered goal of halting decline by 2000, doubling by 2030, and full mitigation by 2194.

Performance Standards - Defined as "[t]erms for measuring whether goals are being achieved." CRITFC gave the examples, without numbers, of adult returns to a subbasin, egg-to-smolt survival ratio in a subbasin, and smolt-to-adult survival ratio to a subbasin, noting that "[m]easuring the efficacy of a mitigation program by adult returns has been a long held position of the fishery managers" and that the Council should "adopt performance standards based on survival of salmon by life stage keyed to adult returns." CRITFC also noted that "relevant information" is being developed through the *IDFG v. NMFS* settlement process. CRITFC attached the Biological Requirements Work Group's Analytical Methods analysis from that process (described below), making only the major point "[a]mong other things, this report indicates that based on recent conditions (1975-1988) various stocks of salmon in the Snake River basin are significantly below threshold levels where their survival is assured. Unless survival rates are significantly improved, we expect that additional stocks will become extirpated."

Biological Objectives - Defined as the "attributes of the affected environment needed to meet the program's goals as measured by its performance standards." In the October/Alternative E framework, CRITFC gave only general examples at this point. In its public comment, CRITFC stated that "CRITFC's August 15 submittal to the Council contained a number of recommendations for such biological objectives. These include:

"With Regard to Mainstem Habitat --

Sliding Scale Flow Targets at The Dalles Dam;
Snake River Flow Augmentation Volume Objectives;
80 percent Fish Passage Efficiency . . . ;
Ceasing transportation of juvenile salmon.

"With Regard to Tributary Habitat --

Surface fine sediment . . . less than 20 percent in spawning habitat;
Specific Watershed Biological Objectives are identified . . . in the CBFWA markup. These objectives are generally consistent with the CRITFC recommendations [in what were then called habitat performance standards]."

Measures - Defined as “actions needed to achieve certain biological objectives.” Examples given here were “specific flow augmentation volumes from the Upper Snake River, Dworshak Dam and Brownlee Dam” and a “[r]equest to USFS and BLM to amend all Columbia Basin forest plans and land management plans to achieve the Council’s habitat performance requirements.”

Success Indicators - Defined as “immediately ascertainable results of implementing measures that can be used to assess the degree to which measures are likely to achieve the biological objective.” Examples given were “[r]eductions in grazing activity in a targeted stream reach” and “[r]eductions in predator populations.”

In separate comments, the Yakama Indian Nation stated, as noted above, that sustaining biological diversity should not be part of the program goal, but only one biological objective among others. The Yakama Nation added that it did not support any biological objective framework or set of biological objectives that focused only on the Snake River.

The Shoshone-Bannock Tribes stated their support for biological objectives based on specific survival rates, although they did not recommend any specific survival rates. They did comment that the goal for Snake River salmon should be more than merely preserving them, and thus the Council should not adopt as biological objectives smolt-to-adult survival rates that do not allow upper Snake salmon runs to rebuild. They also suggested to the Council that the Council add to its population rebuilding targets a rebuilding target or recovery goal for sockeye, of no less than a mean of 6000 sockeye adults over two life cycles returning to the upper Salmon basin.

A number of the upper Columbia river tribes (the UCUTs, the Colville Confederated Tribes, and the Confederated Salish-Kootenai Tribes) supported the upper river reservoir drawdown constraints, and they opposed the Columbia flow augmentation needed to achieve a 300 kcfs flow objective because of its adverse impacts on the upper river reservoirs and resident fish. The upper river tribes did not state an opinion on the adoption of lower river flow targets or velocity equivalent objectives assuming the Council also adopted the objectives intended to protect the upper river reservoirs and their resident fish. The UCUTs were the only one of the upper river tribal groups to add additional comments on the general issue of biological objectives. The UCUTs opposed one provision in proposed Section 4.0 that would have the ISG “develop an overall conceptual foundation for the program,” on the grounds that the fishery managers should do this work. In their view, the Ninth Circuit, when it instructed the Council to give high deference to the fishery managers, “was very clear that the biological objectives it was talking about were the biological objectives developed by the agencies and tribes in managing fish resources.” In addition, the UCUTs did not agree with the Council’s priority on protecting weak stocks, that the Council and BPA should focus biological efforts on recovery of moderate stocks with more genetic variability.

Idaho Fish and Game Department’s comment approach to biological objectives consisted mostly of qualitative or narrative goals and objectives for the program, as well as the quantitative objective of a 140 kcfs velocity equivalent in the Snake, subbasin escapement numbers and a general production goal of 70 percent of the carrying capacity of each subbasin. In the comments directed at the draft amendments, Idaho noted that it had submitted “proposed biological objectives” on previous occasions, that the Council should adopt those objectives in this rulemaking (e.g., travel time and velocity equivalents; subbasin numbers), and that these objectives reflected the goals and objectives in IDFG’s own Anadromous Fish Management Plan, 1992-1996, attached as an exhibit to Idaho’s comments. According to IDFG, “[t]he plan and IDFG’s proposed biological objectives reflect the following principles:” (1) Snake River stocks should be restored to fishable levels; (2) management decisions should aim for self-sustaining populations over the long term; (3) the region should focus on reducing water particle travel time to the ocean, and a 140 kcfs equivalent water particle travel time should be the objective for spring migrants; this should not be a hard constraint on reservoir

operations, however, because it cannot be achieved with flow augmentation; rather, it is a standard with which to evaluate alternative measures; and (4) priority attention should be devoted to downstream survival.

IDFG's management plan then contains a number of goals, policies and objectives. Most are qualitative, including (1) maintain genetic diversity of naturally-produced populations and artificially-produced populations used for natural production enhancement, and maintain natural production and productivity of wild and natural populations; (2) secure adequate flow and passage conditions to increase juvenile and adult survival through the federal hydrosystem downstream of Idaho, with survival sufficiently high to support annual harvest seasons and self-sustaining natural populations; (3) rebuild wild and natural populations to levels which optimally utilize production potential of accessible and potentially accessible habitat; (4) achieve full mitigation for losses caused by the hydrosystem through a combination of survival improvements and production; (5) restore sport and tribal fisheries for salmon and steelhead; and (6) integrate and coordinate Idaho's efforts to boost survival and production with the rest of the basin to ensure achievement of Idaho's escapement goals, with a short-term conservative approach to harvest and production and priority attention on improving downstream survival. IDFG then followed the set of goals with a set of narrative policies providing greater detail, focusing mostly on habitat and production issues.

IDFG did elaborate on the third goal noted above -- to rebuild wild and natural populations to "optimally utilize" the production capacity of habitat. IDFG noted that both the fishery managers and the public desired that the state set adult escapement goals for natural production to carry out this goal. IDFG chose an "interim production goal of 70 percent of estimated carrying capacity" to estimate escapement needs. "Information from density dependent survival relationships indicate that managing populations at 100 percent of carrying capacity is not optimal for both harvest and production goals." Using information generated through the Council's ISP subbasin planning process, IDFG produced a series of charts for each productive subbasin in the state for steelhead, spring chinook and summer chinook, in which was calculated the smolt capacity of the subbasin, 70 percent of the smolt capacity, the number of eggs needed to get that level of smolt production, the number of spawners to get that many eggs, and, finally, the escapement number above Lower Granite (and the smolt-to-adult-survival ratio to the subbasin) needed to get that number of spawners.

Both ODFW and WDFW supported CBFWA's comments, including CRITFC's revised three-tiered goal. ODFW also submitted the Biological Requirements Work Group Analytical Methods report referred to above, calling it "technical support of our call for development of biological objectives" and adding additional if general comments on how this document is "broadly applicable" to their on-going effort to develop biological objectives for stocks of concern and the "foundation" for determining the requirements of salmonids relative to survival and recovery. WDFW commented that a critical element of an adaptive management approach to learning about the effectiveness of juvenile survival actions would be the establishment of survival improvement targets associated with the rebuilding of runs. The assessment work being conducted under the auspices of the Marsh court settlement negotiations should provide the basis for these survival improvement targets. WDFW also agreed with CBFWA/CRITFC that biological objectives describe fish population attributes (e.g., number, age composition, survival) or environmental attributes necessary to achieve protection, mitigation and enhancement of fish and wildlife resources of the Columbia Basin. WDFW did not endorse CRITFC/CBFWA's reference to the specific habitat standards as "biological objectives;" WDFW's recommends retaining the original terminology of "performance standards" for salmon and steelhead habitat.

Environmental and similar groups provided little comment on this issue. The Northwest Sportfishing Industry Assn. endorsed the mainstem migration measures generally favored by the environmental groups, including "biological objectives with hard flow and velocity constraints." Oregon Trout added to its 1991 recommendation that a biological framework must include biological objectives that express the goal of maintaining genetic diversity, such as smolt age, age at maturity, rare alleles, run timing and distribution. The

Save Our Wild Salmon coalition stated generally that a proper biological framework must call for an “ecosystem approach, emphasizing in-river salmon migration and coordinated actions for other imperiled species” and “specific rebuilding schedules and timetables, which lead to harvestable runs (i.e., restoration not just recovery).”

Other groups -- utilities, customers, entities linked to commercial agriculture -- took a different view of the issue of biological objectives, and PNUCC and PNGC found a biological framework for the Council to adopt in the Recovery Team's recommendations, which no entity recommended to the Council.

PNUCC began by stating that the biological objective alternatives proposed by the Council “lack detail and supporting justification,” while biological objectives are a “critical element of the fish efforts and the Council should take the needed time.” PNUCC also stated that it “is certain that biological objectives are not physical characteristics like water particle travel time or flow level.” The Council instead should develop biological objectives “based on the format used by the Recovery Team,” including the “goal of achieving a spawner to spawner ratio of 2 to 1,” plus the Recovery Team’s “identified survival rates for specific life-history stages that are necessary to achieve the overall goal.” Indicator stocks, which are “representative of all stocks and species in the basin,” need “customized” biological objectives and need to be “identified, marked and monitored.” Also, naturally spawning stocks and hatchery stocks need distinct biological objectives. The biological objectives should set the overall survival needed in each life stage, and then the Council is to identify measures that will improve survival and achieve the objective. Survival at each life stage is affected by human and non-human factors, so it may not be possible (because of non-human influences) to improve survival sufficiently in one life stage, and thus it may be necessary to compensate by increasing survival in another stage, with the example of ocean survival less than expected and thus a need to decrease harvest and improve upriver passage. “Monitoring during each life stage will be required to (1) measure survival; (2) determine if the biological objectives are being achieved; and (3) to evaluate the success of specific measures.” At this point PNUCC attached a table of spring/summer chinook life-cycle survival percentages from Page IV-12 of the Recovery Team recommendations:

Given that PNUCC (and PNGC) emphasized the Recovery Team’s approach to measurable biological goals, the Recovery Team approach must be summarized, from Chapter IV, Delisting Criteria, of the Final Recommendations of the Snake River Salmon Recovery Team. Actually, two analytical approaches underlie the Recovery Team’s biological framework: (1) future productivity related to habitat capacity and (2) “historic” survival data (mostly data from the 1960s). These two approaches are expressed in three different levels of objectives:

First, the Recovery Team stated a “preferred” set of delisting criteria for all listed chinook species:

“For each listed ‘species’, the spawner-to-spawner ratio should achieve a geometric mean greater than 2.0 over at least two generations (approximately eight years), and habitat seeding as measured by spawner abundance or parr densities should show similar increases in levels of abundance and use of available spawning and rearing habitats. These criteria should be applied both to the species in aggregate and to component subpopulations selected as subbasin indicators of species recovery.”

The Recovery Team developed the 2:1 ratio based not on any particular or complicated methodology but rather and more simply on the basis of a general understanding of what is an appropriate productivity jump-start for a listed population with the available habitat.

Second, the Recovery Team produced an “alternative numeric delisting criteria” for spring/summer chinook. The Recovery Team recognized managers’ desire for “immediate population numbers as convenient delisting targets,” even though the Team had a lack of confidence in any particular numbers generated. The

Recovery Team looked at “historic data” on five factors that could contribute to this criteria -- spawner-to-spawner ratios, composite run size, redd counts, parr densities, and smolt abundance. For “historic” data, the Recovery Team looked to the period 1962-1967, a time with fairly good data and non-threatened, relatively abundant runs. The Recovery Team then decided that as a reasonable if tentative objective “[d]elisting could be recommended when natural production numbers reach some reasonable (probably arbitrary) fraction of that historic natural productivity (50 percent was considered by the Team as a provision fraction.” The end result was the following population-level delisting criteria for spring/summer chinook:

“Spring/summer chinook salmon delisting may be considered when an eight year geometric mean of naturally produced adult fish passing over Ice Harbor Dam approximates a reasonable fraction (e.g., 50 percent) of the average number passing over that same dam in a base period 1962-1967; and when spawner abundance or parr densities in subpopulation watersheds approach equivalent proportions of the 1960s levels of abundance and habitat use.”

Using this criterion, and the 1962-1967 base period data, the Recovery Team recommended that “a tentative 50 percent delisting target would be an eight year average count of 26,200 naturally produced adult spring/summer chinook salmon passing over Ice Harbor Dam.” PNUCC chose not to include the alternative numerical criteria in their comments, without explaining why.

PNUCC did include the third leg of the Recovery Team tripod for spring/summer chinook -- life-stage survival targets. On the one hand, the Recovery Team noted that a number of the reviewers of the draft “urged the Team to apportion recovery efforts by life stage on the basis of modeling analysis or other information sources” and the Recovery Team recognized the desirability of doing just that. On the other hand, the Recovery Team also recognized that present limited knowledge rendered this an exercise in “fallibility.” On this understanding, the Recovery Team produced a table of what it described as “highly tentative targets” for life stage survival improvements. It appears that the Recovery Team derived these survival percentage rate “recovery objectives” by using survival data from the relatively recent historical base period of the 1960s to compare to present conditions. This table is what PNUCC submitted in its comment). PNUCC agreed with the Recovery Team that these survival rates were highly tentative and “variable” and that they would need to be refined with new information.

In PNUCC’s analysis, the Council should view the life-stage survival objectives as subordinate targets that help “achieve the goal” of the spawner-to-spawner ratio. PNUCC’s view of the relationship between the Recovery Team’s spawner-to-spawner ratio and the life stage survival rate improvements does not appear to be correct. The Recovery Team developed the spawner-to-spawner ratio by deciding on the near-future productivity level that will be needed to seed the available habitat and boost the population. The Team developed the life-stage objectives by looking to the past, to historic survival levels. The two numbers - - the Recovery Team’s 2:1 spawner-to-spawner ratio and its life-stage survival objectives -- have little to do with each other analytically. The spawner ratio was not conceived of as the cumulative result of achieving the proposed life-stage survival targets.

The analytical approaches used by the Recovery Team could be seen to be broadly parallel to the biological framework paths the agencies and tribes have been taking. For example, as noted above the Recovery Team’s preferred criteria of a spawner to spawner ratio is derived from a focus on boosting productivity and the number of adults returning to subbasins to spawn. One can see much the same analytical approach in the subbasin plans and in IDFG’s Anadromous Fish Management Plan (discussed above). The Idaho Plan adopts a subbasin planning approach, using adult escapement numbers and smolt-to-adult survival ratios that will require boosts in overall system productivity to match available subbasin habitat. Idaho’s approach is not dissimilar to the Recovery Team’s use of a productivity increase to seed available habitat.

There are also agency and tribal analyses that parallel the Recovery Team's other analytical approach. This is, as noted above, the use of "historic" 1960s data and a general objective of trying to improve survival and rebuild to those historic numbers or some fraction of them that underlies the Recovery Team's spring chinook population target and life-stage survival targets. A similar conceptual approach can be seen in the Biological Requirements Work Group's Analytical Methods report discussed above. The Group did not endorse the Recovery Team's numbers and did not establish any particular objectives, but it did use, in part, an approach that focused on pre-1970 "historic" data (mostly 1950s and 1960s) -- redd counts, escapement numbers, survival data, etc. -- when it discussed possible analytical methods for establishing preliminary recovery goals, indicator stock population profiles, the "probabilities of persistence" with respect to survival and recovery, etc. In other words, the Group found a useful analytical tool in the comparison of present population conditions with recent historic non-threatened levels, to help determine what is and is not a stock on the rebound.

PNGC also provided extensive comments on the Council's proposed biological objective alternatives, both general and specific, and it also relied on the Recovery Team approach for the specific objectives. As noted above, PNGC began with comments on CRITFC's proposed three-tiered revision to the program goal. PNGC also disagreed with any description or definition of biological objectives as physical or environmental conditions necessary to achieve rebuilding targets. "Biological objectives are biological characteristics of the fish at various life-stages, such as survival targets and spawning numbers, not environmental conditions;" thus PNGC opposed mainstem biological objective expressed as 140/300 kcfs velocity equivalent objectives or the improvement in survival related to flows of 140/300 kcfs. PNGC also disagreed with the adoption of numeric targets and management objectives derived from system and subbasin plan process, as these "appeared to be driven by harvest desires rather than preservation and recovery of natural populations and relied heavily on artificial production, including supplementation." It also opposed waiting for the ESA process to provide a biological framework for the Council to consider, as "[r]ebuilding targets and biological objectives are critical to guiding the Program and evaluating measures."

PNGC recommended instead using the Recovery Team's delisting objectives as "reasonable" interim population targets for the "halt decline" tier of the goal -- for spring/summer chinook, 26,200 naturally produced adults returning annually over Ice Harbor; for fall chinook, 1000 adults over Ice Harbor or Lower Granite, with at least 25 percent naturally produced. The Council might also consider adopting the Recovery Team's very "provisional" escapement objectives of 29,000 spring chinook and 22,800 summer chinook as interim doubling goal objectives. PNGC also opposed the use of biological objectives that cross several life stages [such as a smolt-to-adult ratio]. "[T]o be useful, biological objectives should be discretely tied to each life-stage of the fish. . . . Only in this way will the Council be relatively assured that changes in survival are the result of specific measures and are not actually reflecting the effects of some other factor at another life-stage." In somewhat of a contradiction, PNGC also suggested adopting the Recovery Team's preferred delisting criteria of a spawner to spawner ratio of 2:1 as another interim objective, which in theory expresses improvements across life-stages. PNGC also recommended using the Recovery Team's tentative life-stage survival improvement targets as interim biological objectives.

Less extensive but similar comments came from a number of other groups. The Columbia River Alliance stated that there are two technically supportable measures for the mainstem biological objective: (1) increased smolt survival rates from the rearing area to the estuary; and (2) increased returning adult survival, with all other factors held constant. Developing and measuring the biological objective(s) for mainstem passage should be accomplished through life-cycle model runs that have been calibrated to reflect technical data now being collected by the National Marine Fisheries Service and the University of Washington, for both in-river and barge transportation survival rate estimates. The Douglas County PUD commented that target flows are not biological objectives, but proposed measures instead. The Okanogan Resource Council stated that biological objectives for mainstem passage should be based on production output, not input, and should

allow for standardized comparisons among all mainstem options. Two “technically supportable” measures for mainstem biological objectives are increased smolt survival rates from rearing area to estuary and increased return adult survival with other factors held constant. Measures should be evaluated against these biological objectives using life-cycle modeling runs calibrated to reflect NMFS/UW data on in-river and transportation survival. The Chelan County PUD added that “the biological objective for mainstem passage of 140 kcfs in the Snake and 300 kcfs in the Columbia is not supported by adequate scientific evidence.”

Idaho Power commented that the Council violated the Power Act and acted in an arbitrary and capricious manner in violation of the APA by not adopting biological objectives first and then sending out proposed program amendments for comment so that the public could evaluate them against biological objectives. Idaho Power also said it was impossible to evaluate the proposed options without biological objectives. And the Public Power Council agreed that the Council’s first priority ought to be to determine sound biological objectives. Such objectives should be a function of measurable salmon survival at different life stages. The PPC added its agreement that water particle travel time is not a biological objective; at most, it is a controversial performance standard that may or may not be related to salmon survival. Specific biological objectives are the key to a proper cost effectiveness analysis. Finally, Montana Council staff member Mark Reller, speaking as the State of Montana’s representative on the Snake River Drawdown Committee and alternative member of the FOEC, also commented that biological objectives must be established first, then measures chosen based on those objectives, that the Council should use the Recovery Team’s work concerning percent survival improvements by life stage, and that hydrologic objectives are not biological objectives, and water particle travel time and velocity equivalents are hydrologic objectives.

The BPA and DSIs commented more extensively on this issue. BPA began by stating that sound biological objectives must be developed before the Council can develop program measures. With regard to the skeleton framework proposed by the Council in Section 4.0, BPA agreed with Council’s definitions and explanations, including the definition of biological objectives, with one exception: individual life stage survival targets are not objectives; instead, the entire set of life stage survival targets collectively can be considered an objective. Setting survival goals and objectives for the life stages is necessarily a comprehensive ecosystem approach; since salmon use many different types of habitat in their life cycle over a broad geographic range. Thus survival goals by life stage are a simple but direct way to design a framework for rebuilding. BPA agreed that biological objectives should be independent of the measures, and agreed with the Council that a biological objective is not the same as a measure -- in BPA’s opinion, water particle travel time is a means of achieving a biological objective, not a biological objective itself.

BPA gave the most focus to flow objectives, stating on the one hand that flow augmentation should be viewed only within the context of an entire ecosystem approach, in which multiple measures over the various life-stages add up to improved survival; BPA stated that this view is consistent with the Recovery Team’s approach. On the other hand (in what seems an apparent inconsistency), BPA stated that the Council should specifically set downstream migration survival goals and use those to evaluate flow augmentation against other mainstem survival improvements. BPA also contended that the Council seemed on the verge of going beyond giving the fish agencies and tribes “due weight” and totally deferring to their recommendations for biological objectives, objectives based on the agencies and tribes’ flawed understanding of the flow/survival relationship that is not consistent with the most recent data. The Council should select an alternative, redraft the amendments and seek further comments from the region, and include the operating agencies, in addition to agencies and tribes, in developing biological objectives. Coupled with the rebuilding framework should be a monitoring and evaluation program and a comprehensive cost-effectiveness evaluation. To fully comply with provisions in the Northwest Power Act, the Council should link each measure to a biological objective, and complete both cost estimates and estimated biological outcomes of the measures.

The DSIs also stated that the Council needed to establish biological objectives before selecting fish and wildlife measures, so as to select least-cost measures that meet the objectives. Implicit in the Northwest Power Act is the sense that biological objectives will be in place against which each recommendation may be assessed; and thus it is not logical to adopt measures before adopting biological objectives. The selection of appropriate biological objectives that focus on impacts caused by dams, and cost-effective measures to meet those objectives, will be required to assure an adequate, efficient, economical and reliable power supply. The DSIs in general lauded the Recovery Team, without specifically adopting any of their recommendations, and partly rejecting them, in effect, by expressly rejecting the use of adult returns as a biological objectives, in a complex passage: "Given the myriad of factors which influence salmon survival at all stages of the salmon lifecycle, and the lack of cogent data on estuarine and marine mortality, the Council cannot fairly measure progress in making the hydrosystem more fish-friendly by framing a biological objective of adult returns. This is particularly true to the extent the Basin is at its carrying capacity for anadromous fish. It is certainly true that some upriver habitat, particularly in Idaho, is underseeded, but emerging evidence suggests that the estuary itself and competition from hatchery smolts may cause bottlenecks in salmon production that mean improvements in mainstem passage of juveniles and adults will accomplish nothing in terms of population increases."

The DSIs recommended that the most appropriate mainstem biological objective was a passage survival rate: DSIs noted that "pre-dam passage survival" was far less than 100 percent, in the sense that many juveniles died before beginning migration and many that began migrating died in the migration. The Council should develop a pre-dam passage survival rate as an objective to manage the hydrosystem towards. "At present, the Council lacks a yardstick to measure progress toward achieving pre-dam passage survival. What is certain, however, is that reducing passage mortality to natural levels -- which may well be achieved through the transportation program alone -- discharges the Council's job of offsetting mortality arising from the mainstem projects. The only sensible biological objective for offsetting such mortality is an objective that compares pre-dam and current passage survival rates." To the DSIs water particle travel time and flow targets are not appropriate biological objectives. Selecting water particle travel time as a biological objective "appears calculated to remove the ability sensibly to distinguish between transportation and inriver improvements, both of which may achieve the ultimate biological objective of improving the survival of migrating smolts."

During the consultation process the Council received a legal briefing on the issue of biological objectives from two attorneys who represent the DSIs, Paul Murphy and Eric Redman. Murphy in particular appeared to express an understanding of the Act consistent with the analysis set forth here -- that the recommendations process is what brings biological objectives to the Council for consideration, and that, on the whole, biological objectives have been and are the biological goal or purpose or "thing" that underlie recommended measures.

Finally, at the close of the Council's consultation process, the Council received additional comments as expected from CBFWA concerning the program framework. CBFWA provided a very useful overview of the program framework and a useful assemblage of framework-related insights, none of which were new concepts or discrete, quantified life-stage survival objectives. CBFWA pulled together and organized the general, qualitative, biological goals, purposes, objectives and strategies underlying the various sections of the programs and the individual measures, biological objectives that had sometimes been stated explicitly but often have been implicit in the narrative and the measures.

3. Findings

On this record, the Council has made the following decisions with regard to the issue of biological objectives:

A. Program goal

The Council adopted CRITFC's recommendation as an amendment to Section 4.1, somewhat modified. It is far from clear that the Act would allow the Council to set a goal calling for full mitigation of the losses caused by the development and operation of the hydropower system. It is clear that simply doubling the runs is an interim goal and that under the Act the Council can and should have a long-term goal to protect, mitigate, and enhance salmon populations (and other fish and wildlife) to the greatest extent possible while assuring the region an adequate, efficient, economical and reliable power supply. That is the goal prescribed for the Council in the Act. 16 U.S.C. § 839b(h)(5). For this reason, the Council stated that the third tier of the program goal was to ultimately rebuild the salmon populations to a level that will protect, mitigate and enhance fish and wildlife affected by the operation and development of the Columbia River basin hydroelectric system. In addition, the program continues to state explicitly that the program goal includes rebuilding populations without loss of biological diversity. The agency and tribes and the non-agency and tribal commenters all agree that avoiding the loss of biological diversity should be a central principle of the Council's program. While they differ on how to express that principle, the Council believes the way to make this point clear to the public and the implementing agencies is to state it explicitly as a part of the program goal. The Council does not believe this is necessarily inconsistent with the recommendation submitted by CRITFC.

B. Biologically based operational objectives

The Council has received a set of recommendations for biologically-based operational objectives for the hydropower projects. As noted in the beginning of this section, operational objectives of this type seem to be precisely what is described in Section 4(h)(2)(B) of the Act. Whether or not the Council believed the Act required something more in the way of biological objectives in the program, the Council would still have to consider these operational objective recommendations and either adopt or reject them under the standards of the Act. The Council cannot reject these objectives simply by saying, as some commenters imply, that they are not "biological objectives."

The substantive merit of these recommended objectives is discussed in the introduction to Section 5 and in extensive findings on the objectives and on mainstem measures in the findings below for Section 5. Summary comments are appropriate here: As explained in the introduction to Section 5, the Council has decided to accept the agencies' and tribes' judgment on the expected biological value of these operational objectives, and has set forth for these areas of the program both operational objectives and the qualitative biological objectives addressed by the operational objectives. The validity of these objectives, especially the high flow/velocity objectives, remains a highly contentious area, in which the biological judgments of especially the state agencies and lower river tribes are contested by the judgment of the biologists and others outside of these agencies and tribes, especially linked to the utility and industry groups. In this situation the Council must give due weight to the recommendations of the agencies and tribes and rely on their biological expertise, as required by the Act. If the agencies and tribes had submitted recommendations for which the Council concluded that there was no reasonable scientific basis or rationale and the recommendations were simply policy judgments, then in that hypothetical situation the Council would reject these recommendations. But the fact that the science is highly contested or uncertain in this area is not the same as demonstrating that the best available science conclusively undermines the recommendations of the agencies and tribes. Competent scientists inside the agencies and tribes and out are of the reasonable opinion that the link between high flows and velocities and survival is positive, even though the evidence is less than conclusive. Independent scientific review conducted by Dr. Cada for the Council supports this position. The Council will not substitute its judgment, or the judgment of other credible biologists, who take a contrary view. This is not to say that the Council accepts these agency and tribal judgments conclusively. The scientific data are not

clear, and the genuine disagreements among capable scientists mean that the Council cannot consider the issue resolved conclusively. The critical scientific uncertainty means that the issue must continue to be studied, evaluated and argued.

C. Biological framework

With regard to that portion of CRITFC's recommendation (4-(2) concerning the adoption of "performance standards" to implement the three-phased goal and to be used in the annual program evaluations, and the other recommendations to develop a comprehensive program biological framework -- the Council has adopted this recommendation in a modified way by developing a set of biologically-based operational objectives for hydroelectric project operations, by noting the various biological objectives, purposes and goals underlying measures throughout the program, by describing in Section 4.0 a possible biological framework and set of concepts and general biological purposes for the program that is to be revised and fleshed out in the near future in consultation with the fishery managers, and by establishing an annual monitoring and evaluation process, as described in Section 3 above.

As explained in the opening section, there is no basis in the Act for the Council to conclude that it must adopt a comprehensive, discrete, quantified biological framework or set of biological objectives for the whole program before it can propose or adopt measures. Moreover the Council could not adopt such a framework on the basis of the 1991 and 1994 recommendations. The Act supports a course of action in which the Council takes action on the basis of the operational objectives in the recommendations and on the general and qualitative understanding of the biological basis or objectives for program measures, while describing a possible comprehensive biological framework that the fishery managers and others are to help the Council flesh out in the near future,

The Council continues to believe in the value of developing a comprehensive biological framework for the program, which should include both life-stage survival improvement targets and broader measures of survival, such as adult returns objectives, subbasin productivity numbers or ratios, and smolt-to-adult ratios. The Council has called for the fishery managers and others to continue work on this framework, work that is continuing in any event in the ESA recovery plan and *Idaho v. NMFS* settlement forums. The Council decided not to adopt the tentative biological framework recommended to NMFS by the Recovery Team, which is the only source of an actually fleshed out biological framework known to the Council. The Council declined to adopt the Recovery Team's numbers for a variety of reasons, including: (1) No entity submitted it to the Council in the recommendations; (2) the Recovery Team's mandate under the ESA is not the same as the Council's mandate under the Act, which has its implications for the nature of the goals and objectives in the biological framework. The Council cannot simply incorporate such a framework without critical evaluation (the same will be true of anything produced in the ESA process); (3) the Recovery Team itself noted that its life-stage survival targets were an exercise in "fallibility," and that further research, analysis and evaluation needs to occur before these numbers have any solid basis; (4) the state agencies and tribes have commented that they do not support the Recovery Team's recommendations; and (5) the biological analysis and framework development in the *Idaho v. NMFS* ESA litigation appears likely to supersede what the Recovery Team recommended. The Council did find much to value, however, in the Recovery Team's recommendations -- and, as noted above, the Council believes the analytical approaches taken by the Recovery Team and the agencies and tribes are not necessarily inconsistent. The Council expects that the Recovery Team's approach and numbers will receive serious consideration by all parties, including the fishery managers, as the work of fleshing out the Council's framework continues.

The Council's decisions with respect to the recommended habitat standards/objectives, subbasin plans and population targets and harvest escapement objectives are analyzed below in the findings for Sections 7 and 8.

Program Section(s): 4.1, footnote (definition of biological diversity)
Source: CRITFC
Recommendation No.: 4-1

Recommendation: CRITFC recommended changing the definition of “biological diversity” in footnote 1 to Section 4.1 from “the array of genetic, physical, life history and behavioral characteristics contained within the salmon and steelhead resource of the Columbia River Basin,” to “the variety and variability among living organisms and the ecological complexes in which they occur.” CRITFC stated that the proposed definition was “in line with that commonly used by conservation biologists and is the formal U.S. government definition used by the U.S. Office of Technological Assessment.” CRITFC recommended a similar change in the definition of “biodiversity” in the program’s Glossary.

Finding: Adopted.

Program Section(s): 4.1B (basis for salmon and steelhead goal)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: The Corps recommended revising the passage mortality statistics in Section 4.1B that the Council summarized from its 1987 salmon loss estimate to reflect recent research and NMFS Biological Opinions. The existing program language, based on the information available in 1987, states that passage mortality has been estimated to be 15 to 30 percent of downstream migrants per dam and 5 to 10 percent of upstream migrants per dam, and the cumulative juvenile downstream passage mortality past nine dams has been estimated to be 77 to 96 percent, depending on the volume and timing of flows, while the cumulative adult upstream passage mortality for fish passing nine dams has been estimated to be 37 to 61 percent. A footnote adds the caveat that the downstream and upstream mortality estimates “do not include higher survival levels that may be attainable by further improvements in bypass and transportation.”

According to the Corps, NMFS’ estimates current losses through the power system under the proposed operations in the 1994-1998 Biological Opinion of 58 to 84 percent for Snake River sockeye and spring/summer chinook juveniles, and 67 to 88 percent for fall chinook juveniles. Adult loss estimates are 11.4 percent for sockeye, 20.9 percent for spring/summer chinook, and 39.3 percent for fall chinook. The Corps also recommended that the Council note that “some natural mortality of juvenile and adult salmon occurred in their migration . . . before construction of dams.”

Finding: The Council did not adopt this recommendation. The Council set forth these passage rate estimates as part of its 1987 analysis of the overall, historical impact of hydro projects on salmon migration. The Council recognized then and recognizes now that system and operational improvements might provide higher survival levels than these historic baseline estimates and that the baseline numbers are indeed just “estimates” and may be subject to revision. However, it is premature and information is too uncertain to revise these numbers in this rulemaking. The Corps would have the Council revise the passage mortality estimates based on what NMFS estimated would be the passage mortality rates if operations conformed to the 1994-1998 Biological Opinion. However, the validity of the analysis and of the measures in that biological opinion have been placed in doubt by the federal court in the *Idaho v. NMFS* litigation, and NMFS will be producing a new biological opinion and a recovery plan in 1995. It is impossible now to know what system and operational improvements will be analyzed in that opinion or whether the analysis of passage mortality will take a different approach. A number of commenters also asked the Council to alter the migration

mortality estimates based on indications from UW/NMFS researchers that survival through Lower Granite reservoir is higher than expected (e.g., Douglas County PUD, Chelan County PUD, PNUCC, DSIs, PNGC). Others, including the fishery agencies and tribes (e.g., IDFG), and the Fish Passage Center responded that for various reasons these reservoir survival data are too preliminary, unreported, and limited in scope or study design to be a sufficient basis for revising our understanding of migration mortality at this time. The UW researches themselves have noted that their work is not final and conclusions are tentative and should be used with caution. Nor do they want their research on two upriver reservoirs extrapolated to the entire river system. NMFS has not yet asked the Council to revise its understanding of passage mortality. The biological analyses, recovery plans and research reports expected in 1995 and in the years shortly thereafter should provide a much better, sufficient source for re-analyzing these issues, and it is at that time that the Council will expect recommendations for analyzing these issues. On these circumstances, the Council did revise Section 4.1B by noting that recent analyses “suggest the reservoir mortality in upriver reservoirs or portions thereof could be lower in some instances.” However, at this point, revising the passage mortality estimates based on the Corps of Engineers recommendation would not complement the on-going activities and research of the various fish agencies and tribes. 16 U.S.C. § 839b(h)(6)(A).

SECTION 5: JUVENILE SALMON MIGRATION

Note on biological objectives for juvenile salmon migration:

The findings for Section 4 above contain a lengthy discussion of the meaning and role of biological objectives in the Council’s program. Those findings include a discussion of the recommendations the Council received to adopt objectives for the operation of the basin’s hydroelectric projects. The appropriate place in the program for most of these objectives is Section 5, Juvenile Migration, since most are objectives intended to improve the survival of juvenile salmon migrating through the system. This introduction to Section 5 includes a brief discussion of the recommendations received, the comments received, and the Council’s decisions. The biological and operational objectives are then set forth in the relevant subsections of Section 5. The findings for Section 5 will briefly restate portions of the general discussion on biological objectives from Section 4 and add substantive detail about the recommended objectives and the measures intended as steps toward achieving the objectives.

For biological objectives for the juvenile salmon migration section of the program, the Council started, as does the Northwest Power Act, with the recommendations received from the fish and wildlife agencies, Indian tribes and others. The fish and wildlife agencies and tribes recommended a number of objectives related to hydroelectric project operations, consistent with 16 U.S.C. § 839b(h)(2)(B):

The fish managers’ recommendations reflect a fairly broad consensus that flows or equivalent velocities of 140,000 cubic feet per second (140 kcfs) in the Snake River and 300 kcfs in the Columbia River would improve salmon survival rates, but concerns were raised about resident fish impacts.

There were similarly strong recommendations for an 80 percent fish passage efficiency (FPE) objective for measures to reduce fish mortalities at the mainstem hydroelectric projects.

There were recommendations to control summer and early fall temperatures in the rivers to improve the survival of summer juvenile migrants and returning fall adult chinook salmon.

The Columbia River Inter-Tribal Fish Commission (CRITFC) recommended that the hydropower facilities be managed to achieve 120 kcfs in the Columbia River in September.

The Montana Department of Fish, Wildlife and Parks and the Salish-Kootenai Tribes recommended “integrated rule curves” to protect environmental conditions for resident fish and wildlife at storage reservoirs in Montana. Reservoir constraints were also recommended for Lake Pend Oreille and suggested in comment for Grand Coulee, to protect resident fish and wildlife.

As discussed below in connection with specific recommendations, commenters expressed a variety of concerns about these objectives. The record shows real and potential conflicts in the use of stored water for resident and anadromous species, for juvenile anadromous fish migrating at different times of the year, and for juvenile and adult salmon. In addition, some commenters were skeptical that these operations would produce the survival benefits suggested by the objectives’ proponents.

There also were concerns about the power system impacts of operating to these objectives. A key issue is whether the region would be assured of an “adequate, efficient, economical and reliable power supply.” The Council has made findings on this issue in Section 1.8 of the program. However, these questions require further exploration in the longer term. The Council intends to work with Bonneville, the fishery managers, utilities and others to assure the continuing adequacy, efficiency, affordability and reliability of the region’s power supply. In 1995-96, the Council will conduct a revision of the power plan that will address these issues more thoroughly.

As the program states, for the near term it is not clear when and how mainstem anadromous and resident fish and wildlife objectives can be achieved along with the other purposes of the hydropower system. The measures in the program outline ways of moving toward the objectives, recognizing that they may not be achievable in some years, especially in the near term. The Council is hopeful that the discussions between the upriver and downriver fish and wildlife agencies and tribes, which are being facilitated by CBFWA, will lead to the development of improved insights for evaluating tradeoffs between anadromous and resident species. Inevitably, determining how far these objectives can be achieved in any given year will require careful annual planning and in-season management.

Beyond the near term, the Council and the region must continue to explore changes in the hydroelectric system to make fish and wildlife objectives more achievable, to minimize the need for or impacts of tradeoffs among objectives, and do so while carrying out the purposes of the Northwest Power Act.

The measures outlined in the program are the Council’s prescription for carrying out these courses of action. Consistent with the discussion in Section 4 above, the measures are accompanied by a statement of their biological objective, which was explicit or implicit in the original recommendations and in the Council’s proposed amendments. This approach, in which biological objectives are understood to be the biological purpose of any given measure, is consistent with the Council’s interpretation of the Northwest Power Act, and with comments received from the fish and wildlife agencies and tribes in this process.

Program Section(s):	5 (introductory text)
Source:	Idaho Department of Fish and Game
Recommendation No.:	5-9
Source:	PNUCC
Recommendation No.:	5-1
Source:	Corps of Engineers

Recommendation No.: 5-3

Recommendations: These three recommended different revisions to the introduction to Section 5 to reflect their particular position on the central issues of juvenile migration, especially the nature of the relationship between the needs of migrating salmon and higher flows and velocities, the validity of using reservoir drawdowns to meet those needs, and the validity of the use of juvenile salmon transportation around the projects.

Idaho proposed various amendments to the introductory text of Section 5 to reflect the focus of its proposed measures. These included an explicit statement that juvenile migration survival rates correlate with productivity rates for the Snake basin populations; a specific description of the velocity, travel time and survival impacts of the mainstem dams, especially the four in the lower Snake; a description of the limits of flow augmentation (e.g., the Snake River flows through an arid region with relatively low potential storage capacity and long refill times; existing storage is committed to other use, including resident fish and water rights for irrigation; 2/3 of inflow to mainstem reservoirs comes from watershed with little or no controlled storage); and the deletion of references to the use of and improvements in transportation. The recommendation was included in the draft, in Option 3, Introduction.

PNUCC recommended deleting the Salmon Strategy language concerning intermediate measures, such as additional water and drawdowns, to delete references to the promise of reservoir drafting and drawdowns and any language describing implementation of intermediate measures. They would replace it with language noting that the Council's adoption of these measures will depend upon the evaluation and biological effectiveness of current measures. This recommendation was included in the draft, as Option 1, Introduction.

The Corps recommended revising the second paragraph to delete reference to "biological time clock," because research does not support this concept in their view. The draft amendments did not incorporate the recommendation.

The only comments received on the precise subject of the "biological time clock" were the Corps', although the Corps made this point as part of comments that were generally similar to the general comments of PNUCC and a number of other groups and entities, primarily from utility and industry groups. That is, PNUCC, the Corps and others contended that measures to maximize survival of Snake River salmon should focus on improving juvenile fish transportation, decreasing predation and competition, and increasing in-river survival for both juvenile and adult fish. They opposed increases in flow, velocity, spill, or reservoir drawdowns outside those described in Option 1, contending that it has not been scientifically proven that spill and drawdown actions will increase fish survival, that gas supersaturation caused by spill poses a serious threat to fish survival, and that there is no direct evidence linking survival to travel time. Comments from others, particularly fish agencies and tribes and environmental groups, corresponded roughly to the introductory revision recommended by IDFG.

Finding: The Council largely adopted IDFG's recommendation and rejected the other two. To reiterate, these recommendations are part of the larger dispute reflected in this rulemaking record, in the record of the Council's rulemaking process for the Mainstem Hypotheses, and in the record for the Strategy for Salmon, over the scientific validity of the flow/velocity/travel time/survival relationship, drawdowns and transportation. The findings below on recommendations for particular flow and drawdown measures discuss this debate in more detail. To summarize in the context of these particular recommendations: The biologists for the fish agencies and tribes have developed an understanding, based on their view of the best available scientific knowledge available, of the biological needs of migrating juvenile salmon, including an understanding that delays in migration time through the hydro projects and reservoirs to the estuary result in

significant mortality for a number of reasons. The fish agencies and tribes also understand that increasing river flows and water velocities would aid in reducing juvenile migration time and increasing survival, that the benefits continue to increase as flows and velocities increase, and that reservoir drawdowns will need to be a part of that effort. The Council's Mainstem Hypotheses, Section 5.0E, provide a more complete explanation of the flow/survival relationships and hypotheses to be tested. Other entities, as represented here by the Corps of Engineers and PNUCC dispute that the best available scientific knowledge supports these understandings.

The recommendations for the introductory language, as well as the recommendations for specific flow and drawdown measures, are thus in conflict. In resolving these conflicts in the substantive measures, from which the introduction derives, the Council must give due weight to the expertise, rights and responsibilities of the fish agencies and tribes, and adopt measures that complement their activities, 16 U.S.C. § 839b(h)(6)(A), (7). The Council's review of the information and analyses, and reviews by independent consultants, indicate that the scientific judgments and recommendations of the agencies and tribes are supported by, and certainly not conclusively undermined by, the best available scientific knowledge, 16 U.S.C. § 839b(h)(6)(B), (7)(B). Thus the Council has concluded that to adopt measures in this area based on the agencies and tribes' recommendations is reasonable and is the more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(5), (7)(A), (C). At the same time the Council believes these issues and measures deserve continued consideration and evaluation, and the Council has called for an adaptive management approach to address critical uncertainties while taking action.

The Council therefore concluded that the Corps' particular recommendation is not supported by the best available scientific knowledge. While there are no direct measurements that support the concept of the "biological time clock," it is supported by theory, has indirect support in flow/survival data, and is not seriously contradicted by any data that have been brought to the Council's attention. The Council rejected PNUCC's recommendation as inconsistent with the obligation to include measures that are supported by the best *available* scientific knowledge. The Council interprets this standard as requiring action notwithstanding scientific uncertainty, albeit action that is carefully monitored and evaluated so that mid-course corrections may be made. The case for proceeding with drawdowns is described below, in connection with specific drawdown recommendations.

Program Section(s): 5 (introductory text)
Source: Regional Services Inc.
Recommendation No.: 5-7

Recommendation: Regional Services recommended revising Section 5 and its introduction as part of a long-term proposal calling for 8 million acre feet more water from the upper Columbia and Snake. Regional Services proposed a measure calling for 3 million acre feet more water from the Snake and 5 million acre feet more from the Columbia above 1994 operations. To explain and justify the measures, Regional Services proposed to add seven new paragraphs at the end of the introductory text to Section 5, after the “Intermediate measures” discussion and with a heading of “Long-term measures.” The discussion focused on how the “vast expansion of water storage capabilities on the upper reaches of the Columbia and Snake” for the purposes of lower river power generation (mostly) and flood control and irrigation is both a primary cause of the salmon decline and also a potential source of resolution of the problem, if the region will make major changes in the way these projects are operated and coordinated. The discussion also emphasized how over the long-term water can be obtained through transformations in water use and in the way the power system and power markets operate, “while minimizing impacts on the regional economy.” This long-term measure was to be implemented between 1996 and 2024.

The recommendation was not included in the draft, and no comments were submitted on it.

Finding: The Council rejected the recommendation for the reason that the adopted recommendations are a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The full findings on this issue are provided in the response to the substantive recommendations, below. The Council recognizes that there could be significant advantages to changing patterns of water use (see the Environmental Defense Fund analysis), and the Council has called for the use of structural and nonstructural methods, whichever are more cost-effective, to be used to supply additional flow augmentation water from the Snake River and other basins. However, reports by Hydrosphere and Bookman-Edmonston Engineers showed that there are significant barriers to water transactions, conservation and other nonstructural alternatives, which make it unlikely that flow changes of the kind and extent recommended here are realistic. Instead, the Council calls for a combination of flow and velocity improvements, such as drawdowns, to achieve mainstem objectives.

Program Section(s): 5 (and others)
Source: Natural Resources Defense Council, et al.; Idaho Rivers United
Recommendation No.: 5-4, 5-6

Recommendation: Declare a salmon extinction emergency in Columbia basin. Call for President to direct federal agencies to take all immediate steps necessary to avert further decline and begin recovery of wild stocks. Call on Congress (and actively lobby) to immediately appropriate funds to implement all measures necessary.

The recommendations also call for the implementation of the recommendations of the House of Representatives' BPA Task Force, including the transfer by BPA of the work of its Fish and Wildlife Division to “an appropriate agency, or to some appropriate board of fishery agencies and Tribes.” The other recommendations would allow BPA to gain or save money to devote to fish and wildlife: (a) BPA to terminate the irrigation power discount and replace it with variable, conservation-inducing rates; (b) Congress to authorize the Bureau to “pay market rates for power for its projects,” (c) BPA to manage WPPSS-2 more efficiently; and (d) BPA to terminate moth-balling of WPPSS-1 and -3.

The draft amendments, Option 5, Extinction Emergency, Salmon Funding, and BPA Task Force Recommendations proposed this recommendation.

A number of documents and comments in the record state the case for the salmon emergency in 1995. One of the most useful is a memorandum from the Fish Passage Advisory Committee, submitted by the Save Our Wild Salmon coalition. More precisely, this was an August 8, 1994 memo from the FPAC to the CBFWA Liaison Group entitled "Snake River Spring/Summer Chinook Expectations, 1995-1997," based primarily on the data collected by the Fish Passage Center. This memo explained the statistical situation: dramatically lower adult returns in 1994 and expected in 1995; an expected order of magnitude decrease in juvenile migration in 1996 and 1997; and thus the importance of the 1995 juvenile migrating class. The memorandum concluded that "[a]ctions should be implemented immediately to avert the immediate specter of extinction." The memorandum recommended among other things immediately enhanced flows, velocities and spill and an end to research programs that stress the population and have little management application.

The Council received hundreds of letters, cards and petitions supporting this position, proposed mainstem Options 3 through 5 (or Option 5 alone), and the environmental groups' general position on various issues. While the recommendations of Idaho Rivers, built into Option 5, differed in significant ways from those of American Rivers, NRDC, etc., which were reflected in Options 3 and 4, those differences were not generally reflected in the comments. The vast majority of these comments were from private individuals not representing any organization, although a number stated the organization(s) they belong to. Most of the rest represented very small and local, even ad hoc groups. Comments from representatives of larger organizations include those from Liz Hamilton of Northwest Sportfishing Industry Assn. (285), Pacific Coast Federation of Fishermen's Associations (392), Bill Arthur, NW Regional Director of Sierra Club (394), Pacific States Marine Fisheries Commission (478), American Whitewater Affiliation (484), Friends of the White Salmon River (575), Colorado Oil & Gas Assn. (586); Save Our Wild Salmon Coalition (628); Trout Unlimited (701); Northwest Environmental Defense Center (708); American Rivers/NRDC/Trout Unlimited (715); Sierra Club, Columbia Basin Field Office (735); Idaho Trout Unlimited (788); Idaho Wildlife Federation (814); Sawtooth Wildlife Council (821); Friends of the Wild Swan (827); Friends of the Earth (829); Trout Unlimited, Panhandle Chapter (Idaho) (880).

On the other hand, PNUCC submitted a paper from the consulting biologist Don Chapman refuting the idea that 1995 juvenile class needs emergency treatment, "Is 1995 the Last Chance for Snake River Spring/Summer Chinook?" The main conclusion of the paper is that the 1995 juvenile class is no more important than other year classes at various stages in the life cycle, and to take extreme actions to benefit the 1995 juveniles that could negatively impact others (such as returning adults) or risk the intended beneficiaries from possible if not certain harm (such as possible negative effects of drawdowns) is not wise. The paper also noted that even if this class is critical, it is not clear what can or should be done to mitigate for problems, especially given Chapman's view that mainstem passage problems are not the major limiting factor on the populations at this time, and his view that with regard to mainstem passage, there is still the question of whether survival of this special class is best ensured by in-river migration or transportation.

Finding: The Council revised the introduction to Section 5, Juvenile Salmon Migration, to incorporate the sense of urgency that is represented by the recommendation for a declaration of a salmon emergency. The Council concluded that conveying this sense of urgency is important, and that conveying it through a declaration of a salmon emergency, which would have no independent legal force, is not. The Council agrees that the 1995 year class is important, but also agrees that taking strong actions for a single year class should avoid major risks for returning adults.

A number of issues raised by this recommendation, including the institutional, power and cost issues raised by the BPA Task Force, have been addressed in Sections 1-4 of the program and in the findings on those sections, including the program discussions of the history and present status of salmon runs, the salmon and steelhead goal, the management of the power system, and general matters of regional funding and staffing. The recommended transfer from BPA and the issues of power system management and costs, for example, have been discussed in Section 1, in the findings for Section 1, in the hydropower costs and impacts analysis, Appendix B, and in the analysis of "Assuring an Adequate, Efficient, Economical, and Reliable Power Supply and the Ability to Carry Out Other Purposes of the Power Act," Appendix C.

SECTION 5.1: COORDINATE RIVER OPERATIONS

Program Section(s): 5.1 and 5.1C.1 (coordinating river operations)
Source: PNUCC/Corps of Engineers
Recommendation No.: 5-1 and 5-3

Recommendation: Revise whole section to reflect provisions in NMFS 1994-98 biological opinion regarding coordinating river operations through in-season management process (Corps). Delete references to the participation of Fish Operations Executive Committee in this process and replace with In-Season Management Team (PNUCC).

The draft amendments did not include these recommendations. Option 2 incorporated the NMFS Biological Opinion flows, but no language was added on NMFS' river operations process and the In-Season Management Team. No comments were received.

Finding: The Council rejected the recommendations as less effective than the adopted recommendations for the protection, mitigation and enhancement of fish and wildlife, 16 U.S.C. § 839b(h)(7)(C), and as failing to complement the activities of the fish and wildlife agencies and Indian tribes, 16 U.S.C. §§ 839b(h)(6)(A), (7)(B). The fishery managers recommended operational flow/velocity objectives for the lower Snake and Columbia Rivers to address all weak salmon stocks in the Columbia River Basin, not just endangered species. In addition, the recommended In-Season Management process fails to include key participants in important salmon recovery decisions, and instead is limited to federal agencies. The Council believes that the In-Season Management Process, if it continues to function as it has in recent years, will continue to generate undue controversy and make less effective decisions because of its narrow membership.

Program Section(s): 5.1B, 5.1C.2
Source: PNUCC
Recommendation No.: 5-1

Recommendation: PNUCC proposed to drastically restructure the Fish Passage Center. The center and its manager and staff would be limited to the collection and distribution of data, as a "regional data center for the smolt monitoring program." The manager "will not make decisions or recommendations on the use of the water budget and will not engage in advocacy and/or lobbying." Revise Section 5.1C.2 to delete references to the fish passage manager as a participant in the winter meetings to review the run-off forecast and develop an augmentation plan.

Finding: The Council rejected the recommendation as less effective than the adopted recommendations for the protection, mitigation and enhancement of fish and wildlife, 16 U.S.C. §

839b(h)(7)(C), and as failing to complement the activities of the fish and wildlife agencies and Indian tribes, 16 U.S.C. § 839b(h)(6)(B). The Council sees the utility of the Fish Passage Center in its ability to collect mainstem passage data, and to operate as the primary coordinating mechanism for agency and tribal requests regarding mainstem operations. Whether or not these functions generate controversy, the Council believes it is important that the Center meet the agencies' and tribes' needs in these respects, so long as the Center also affords open access to its data -- a point emphasized by the Council.

Program Section(s): 5.1B.3, 5.1B.5 (Fish Passage Center) and 5.1C
(coordinated plan of operations)

Source: Corps of Engineers

Recommendation No.: 5-3

Recommendation: Revise Section 5.1B.3 to refer to Fish Passage Center as just "a center" for housing data and information on juvenile passage (not "the primary program center"). Section 5.1B.5 describes the role of the fish passage manager as the primary point of contact between power system and fish agencies and tribes and the activities of the manager in requesting flows, spills, etc. Revise this to explain the current process, especially role of NMFS -- flows and spills are developed and implemented through in-season management process created through ESA consultations with NMFS.

The draft amendments did not include the recommendation, and no comments were received on it.

Finding: The Council rejected the recommendation as less effective than the adopted recommendations for the protection, mitigation and enhancement of fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The Fish Passage Center operates as the primary coordinating mechanism for agency and tribal requests regarding mainstem operations under this program, and has since adoption of agency and tribal recommendations in 1982. The program already recognizes the critical role of the National Marine Fisheries Service under the Endangered Species Act.

Program Section(s): 5.1C.2 (coordinated plan of operation for flow
augmentation)

Source: Corps of Engineers

Recommendation No.: 5-3

Recommendation: Reference in Section 5.1C.2 to "volume-of-runoff" forecast should be changed to "water supply" forecast.

The draft did not propose this change, and no comments were received on it.

Finding: The Council adopted the recommendation.

Program Section(s): 5.1D (operating rules for flow augmentation)

Source: CRITFC

Recommendation No.: 5-2

Recommendation: The Corps should reduce its use of power peaking and establish appropriate ramping rates for daily flow fluctuations at mainstem Columbia and Snake projects to "reduce impacts to

anadromous fish migrations and littoral biota” and “allow fish passage facilities to remain in criteria.” “There shall not be more than a 10 percent reduction or increase in total flow per 24 hour period” at the Corps’ Snake and Columbia mainstem projects.

Draft: In the draft amendments, the specific ramping rates recommendation was proposed as a new Section 5.1D.4 in Option 4, Constraints on Flow Variation. Proposed revisions to Section 6.1A.1 (in the adult passage section) call on the Corps to, among other things, “minimize power peaking, establish ramping rates for daily flow operations and eliminate zero-flow operations.”

Comments: Douglas County PUD opposed the recommendation to establish ramping rates that ensure no more than 10 percent reduction or increase in total flows in 24-hour period, contending that it would have dramatic impact on load following capabilities, and was not supported by data. CBFWA supported the recommendation.

Findings: The recommendation was not supported by detailed information and, on this record, the Council was unable to evaluate the potential effects of the recommendation on the adequacy, efficiency, economy and reliability of the region’s power supply. Accordingly, the Council called in Section 5.1D.4 for an evaluation to be conducted, rather than implementing the recommendation *per se*. Preliminary estimates indicated that the recommended constraints could raise reliability problems in the short term, and broad financial implications for the power system and, as described in the Council’s findings and analyses on power system impacts, on Bonneville’s ability to carry out some of the purposes of the Northwest Power Act. In the power plan revision, the Council will evaluate this recommendation further. The Council rejected the recommendation to establish such rates now, because the Council could not adopt it and still assure the region of an adequate, efficient, economical and reliable power supply, 16 U.S.C. §§ 839b(h)(5), (7)(A).

Program Section(s): 5.1D.1 (operating rules for flow augmentation)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 5.1D.1 to reflect current process and terminology for flow requests established by NMFS biological opinion and used by In-Season Management Operations Team. In particular, Columbia flows are now requested for “McNary,” not for “Priest Rapids and /or The Dalles” as stated in Section 5.1D.1. Snake flows are now requested from Dworshak and/or Brownlee to provide flow augmentation not only at Lower Granite but also in the lower river. Use of flow augmentation to meet target flows at McNary and Lower Granite is discussed at weekly meetings of In-Season Management Team.

Finding: The Council rejected this recommendation as a less effective way to protect, mitigate and enhance fish and wildlife than the adopted measure, 16 USC § 839b(h)(7)(C). Because McNary Dam is upstream from the John Day project, it cannot measure the velocity benefits of a John Day drawdown. By using The Dalles as a point of measurement, these benefits can be accounted for.

SECTION 5.2: IMPROVE SNAKE RIVER FLOW AND VELOCITY

Program Section(s): 5.2 (Snake River flows)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise all of Section 5.2 to make Snake flow-related measures consistent with NMFS 1994-98 biological opinion.

In the draft, Option 2, Biological Opinion Flows and Velocities (concerning spring flows in the Snake) and Additional Snake Water (the part of this proposition concerning the summer flow target proposed for Section 5.2B and the volumes from Dworshak and the upper Snake to meet that target in Sections 5.2B.2 and 5.2B.3). Also, a proposed amendment to Section 6.1D reflected the implications of the NMFS Biological Opinion for the use of Dworshak for fall chinook temperature controls.

Finding: The Council adopted the recommendation. For the reasons explained below, the Council called for additional flows and velocity improvements beyond those called for in the 1994-1998 Biological Opinion.

Program Section(s):	5.2, 5.6C.1, 5.6C.4 (Snake River flows/additional water measures)
Source:	CRITFC
Recommendation No.:	5-2
Source:	Natural Resources Defense Council, et al.
Recommendation No.:	5-4
Source:	ODFW
Recommendation No.:	5-8

Recommendations: Snake flow recommendations from CRITFC and ODFW and a coalition of environmental groups:

CRITFC

For the Snake in 1995 to 1998, CRITFC called for the following “flow augmentation volume objectives” from April 15 through September, essentially derived from the fish managers’ 1994 Detailed Fishery Operating Plan (DFOP):

The total volume to be made available for augmentation increases from 4.3 million acre feet in 1995, to 4.874 million acre feet in 1996, to 4.914 million acre feet in 1997 and 1998, broken down as follows:

From Dworshak, in all these years, 1.5 million acre feet April 15 to July 1; 1.0 million acre feet from July through September. “The Fishery Managers’ in-season recommendations” are to determine “management of available runoff volumes and tradeoffs among spring, summer and fall releases.” Augmented flow levels “should be maintained through the lower Columbia River.” The July through August volume is intended both to augment flow levels and reduce water temperatures.

From Brownlee, in all years, 110,000 acre feet in May, and 137,000 acre feet in July. In August, 50,000 acre feet in 1995, 100,000 in 1996, and 140,000 in 1997 and 1998. In September, 100,000 acre feet in all years. These volumes are to be shaped by the Fishery Managers, with no refill. The project would pass through inflow. Idaho Power is then to “draft in October for Hells Canyon Complex fall chinook plan.”

From the Upper Snake, 1.427 million acre feet in 1995 and 1.927 million acre feet in 1996-1998 to be available between April 15 and September 30. The Bureau, State of Idaho and Idaho Power are called upon to “take all steps necessary” to provide this water. Flow augmentation from the Upper Snake is to be shaped “to

benefit juvenile migrations, allowing use of Dworshak water supplies for temperature abatement, specifically targeted for adult fall chinook and steelhead.”

NRDC

NRDC, et al. recommended the same flow augmentation volumes as did CRITFC, except that the August volume called for from Brownlee in 1996 and after was 100,000 acre feet (CRITFC went to 140,000 acre feet in 1997 and 1998). These groups attached a report titled “Strategies for Flow Augmentation in the Upper Snake River.” The report calls for the Council to adopt “a biologically based travel time objective and a system of minimum flows capable of meeting that objective. The minimum flows are to be “incorporated as hard constraints into the operating plans and rule curves of the hydropower system. In the longer term, flow augmentation is to be measured by adopting a smolt-to-adult return ratio.”

The report also elaborated on four “strategies” that it wants the Council to call for to obtain the extra water from the Snake:

(1) Dry-year option market. The Bureau is to establish and BPA is to fund a dry-year option market, with lease prices sufficiently high to provide farmers with a profit and compensate them for uncertainties in farm planning.

(2) Purchase programs for natural flow rights and unused storage rights. The Bureau is to strengthen and expand, and BPA is to finance, the existing program of purchasing natural flow and unused storage rights, with purchase prices that are “competitive with profits that farmers in the area make on lower value or surplus crops.”

(3) Expand Idaho water bank. The Bureau is to work with the Idaho Department of Water Resources (IDWR) to expand the current Idaho water bank so that it could provide flow augmentation for salmon in addition to fulfilling its current purposes. Changes needed include (a) allowing water bank prices to reach free market prices; (b) obtaining a waiver in 1995 of “Rule 3.6, regarding refills,” and eliminating the rule in the long term; and (c) obtaining a waiver in 1995 of the provision preventing downstream transfer prior to July 1 eliminating the rule in the long term.

(4) Eliminate water spreading. The Bureau is to “quickly adopt procedures” to eliminate “all forms” of water spreading and reallocate water to “instream uses, including flow augmentation for salmon.” Before the Bureau approves any expansion of use it is to reallocate a portion of the water to instream flows.

To facilitate these transfers of water, the Bureau is to work with the Idaho Department of Water Resources (a) to identify necessary changes in Idaho water law to allow markets to function and transfers to take place and to ensure the water may be used for salmon flows, including possible use of trust water rights, and (b) to seek expedited approval of processes for water transfers.

ODFW

For the Snake, ODFW called for minimum flow targets at Ice Harbor, rather than the flow augmentation volume objectives recommended by CRITFC and the environmental groups. ODFW stated that flows be augmented to reach these targets “utilizing PNCA critical year (1929-32) planning to incorporate target flows into firm planning under PNCA. The flow targets --in kcfs and for first, second and third year critical-year designations -- are:

April 16-30 140, 100, 85 kcfs

May	140, 100, 85
June 1-15	140, 100, 85
June 16-30	85, 65, 50
July	80, 60, 50
August 1-15	50, 50, x
August 16-31	50, x, x

Targets in columns marked with an “x” are to be “determined through in-season management decisions.”

Draft: In the draft amendments, Option 4, Additional Flow and Velocity (DFOP) and Additional Brownlee Water generally reflect CRITFC’s and NRDC’s recommendations. Option 2, Additional Snake Water, incorporates NRDC’s market-based strategies into a call for an additional 1 million acre-feet from the Snake. Proposed Section 7.8F.3 called on the Bureau to identify cases of water spreading and propose actions to make at least some of that water available for instream uses, an issue further discussed in the findings on Section 7. Option 4, Water Temperature Reduction, called for the retention of 400 kcfs in Dworshak for fall chinook temperature controls. CRITFC did not specifically recommend this, but did recommend managing flow augmentation to reserve the use of Dworshak for cool temperature releases. ODFW’s recommended sliding-scale flow targets for the Snake, which was similar to a comment from ODFW in the Strategy for Salmon process, were not included in the draft. However, Option 4, Additional Flow and Velocity (DFOP) and Additional Brownlee Water reflect the water quantities that would be produced in at least the high and medium flow years under ODFW’s recommendation.

Comments: The CRITFC, ODFW and NRDC flow augmentation and flow target recommendations raised the issues raised by all of the recommendations for increased flows, high flow and velocity equivalent targets, increased flow augmentation, and drawdowns -- whether there is a need for increased flows and velocities to improve the survival of juvenile salmon. All of these groups, along with Idaho and Idaho Rivers United, recommended Snake River drawdown measures as well. These measures issues were also bound up in the debate over the survival benefits of juvenile salmon transportation, in both an absolute sense and as compared to the survival benefits from in-river migration with increased flows and velocities. Comments and analysis on these interrelated issues will be addressed here.

Besides the detailed information that CRITFC submitted with and referenced in its recommendation, CRITFC submitted four documents during the comment period that it called “particularly useful for the Council in its deliberations on mainstem passage amendments.” “Taken together, these documents describe the inability of the 94-98 Biological Opinion . . . to allow for the survival and recovery of listed Snake River salmon stocks. In contrast, the documents show large survival improvements associated with implementing mainstem passage measures contained in the DFOP.” Three of the are relevant to the Snake flow measures.

Two of the documents were the State and Tribal Fisheries Analytical team’s final reports to NMFS on February 10, 1994, for the 1994 ESA Section 7 assessment of Snake River spring/summer chinook and Snake River fall chinook, produced by Howard Schaller of ODFW, Charles Petrosky of IDFG, Earl Weber of CRITFC, Paul Wilson of CBFWA, and Tom Cooney and Olaf Langness of WDF. The reports are summaries and explanations of FLUSH and ELCM model runs of various alternatives, including a base case, the 1994 biological assessment from BPA, three NMFS proposed sliding scale options, and the DFOP, describing the models and the assumptions and parameters used in the models and then displaying and describing the results. The third document was an independent evaluation of the region’s various passage models. It was produced by Lawrence Barnhouse of Oak Ridge National Laboratory on behalf of the Scientific Review Panel and titled the “Interim Report of the Columbia River basin Salmonid Model Review,” dated October 1994. This was an analysis primarily of the UW/BPA model CRiSP and the fish managers’ FLUSH passage model, with a few comments on the Council staff’s Passage Analysis Model (PAM). The report’s main conclusion was

that the models do not work differently, they just have different core assumptions built into them, especially differences in survival assumptions for transportation and flows.

Idaho, as noted above and below, believed that the large amounts of water from the upper Snake recommended by CRITFC and NRDC are unlikely to be available and thus the better course is to set a velocity equivalent objective in the Snake and try to reach it by reservoir drawdowns. But Idaho was fully in accord with CRITFC, ODFW and others on the value and need for increased river flows and velocities to improve survival. Idaho submitted the same analyses by federal, state and tribal biologists that CRITFC submitted, and highlighted the Biological Requirements Work Group's "Analytical Methods" report from the *Idaho v. NMFS* settlement process (also submitted by CRITFC, ODFW and others), which analyzed population trends for six index stocks of spring/summer chinook. The analysis indicated that under current system conditions, in contrast to pre-1970 conditions, key stocks are likely either to decline to extinction or cycle at such very low levels where they are vulnerable to genetic and demographic risk and to environmental variability. Substantial survival improvements are needed.

Idaho argued that this and other analytical work by state and tribal biologists rebuts the argument that ocean, estuary and drought conditions are responsible for the decline of Snake River salmon and that the hydropower system is not a major cause of decline, best demonstrated in a comparative analysis submitted by IDFG by Petrosky and Schaller, comparing Snake River spring/summer chinook (primarily Marsh Creek spring chinook and Imnaha River summer chinook) with Warm Springs River spring chinook stocks. The analysis indicated that lower Columbia stocks have retained their productivity.

Idaho also responded to arguments and comments from others, especially from the utility, agricultural and industry groups and the Corps of Engineers, that the NMFS/UW studies of survival in Lower Granite pool indicate very low reservoir mortality and no benefit from increased flows and velocities and drawdowns. Idaho noted first that no report of those studies has been released, and so the fish managers have had no opportunity to evaluate them; that the two weeks of data collection in 1993 was a pilot study only and "not a reliable estimate of reservoir survival"; that the 1993 Little Goose survival study "showed reservoir mortality for the hatchery release groups within the range estimated in the Sims and Ossiander study"; that all that exists for the 1994 study is a brief memorandum that "merely recite[s] certain figures;" and that there are a number of questions about the accuracy of the study that cannot be answered until a report is released, such as the choice of FGE assumptions at Lower Granite Dam and the sampling methods. Second, the studies do not even attempt to evaluate the cumulative mortality effects of migration delay through the system; "[m]any of the problems associated with delayed migration time are cumulative in nature, such as increased stress due to extended migration time and poor fish condition at the time of saltwater entry;" Council's own mainstem hypothesis "recognized the limitations of reach survival data." In the opinion of IDFG and other state agencies and tribes, NMFS reservoir studies are not a sufficient basis for reversing the current understanding of the flow/survival relationship and should not be the basis for deciding on actions. The UW researchers themselves have noted that their work is not final and conclusions are tentative and should be used with caution. They have also indicated that they do not want their research on two upriver reservoirs extrapolated to the entire river system.

Idaho said that further research activities on the flow/transportation/survival relationship, such as envisioned by Options 1 and 2, although important, need to be tempered by two considerations; first, the decline of the Snake River populations does not permit further studies before action is taken, while there is information to act; second, major research involves stress to fish which raises additional risks for their survival.

CBFWA supported all these recommendations, both the ODFW recommended sliding scale flow targets and the CRITFC recommended flow augmentation volume objectives. CBFWA recognized that in

some years, such as 1994, these targets and volumes cannot be achieved. The Washington Department of Fish and Wildlife endorsed CBFWA's position on the Snake River flow targets. WDFW also said that approaches to improving juvenile survival are based on assumptions regarding survival relationships; evaluation and monitoring of efforts during the initial phases of implementation must test these relationships; the Council should call for the development and oversight of an experimental plan. The fishery agencies and tribes, provided with access to outside expertise, should be charged with the primary responsibility for developing the design.

William Stelle, Regional Director of NMFS urged the Council to phase in flow changes to evaluate significant additional flows in Snake River and seek conservative operation of the hydropower system to ensure meeting the flow targets.

Save Our Wild Salmon urged a sliding-scale, share-the-wealth flow requirements; minimum flows that salmon need in dry years, increased flows in better years.

Idaho Power attached a "Flow Augmentation Analysis," describing the scientific debate about the relationship between flow, velocity and survival; noting the weaknesses in past data and analysis, especially the Sims/Ossiander studies; and noting the confounding variables that make exploring the relationship of river flow/travel time and survival difficult. But Idaho Power also noted that "despite the difficulty in assessing the sources of mortality and exploring relationships, there is a group of biologists that support the idea that higher water velocities will improve smolt survival (Giorgi 1993)," substantiated in part by the 1983 and 1984 flows and adult return data.

BPA, the Corps of Engineers, and utility, commercial agricultural and industry groups took a different view of the existing science. Extensive comments came from PNUCC. PNUCC contended that the Council staff's modeling analysis showing Snake River spring chinook survival with Snake River drawdowns to achieve higher velocities "is only true if you assume that transportation is not effective and that there are other large, unsubstantiated benefits of drawdown. The conservative modeling assumptions and inherent bias of [PAM] to overestimate river mortality create an overly pessimistic outlook of fish survival and optimistic view of drawdown benefits." PNUCC listed a number of specific criticisms of the Council's passage model and SPM analysis, and about the science underlying those modeling efforts. First, PNUCC stated that the Council's modeling analysis conflicts with modeling for the BPA/Corps of Engineers System Operating Review (SOR), especially on the issue of the efficacy of transportation. CRiSP 1.4; 1986 transportation data and the SLCM life-cycle model show transportation "effective in maintaining or increasing future Snake River spring chinook runs" and clearly beneficial to yearling salmon in almost all scenarios, while SOR modeling of 40 years without transportation and with drawdowns could not prevent chinook extinction. PNUCC contended further that the Council based its transportation hypothesis on 1986 and 1989 transportation studies, without recognizing that two years of data are not sufficient to show a statistical relationship and thus does not do as the federal agencies do and bracket the uncertainties with variable transportation survival estimates.

Second, PNUCC argued that the survival benefits from drawdown that are in the model are unsubstantiated, and that the model does not account for negative effects which may result from drawdowns. Recent data on survival through Lower Granite (Schiewe 1994) indicates survival is high, so a model analysis based on mortality in reservoir and use of drawdowns to reduce mortality is not supported by the empirical evidence. At the same time, unknown biological risks are under-represented in model, such as predator concentration, decreased turbine efficiency; and changes in food availability. The Council's model should be expanded to reflect SOR modeling, which used an optimistic and pessimistic assumption on reservoir mortality, and under pessimistic assumption juvenile survival and adult returns were less than with current river operations.

Third, PNUCC stated that the way the Council models the flow/survival relationship -- using Sims/Ossiander data -- is questionable in light of more recent data and reports indicating the S/O relationship is invalid due to use of 1973-1980 data that does not reflect current river operations; because sampling methods were too variable and unreliable and the statistical model was too simplistic to be useful. Recent reservoir survival studies in their opinion show little or no mortality in Lower Granite reservoir and that juvenile survival is not sensitive to flow over a range of flows; PAM itself is overly simplistic because all reservoir mortality is represented by flow, ignoring effects of fish condition, predator density, river temperatures, differences in spill, and gas bubble disease.

Fourth, in the Council's model, ocean survival estimates are too conservative, according to PNUCC. Long-term ocean temperature cycles and currents have always affected salmon survival (Pearcy 1992), but predicted extirpation of Snake spring chinook is based on the assumption that poor ocean conditions from 1974 to 1992 will continue indefinitely, ignoring cyclic nature of ocean conditions. Council should model ocean conditions as it does freshwater habitat, with a sensitivity analysis showing low, medium and high levels of ocean productivity.

Fifth, PNUCC argued that the end result is that the Council's dismal forecasts for spring chinook runs are not justified, as they ignore the true range of effects on the salmon from human and non-human influences. PAM needs to be recalibrated, while Council's graphs mislead the reviewer.

The Columbia River Alliance and the DSIs submitted extensive comments similar to PNUCC's. They (and the Corps of Engineers) commented that salmon declines are a coast-wide, not a basin problem, submitting the study by Darryl Olsen and Jack Richards, "Inter-Basin Comparison Study: Columbia River Salmon Production Compared to Other West Coast Production Areas, Phase II Analysis (October 1994)," prepared as part of the Corps' SCS study. In their view the best available science indicates that the very greatest part of the decline is due to poor ocean conditions and drought. Thus the agencies and tribes' and the Council's focus on the effects of hydropower system is not supported by science. The Corps itself emphasized that the extreme survival problems with Snake River stocks must be related to ocean conditions, drought and bad spawning/rearing habitat conditions, and it opposed the recommended flow targets as unsupported by scientific evidence.

The DSIs also said that estimates of historic losses associated with hydropower are grossly inflated and irrational, and do not take into account habitat, harvest and other factors that depleted populations. In their view, recent examinations indicate that runs were in serious decline due to overharvest at the time of dam construction, and that dam passage mortality has never been as great as assumed and is negligible now. The Council has adopted the conventional wisdom of 10-15 percent turbine mortality at each dam, yet recent studies show mortalities as low as 2 or 3 percent, even at Bonneville II, and 3.5 percent at Lower Granite, equivalent mortalities to spill. Consequently, Council should, for example, call for greater use of Bonneville II, not more study.

The DSIs argued further that the goal of reducing water particle travel time is not supported by good science, and that predictions of significant improvements in salmon flow augmentation schemes largely emanate from computer models that are hard-wired to give such results. In their view the Council remains biased in favor of bolstering the flow/travel time/survival hypothesis, while the question is not whether the positive flow/survival relationship still appears to be reasonable, the question is whether the Council's program of augmenting spring flows under all conditions has had any measurable effect on salmon survival. The DSIs stated that the Council has no evidence that the flow augmentation program has had any effect on salmon survival.

The DSIs followed PNUCC in asserting that the Council's use of scientific data in its PAM model and elsewhere is defective. Anderson and Hinrichsen of the University of Washington pointed out that reducing travel time through reservoirs may increase, decrease or leave unchanged overall mortality to migrating juvenile salmon, depending on whether predation rates are higher or lower below the reservoirs. Decreased migration timing may lead to shorter freshwater residence time, but actually provide little or no benefit from a life history perspective. This can occur because reducing time at risk to mortality in freshwater serves to increase risk in the estuary during the vulnerable juvenile stage. If the juvenile is flushed or transported to the estuary before it is sufficiently smolted, or at a time when mortality is not better in the estuary, then it is possible that these measures provide no benefit. A broader approach than primarily on the freshwater stage of the life cycle is needed. Existing computer models don't account for this phenomenon.

The DSIs urged the Council to keep in mind the limitations of the models in interpreting model runs, and stressed that PAM and FLUSH are simply not constructed to answer the questions at issue. The DSIs attached to their comments the model analysis by UW's James Anderson also submitted by the Columbia River Alliance, entitled "FLUSH and PAM models: A critique of concepts and calibrations." Specific problems Anderson identified with these models included: (1) FLUSH and PAM do not account for adverse effects of spill and drawdown; (2) FLUSH and PAM are based on 1970s data that have no relevance in assessing impacts of the present hydrosystem; (3) FLUSH assumes mortality rises as travel time rises, but there is no proof of that; (4) FLUSH predicts greater than 100 percent survival with low travel times; (5) FLUSH assumes less benefit to transportation under low flow conditions, contrary to empirical data; (6) FLUSH has serious errors in its treatment of the predation rate. Both models are seriously flawed and should not be used to evaluate the impact of the hydrosystem on spring chinook.

PNGC said that although the Council's Strategy for Salmon was based on the best available scientific information at the time, studies since then call into question even the validity of those flow measures. "There is no scientific information that justifies flow levels higher than those of the Council's Strategy". In their view, Dr. Cada, who undertook an independent review of the scientific literature on the relationship between flow and survival for the Council (discussed below), could find no justification for higher flows and the NMFS Recovery Team concluded that CBFWA evidence that higher flows are necessary was not convincing. The best available science indicates only a general positive relationship between flow and survival at low flows but it is unknown at higher flows. PNGC believed that "until valid scientific studies are conducted to quantify the relationship between flow and survival, the sufficient quality and quantity of flows necessary to meet sound biological objectives remains unknown." The Council should heed the advice of the Recovery Team and others and require more research and analysis to determine whether there exists a flow/velocity/survival relationship, and if so, what is the relationship. PNGC attached to its comments a paper written by Chapman and Giorgi titled "Comments on Work of Biological and FCRPS Alternative Work Groups," which explains the scientific viewpoints and literature underlying the recommendations of PNGC as to the best available science on the host of mainstem issues, and on the nature of the scientific process itself with regard to Columbia River anadromous fish.

BPA added that the Cada report's conclusions on the flow/survival relationship should be used cautiously, because (1) the vast majority of flow/survival data available is for yearling chinook, which do show a much stronger response to flow than subyearling chinook; and (2) the (Cada) report was a literature review, not a critical scientific report.

Chelan County PUD questioned the scientific basis for a relationship between flows, velocities and survival at any level above low flows, also emphasizing the recent UW/NMFS Lower Granite reservoir studies showing greater survival than previously assumed, and identifying ocean conditions as the big source of mortality. Chelan noted that neither transport or in-river flow/velocity augmentation can override the

effects of poor ocean conditions or drought; still, flow/velocity measures have a poorer record for demonstrating benefits than does transportation.

With regard to the specific issue of extra water from the upper Snake and from Idaho Power's Brownlee Reservoir, Idaho Power Co. commented that because of limited transmission capacity to import power, Brownlee is 100 percent of Idaho Power's power reserves during the same time period that the fish are migrating downstream. As a result, the company cannot significantly draft Brownlee Reservoir during the fish migration period. Idaho Power also included an analysis of the adverse impacts on the natural and cultural resources in and around Brownlee Reservoir from heavy flow augmentation demands. Any significant increase in flow augmentation must come from either an increase in intra-region transmission capability, an increase in Upper Snake River channel capacity, or both. Idaho Power also said it has fully mitigated the impact of its dams on fish, and included a copy of the agreement with the Federal Energy Regulatory Commission on that matter, desiring the Council to recognize this point explicitly. In Idaho Power's view, the Council's flow augmentation proposals are clearly attributable to passage problems at the federal dams, not at Idaho Power's dams, and the Council should make that clear.

The Washington Department of Fish and Wildlife supported the call to the Bureau of Reclamation, Idaho, Idaho Power and BPA to provide water for flow augmentation, "including the implementation of a willing buyer/willing seller program. As a longer term project, the Bureau should proceed with planning, design and environmental law compliance for additional upper Snake River storage, including the potential Galloway storage project for salmon and steelhead flow augmentation.

Idaho Fish and Game supported the recommended flow augmentation levels only on the condition that the additional water is acquired on a willing buyer/seller basis and that resident fish and wildlife protection and other reservoir values are protected. Idaho opposed CRITFC's DFOP-derived recommended Snake flows as proposed by the Council in Option 4 because the Option did not include these approaches. The Department said that flow augmentation is not a long-term viable option for the Snake Basin because of its aridity and limited storage space, most of which is dedicated to irrigation. In 1994, for example, even though 2.7 million acre-feet were released for flows, flows still fell 4.5 million acre-feet short of NMFS flow targets; 1994 releases also decreased the likelihood of refill in future years. IDFG also urged caution in relying on the Bookman-Edmonston report on Snake River Water Alternatives, especially about large-scale conservation in the Rigby Fan area. Even modest changes in flow require large amounts of water; drawdowns would be less costly, more effective and less socially and economically disruptive. Four principles should guide flow augmentation: (1) Ensure that any contracted storage is acquired only on a willing buyer/seller basis; (2) any storage water that is obtained must be delivered in accordance with state law; (3) flow augmentation should minimize impacts to resident fish and wildlife; and (4) if agricultural land is voluntarily taken out of production, impacts to local communities should be mitigated (citing National Research Council, *Water Transfers in the West*, National Academy Press at 10-11, 257-59 (1992)). IDWR observed that any long term flow augmentation program will require changes in water rights and water law. Idaho attached reservoir reports; affidavits of IDWR and IDFG personnel from the Marsh court proceedings; water market reports; analyses of the impacts of downstream flow augmentation on resident fish and wildlife in Idaho, etc. -- to support its position on the limitations of flow augmentation potential in the Snake basin, the adverse impacts to resident fish and wildlife, and the nature of the emerging water market.

With regard to the water market, IDFG supported a call for water bank prices to achieve market levels (Section 5.2A.5), but not the waiver of water bank rules such as the last-to-refill rule (Section 5.2A.6), which protects spaceholders who have not leased their water. The call for elimination of obstacles to downstream use of this water for salmon is not objectionable but Idaho does not have the authority to curtail valid water rights in downstream areas; Idaho does have an effective moratorium on new water rights, but cannot ensure

that downstream states have the same protection in place. Idaho also submitted comments and reports on the comparative cost-effectiveness of flow augmentation and drawdown.

Rosholt, Robertson & Tucker, for Twin Falls [Idaho] Canal Co. and North Side Canal Co. said the Bookman-Edmonston report on Snake River water management opportunities is “seriously flawed” in its assumptions as to how water can be conserved by new distribution and irrigation practices. The commenters are opposed to taking any further water from Idaho for salmon due to agricultural and economic impacts and lack of evidence that it will increase survival; the amount that can realistically be gained from willing sellers is minimal.

The Bureau of Reclamation commented that it is committed to finding needed volumes for flow augmentation consistent with protection of water rights and with the need to develop cooperative and creative ways to obtain water. The Bureau attached two charts depicting the reservoir storage required, acres permanently removed from irrigation and costs for selected volumes of flow augmentation: .427, .927, 1.427, and 1.927 million acre feet, with variables as to whether the Bureau used the last-to-fill rule or not and whether the Bureau seeks 50 percent or 95 percent reliability of achieving the flow volume. Costs range from \$750,000 for .427 million acre feet without last-to-fill and 50 percent reliability, to \$1 billion for 1.927 million acre feet with last-to-fill rule and 95 percent reliability. The number of acres the Bureau estimates would have to be taken out of production permanently range from 22,000 to 925,000. Total Idaho and Oregon Snake Basin irrigated acreage (above Brownlee) is 3.7 million acres; highest flow augmentation volumes could take up to 25 percent out of production.

The Bureau said it is addressing local Idaho water bank rules, including the last-to-fill rule, which is designed to avoid third party impacts. Water purchased for flow augmentation comes only from those whose storage entitlements are purchased; if last-to-fill rule is not followed, flow augmentation may further affect reservoir levels, streamflows in non-augmentation months, non-participating irrigators, resident fish and recreation. Providing more than 427,000 acre feet will require several years, changes in implementation of Idaho law, significant changes in cooperation of water users and legislature, and more funding.

The Bureau observed that proposed Section 5.2A.5 (in Option 2) calls for review of cost-effectiveness of measures identified in Bookman-Edmonston report; that report was at a “subappraisal” level and did not include the kind of detailed cost, technical feasibility and environmental studies to be able to convert quickly to cost-effectiveness analysis; additional time will be needed. With regard to planning called for in Section 5.6B.1 (Option 2) for three possible new storage sites, the Galloway analysis done by Corps in 1980 need only be updated; the other two will require full blown feasibility studies; Council should prioritize.

Idaho Power agreed with the Idaho Department of Fish and Game’s comments indicating that there is not enough water in the state of Idaho to sustain flows at Lower Granite at the 140,000-cubic-feet-per-second level recommended by the agencies and tribes. The best available scientific knowledge does not support the use of water from the Snake River above Lewiston to augment flows to aid downstream migrating fish, nor does such a program complement the existing and future activities of the relevant agencies and tribes, attain any sound biological objective, or improve survival of the fish. The only sound alternative is to draw down the Lower Snake projects and spill the fish past them; flow augmentation has failed because it has not been able to provide similar conditions to the high flows observed in 1983 and 1984.

Regarding water temperatures for fall chinook, the Corps of Engineers said there are no data supporting the idea that cold water from Dworshak affects adults’ entry into the Snake River. Measures proposing to hold significant amounts of Dworshak water for fall chinook temperature control conflicts with water availability for juveniles and with the Draft Recovery Plan which considers juvenile use a higher priority.

BPA said that adult Snake River migrants need cooler water than they experience now; improve the chances of adult migrants surviving to spawning areas by using flow augmentation in late summer for adults (especially out of Dworshak) instead of early summer for juveniles.

Findings

The biological value of flow augmentation and velocity improvements:

The rationale for the Snake River flow recommendations is based on several considerations cited by the fish and wildlife agencies and tribes and by NMFS in the Appendix to the 1994-1998 Biological Opinion, and found reasonable by the independent review conducted by Dr. Cada of the Oak Ridge National Laboratory. The fishery managers assert that anadromous fish evolved to survive in a natural river environment. NMFS, in particular, has noted that the fish evolved biologically and physiologically to an environment that is markedly different than that of today. Taking steps such as flow augmentation to move toward a natural river condition can be expected to improve anadromous fish survival. The fish will survive best in conditions that resemble those in which they evolved, the fish managers suppose. By the same token, they contend, moving toward a swifter-flowing river can be expected to provide a less hospitable habitat for predators, primarily resident fish that adapt well to slow moving, warmer reservoirs. Especially in the spring, the fish managers say, moving fish down the river faster should allow them to arrive at the estuary and ocean earlier, when environmental conditions are expected to be better, and limit their exposure to predators and other sources of mortality in the reservoirs.

The scientific evidence for and against this position was reviewed exhaustively in the Council's "Mainstem Hypotheses" amendment process over the summer of 1994, which focused precisely on the issue of the relationship between flows, river velocity, transportation and salmon survival. The Council adopted amendments that set out the Council's hypotheses regarding these relationships. Section 5.0E, Mainstem Passage Hypotheses, represents the result of that process, and the Council believes it fairly reflects what is known and unknown about these relationships. In sum, notwithstanding continuing controversy over the relationship between flow/velocity augmentation and salmon survival, the best available scientific knowledge indicates that the relationship is positive and that efforts to move the ecosystem in a direction more closely resembling that under which the fish evolved should be beneficial. See also Response to Comments, Mainstem Hypotheses.

Documentation supplied by the Idaho Department of Fish and Game responded to many other points raised by critics of flow augmentation. Idaho points to analytical work by state and tribal biologists in response to the argument that ocean, estuary and drought conditions are responsible for the decline of Snake River salmon and that the hydropower system is not a major cause of decline. Idaho cites, for example, the comparative analysis of Snake River spring/summer chinook (primarily Marsh Creek spring chinook and Imnaha River summer chinook) with Warm Springs River spring chinook stocks by Petrosky and Schaller, indicating that lower Columbia stocks below the mainstem dams have retained their productivity.

As noted above, Idaho also responded to arguments that the NMFS/UW studies of survival in Lower Granite pool indicate very low reservoir mortality and no benefit from drawdowns. Idaho noted that no report of those studies has been released, and so the fish managers have had no opportunity to evaluate it; that the two weeks of data collection in 1993 was a pilot study only and "not a reliable estimate of reservoir survival"; that the 1993 Little Goose survival study "showed reservoir mortality for the hatchery release groups within the range estimated in the Sims and Ossiander study;" that all that exists for the 1994 study is a brief memorandum that "merely recite[s] certain figures;" and that there are a number of questions about the accuracy of the study that cannot be answered until a report is released, such as the choice of fish guide

efficiency (FGE) assumptions at Lower Granite Dam and the sampling methods. Second, the studies examined two upriver reservoirs only, and did not purport to evaluate the cumulative mortality effects of migration delay through the system. "Many of the problems associated with delayed migration time are cumulative in nature, such as increased stress due to extended migration time and poor fish condition at the time of saltwater entry." The Council's own mainstem hypotheses, IDFG argued, "recognized the limitations of reach survival data." Idaho contends that NMFS reservoir studies are not a sufficient basis for reversing the current understanding of the flow/survival relationship and should not be the basis for deciding on actions. Because their results are preliminary and relate to only a limited portion of the river, the NMFS researchers have advised using the data with caution.

The Council agrees that ocean mortality appears to be a major factor in recent declines, and that this may help explain why recent declines are coastwide. Salmon have always been subject to fluctuating ocean conditions, however, but before now have not been brought to the edge of extinction by them. Ocean conditions are not generally subject to the Council's control, except perhaps to the extent that the region can alter the flow regimes of the Columbia River and its tributaries to produce an ocean plume that more closely corresponds to the conditions in which salmon evolved. In-river conditions that decrease the survival margin of these fish are, however, within the Council's purview. The Council believes that the region should improve conditions in the river, as the Northwest Power Act envisions, with the expectation that this will help restore stock productivity so that the basin's salmon runs can withstand occasionally severe adverse ocean conditions.

The Council's own analysis buttresses these conclusions. In a Council analysis of the correlation between flow and spring chinook returns, higher returns of spring chinook were associated with higher flows during the outmigration (see Memorandum from Chip McConnaha to Ted Bottiger, November 25, 1994). While this correlation did not explain all of the variation in adult returns from year to year, it did account for about 26 percent of the variation in returns. As commenters point out, this argues that other factors, such as variation in ocean conditions (which the Council knows is a major factor), drought and other natural conditions also contribute, and in the aggregate these natural conditions may be a bigger factor in salmon mortality than slow river flows. However, it remains apparent that flow variations appear to explain a significant portion of the annual variation in fish runs. If the bulk of annual variation is controlled by the ocean and other factors outside our control, then flow may remain as the largest factor humans can hope to influence.

The criticisms of the Council's passage model and model analyses are either not accurate or are misleading. First, the SOR modeling cited by PNUCC as superior to the Council's did not include the most recent information on returns of wild spring chinook to the Snake River. In 1994 the return was about 1,500 fish, while the projection for 1995 is considerably worse. In the Council's analysis, the model was calibrated so that it recreated the returns from 1975 to 1995 (1995 projection). The analysis then proceeded into the future from this basis.

Second, the contention that the Council staff has been overly pessimistic regarding transportation benefits ignores the fact that, in contrast to virtually all of the modeling cited by PNUCC, BPA, the Corps and the DSIs, the Council has attempted to explicitly show the importance of alternative transportation assumptions and their impact on the results. The Council staff has analyzed the options over a wide range of benefits suggested by several commentors, including those making the criticism. Most recently, the Council staff added an assumption set based on ideas from the Columbia River Alliance that suggest that transportation survival is very high (80 percent) and that the hydroelectric system has a nominal effect on salmon survival. It is true that all of the Council's assumptions about transportation have been based on the results from NMFS for 1986 and 1989. However, this is because these are the only data relating to modern transport conditions. In contrast to PNUCC's assertion, the Council has recognized this limitation; it has been

frequently noted in the analytical documentation and in presentations to the Council. This is one of the main reasons the Council has focused on this uncertainty, in the Mainstem Hypotheses and elsewhere, and have addressed it by bracketing the model analysis and results within a range of plausible transportation benefits.

Third, many of the positive *and* negative aspects of drawdown are unsubstantiated. Drawdown is outside the range of conditions of almost all scientific studies relating to mainstem passage. This is because almost all of the studies have been conducted after the hydroelectric system was in place; very few studies were conducted prior to the development of the hydroelectric system. This allows endless opportunity for speculation on the potential positive and negative aspects, none of which will be known with certainty until drawdown is tried. The Council's analysis has been neutral on many of these areas of speculation. For example, PNUCC and other utility interests frequently assert that drawdown will have a negative impact by concentrating predators; in other words, the number of predators will stay the same, but the volume of water will decrease under drawdown. With more predators in a smaller volume of water, they contend that predation rates will go up. There is absolutely no empirical evidence to support such a claim. In fact, an at least equally plausible hypothesis is that the drawdown will increase velocities and so decrease the suitable habitat for predators, and thus decrease mortality beyond what would be expected on the basis of water velocity improvements alone. Because these assertions are speculation, the Council has not attempted to incorporate them into the routine analysis as suggested by PNUCC.

Fourth, the Council's analysis has used the flow/survival relationship advocated by the fishery managers based on the Sims and Ossiander data. Despite the obvious weaknesses in the Sims/Ossiander data, which the Council has been informed of many times over the years in memoranda and staff briefings, the data and analysis do present a reasonable biological model of the flow-survival relationship that is consistent with other data and analyses, including the Marsh Creek analysis by IDFG and the data and reports from the Fish Passage Center's smolt monitoring program. The scientific review conducted by Dr. Cada for the Council's mainstem hypothesis rulemaking is only the latest review to confirm this point. Still, the Council staff recently contrasted this with a model suggested by the Columbia River Alliance which suggests that the development and operation of the hydroelectric system is not an important factor limiting Snake River chinook production. PNUCC and others have advanced the recent work by NMFS as invalidating the older Sims/Ossiander data. To do this they have had to extrapolate a limited data set from portions of two upper reservoirs in two years to all eight reservoirs in all years. The analysts who conducted the NMFS research do not support extrapolation of this work to all the mainstem reservoirs. The Council supports this research and hopes that it will lead to an improved understanding of this important relationship. However, the Council does not agree with those who would use the results beyond their limited scope and progress to radically alter the region's understanding of the flow-survival relationship through the system. Instead the results argue for continued work in this area. The nature and breadth of this controversy is the basis for the Council's use of a range of assumptions in its analysis and the development of an adaptive management approach.

Fifth, while the Council fully acknowledges the cyclic nature of ocean survival conditions, no one has suggested a way to meaningfully incorporate them into the existing models. Further, the present pattern of adverse ocean conditions is unusually persistent, and has lasted longer than many would have predicted. This points to the limitations in our ability to predict ocean events. The Council has chosen to be conservative biologically and not arbitrarily presume some marked improvement in ocean conditions in the future.

Sixth, PNUCC's assertion that the Council's analysis is too conservative is not based on fact as shown above. The Council's analysis is, in fact, calibrated to the most recent information that indicates that Snake River spring chinook are at all time record low numbers; given these low numbers many populations risk extirpation or loss of genetic diversity. While natural variability in survival and scientific uncertainties are such that we could all be pleasantly surprised with large future returns in the absence of additional actions, recent experience and the present low abundance suggest no reason for optimism.

Descriptions of the Council's staff analysis for this rulemaking can be found, among other places, in Part II of Technical Appendix B of the Appendices to the Draft Amendments (Document No. 94-47) and in Appendix D to this revised program, which is a description of the latest staff analysis; the technical documentation for the analytical model is in the administrative record.

Considering the data and information presented by the fish and wildlife agencies and Indian tribes and others in the current amendment process, the independent scientific review conducted by Dr. Cada, the Council staff's analysis, and the extensive scientific work that supported the mainstem hypotheses, and giving due weight to the authorities, expertise and rights of the agencies and tribes, the Council accepts the agencies' and tribes' judgment on the expected biological value of the recommended flow and velocity objectives and concludes that it is supported by the best available scientific knowledge. The Council concludes that the recommended flow/velocity targets would protect, mitigate and enhance fish and wildlife. Regarding the potential impacts on the region's power supply, see Section 1.8, the introduction to Section 5, and Appendices B and C (hydropower costs and impacts analysis and the analysis of "Assuring an Adequate, Efficient, Economical, and Reliable Power Supply and the Ability to Carry Out Other Purposes of the Power Act"). The biological benefits of the Council's measures are summarized in Appendix D, "Staff Analysis of Biological Benefits of Mainstem Passage Actions."

The need for better information:

The Council does not accept these judgments conclusively. As the mainstem hypotheses show, the scientific data are not clear, and there are genuine disagreements among capable scientists on these matters. The region must evaluate the biological assumptions that underlie these operations to see if they achieve the expected biological benefits. One of the central purposes of the Mainstem Hypotheses section of the program is to focus research and evaluation on critical aspects of these relationships. Similarly, in the current amendment process the Council calls for a multi-year evaluation of the relative survival benefits of flow/velocity versus transportation, probably the single most critical issue surrounding efforts to protect juvenile migrants from the effects of the dams. As new information emerges, the region must be prepared to adjust these operational objectives.

Recommended flow/velocity objectives and volumes of water:

Flow/velocity objectives: The Council adopted sliding scale flow/velocity objectives or targets in the Snake, ranging from a minimum spring targets of 85 to 140 kcfs, and a summer flow/velocity target of 50 kcfs. The Council did not call for these objectives to be incorporated into firm planning because they cannot be met by doing so, at least not until drawdowns are implemented. The only project called on to contribute these objectives that is actually included in firm power planning is Dworshak Dam, and the Council does call for its contribution to be factored into firm planning. Its storage capacity is virtually exhausted by the flow augmentation measures the Council calls for, but even so it cannot meet the recommended targets. In order to meet the recommended targets in dry water years, approximately 13 million acre-feet of flow augmentation water in addition to that called for in the Strategy for Salmon would be required in the lowest water years. The Snake Basin reservoirs apart from Dworshak and Brownlee comprise approximately 11 million acre-feet of storage, but little or none of this is actually incorporated in firm power planning because most of it is committed to irrigation uses for which these projects were principally authorized. The Council has called for the water volumes to be contributed by the upper Snake to be incorporated into firm power planning, if possible, but not the flow targets. Accordingly, instead of calling for these targets to be met through firm power planning, the Council has adopted a drawdown strategy to supplement a flow augmentation program. Analysis shows that the targets can be met in most years through a combination of drawdowns and flow augmentation. The Council concluded that this combination of flows and drawdown is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. ☞ 839b(h)(7)(C).

Dworshak: The Council calls for 1 million acre feet from Dworshak in the spring as part of the effort to meet the 140 kcfs velocity equivalent objective. This is less than the 1.5 million acre feet recommended by CRITFC. CRITFC recommended a further 1 million acre feet in the summer and fall. The Council called in summer for Dworshak to be allowed to draft to elevation 1520 (an average of 500,000 acre-feet) by the end of July if needed to meet the minimum summer flow/velocity objective of at least 50 kcfs. If Dworshak is above elevation 1520 by the end of July, FOEC is to consider using its water for late summer/fall temperature control. Ignoring the spring volume, these summer and fall volumes are not likely to add up to 1 million acre feet in most years. However, analysis showed that the DFOP-derived operation recommended by CRITFC and NRDC would reduce Dworshak's probability of refilling in succeeding years to approximately zero, compared to a 34 percent probability with the adopted measures (see among other DFOP analyses, the analysis of Option 4 in Appendix B, Draft Amendment Document No. 94-47). In effect, the recommendation would convert Dworshak into an unreliable fish flow augmentation resource if the region experiences a succession of low-water years, as it has in the last 8 out of 10 years. Analysis showed that the Dworshak drafts called for by the Council, together with reservoir drawdowns and volumes from the Upper Snake, should achieve the flow/velocity objectives for the Snake River in most years, and without severely depleting water storage for succeeding years. Accordingly, the Council rejected the recommendation for more water from Dworshak because the adopted measure is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. ☞ 839b(h)(7)(C). The Council adopted the recommendation for maintaining flows through the lower Columbia, and called for in-season shaping to be managed by the Fish Passage Center and the Fish Operations Executive Committee.

Brownlee: The Council accepted the recommendation regarding Brownlee, insofar as the recommended releases are needed to meet flow objectives. The Council appreciates the fact that Idaho Power Co. relies heavily on Brownlee, that its license entitles it to certain operations, and that the Company has a settlement agreement regarding the Hells Canyon Complex. However, the Council does not agree that Brownlee necessarily bears no responsibility for downstream flow problems, especially summer flows for fall chinook, much of whose spawning grounds are blocked by the Idaho Power Company projects. The extent to which Brownlee contributes to those problems, and Idaho Power Company's right to compensation from Bonneville, is addressed in Section 5.2C.1.

Snake River Basin: Regarding the Snake Basin, the Council calls for an additional million acre-feet of water to be secured through nonstructural (willing buyer/seller transactions, water conservation, etc.) and/or structural means (storage reservoirs), for a total of 1.437 million acre-feet by 1998. The Council believes this to be an ambitious target, which can be reached only through voluntary measures because of limitations on the Council's authority with regard to water rights, 16 U.S.C. § 839g(h). However, reports by Hydrosphere and Bookman-Edmonston Engineers and comments by the Bureau of Reclamation showed that there are significant legal, political, economic and hydrologic obstacles to obtaining Snake Basin water from existing users through voluntary transactions. These problems were illustrated during the past two years, when very little water was made available from Snake River water banks for salmon flows, due to drought conditions. The Environmental Defense Fund's analysis shows that securing this water through voluntary transactions would be the most cost-effective way to reduce water particle travel times. However, finding ways to secure even 1.437 million acre-feet through voluntary measures cannot be assured. The Council concluded that calling for more water than 1.437 million acre-feet could actually make it more difficult to secure water for salmon by undermining efforts to effect the legal and political changes that will be needed if this water is to be acquired. There is a possibility that additional new storage could help, and this will be explored further under the Council's program. Accordingly, the adopted recommendation is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). As ways are found to secure this water, and as drawdowns are implemented, the Council can review the region's experience in securing this water, if appropriate. The Council calls for all this water to be shaped for maximum benefit to fish.

Temperature control: The Council accepted the need to continue evaluation of temperature control for fall chinook, but leaves to the fish managers and the Fish Operations Executive Committee decisions about whether to shift water from spring to summer for this and other purposes.

Additional measures: The Council's analysis showed that the adopted flow augmentation measures, and even the recommended flow augmentation measures, would not achieve flow/velocity objectives in all water years. The Council concludes that this is in large part for the reasons given by Idaho Department of Fish and Game. The Department contended that flow augmentation is a difficult option for the Snake Basin because of its aridity and limited storage space, most of which is dedicated to irrigation. In 1994, for example, even though 2.7 million acre-feet were released for flows, flows still fell 4.5 million acre-feet short of NMFS' flow targets; 1994 releases also decreased the likelihood of refill in future years. Even modest changes in flow require large amounts of water. For these reasons, in Section 5.3 the Council calls for the implementation and evaluation of various reservoir drawdowns to increase water velocities in the mainstems of the Snake and Columbia Rivers.

The Council also concludes that no party has recommended less costly alternative measures to achieve the Council's flow/velocity objectives.

Program Section(s): 5.2A (Snake River performance standard)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-9

Recommendation: Revise introductory text to Section 5.2A to state that 85 kcfs minimum monthly average flow equivalent is not biologically adequate but reflects hydrologic constraints and that "consistent with its hypothesis that increased river velocity improves migrant survival, the program emphasizes mainstem reservoir drawdown actions" to achieve a 140 kcfs velocity equivalent in all but low flow years.

Draft: This particular change was not proposed in the draft, but Option 3, Introduction and Lower Snake Drawdown, proposed changes to the introductory text for Section 5 generally and for Section 5.5 (now Section 5.3) that reflect the same position.

Findings: The Council adopted the substantive recommendation (see above and below), but with its own introductory statement.

Program Section(s): 5.2A.2 (Snake River flows)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise footnote to Lower Granite flow figure to state that minimum flow from Dworshak is 1200 cfs, not 2000.

Draft: The draft proposed this change in general Section 5 amendments.

Findings: The Council adopted the recommendation.

SECTION 5.3: IMPROVE COLUMBIA RIVER FLOW AND VELOCITY¹

Program Section(s): 5.3 (Columbia River flows)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise all of Section 3 to make Columbia flow-related measures consistent with NMFS 1994-98 biological opinion.

Draft: In the draft, Option 2, Biological Opinion (concerning the Columbia River spring migrant performance standard) and Biological Opinion Flows covered the NMFS biological opinion flow targets and measures for the Columbia.

Findings: The Council adopted the recommendation. For the reasons explained above and below, the Council called for additional flows and velocity improvements beyond what was called for in the 1994-1998 Biological Opinion.

¹ **Note:** This section of the original 1994 Fish and Wildlife Program -- concerning Columbia River flow and velocity -- has been renumbered Section 5.4 in the amended program.

Program Section(s):	5.3, 5.6 (Columbia River flows/additional water measures)
Source:	CRITFC
Recommendation No.:	5-2
Source:	ODFW
Recommendation No.:	5-8
Source:	Natural Resources Defense Council, et al.
Recommendation No.:	5-4

Recommendations

CRITFC

For the Columbia, from DFOP, CRITFC calls for a sliding scale of minimum flow targets at The Dalles “based on [PNCA] firm power planning” and thus “critical year designation established at the beginning of each power planning year (August 1 to July 31) to allow for fall and winter operations that provide minimum targets the following spring and summer.” The flow targets --in kcfs and for first, second and third year critical-year designations -- are:

April 15-30	300, 260, 220 kcfs
May	300, 260, 220
June 1-15	300, 260, 220
June 16-30	250, 250, 200
July	200, 200, 200
August 1-15	160, 160, 160
August 16-31	160, 160, 160

Also from the DFOP, in addition to the minimum flow targets, use a “sharing formula” in years of above average January-July runoff (at Grand Coulee based on March 1 forecast) to store “shapeable volumes” for flow augmentation. Forty percent of the above average runoff would be provided for flow augmentation; 40 percent and 20 percent would be stored in Libby and Hungry Horse to improve reservoir elevations.

In addition to the DFOP measures, CRITFC calls for two other measures:

(1) Minimum flow of 120 kcfs at The Dalles during September to benefit both the end of the subyearling fall chinook out-migration and the adult fall chinook and steelhead in-migration.

(2) “BPA shall immediately take steps to secure at least an additional 3.5 million acre feet in available Canadian storage” for augmentation and “reconstruction of the historical hydrograph.”

ODFW

ODFW calls for the same April-August The Dalles flow targets as CRITFC calls for and the same sharing formula in years that exceed normal run-off. ODFW stated that provision of flows to meet the targets “is dependent on inclusion of Canadian reservoirs and use of Non-Treaty storage volumes.” In addition: (1) provide flexibility in Grand Coulee, Arrow and Mica Reservoir elevations to meet flow targets and limit fall and winter power drafts of Libby, Hungry Horse and Grand Coulee to maintain pool elevations for resident fish; and (2) in future years, “allow FELCC to be impacted in low water years to achieve Lower Columbia flow targets.”

NRDC

NRDC, et al., called for the same April-August flow targets at The Dalles as CRITFC. To help meet these targets “and to minimize the release of water from upstream U.S. storage projects,” the recommendation called for the Corps to operate John Day at minimum operating pool and for BPA to “pursue long-term arrangements with B.C. Hydro for the purchase and release of Canadian storage” (CRITFC specified at least 3.5 million acre feet from Canadian storage; the groups did not specify an amount.) The groups did not include two elements from CRITFC's Columbia flow proposal: the sharing formula for above average runoff years and the September flow target. The recommendation also called on the fishery agencies and tribes to develop “biological rule curves” for all the mainstem reservoirs, to be implemented on a systemwide basis.

Draft: Option 4, Additional Flow and Velocity generally reflected these recommendations. The Option 4 proposals did not specifically include the two elements added by ODFW, although reservoir constraints were proposed in Section 10 for Libby, Hungry Horse and Grand Coulee. Reservoir constraints for Hungry Horse and Libby were proposed at Section 10.3A and 10.3B, for Grand Coulee at Section 10.3E, and as a study measure for Lake Pend Oreille at Section 10.6E. Criteria for developing biologically-based constraints on “hydro project operations” were proposed at Section 2.2E.6.

Comments: The recommended Columbia flow targets raised the same general issues of the flow/velocity/survival relationship as were raised and discussed above, in the findings on Section 5.2, with regard to the Snake River flow/velocity objectives and flow augmentation recommendations.

CBFWA in its comments incorporated the recommended flow targets for the Columbia, as well as the upper-river reservoir constraints at Hungry Horse, Libby, Grand Coulee, and Albeni Falls/Lake Pend Oreille, and notified the Council that CBFWA internally will attempt to resolve any inconsistencies between the two sets of objectives and any conflicts between upper-river and lower-river fish managers and report to the Council in February or March 1995. The Washington Department of Fish and Wildlife endorsed the Columbia sliding scale flow targets as stated in the CBFWA comments, stating that this approach should take into account biological impacts on storage reservoirs and the availability of Canadian water.

The Upper Columbia United Tribes and the Colville Confederated Tribes disagreed with the Columbia flows represented by the DFOP flow targets, noting that there was a lack of consensus among members of the Columbia Basin Fish and Wildlife Authority (CBFWA) about whether the flow targets allow for protection of resident fish and wildlife and a reliable power supply; and noting the CBFWA process for trying to resolve these issues by February 1995. The UCUTs particularly objected to augmenting flows for summer migrants during July and August in below average water years, due to severe negative impacts to resident fish in storage reservoirs. The UCUTs also commented that the program “should include a description of the projected impacts of this plan to resident fish in Grand Coulee, Hungry Horse, Libby and Dworshak Reservoirs. It shall also specifically evaluate tradeoffs between anadromous fish and resident fish and be consistent with equalizing the benefits to both types of fish.” The UCUTs also suggested revising the provision in Section 1,5 on the use of Canadian reservoirs as a source for flows, so that section reads: “In determining the sources of water for fish and power flows, as well as protecting fish in storage reservoirs, the use of Columbia And, “[i]n general, fish flows, as well as reservoir elevation and water retention time required to protect resident fish in the storage reservoirs, should be accommodated”

The Colville Tribes were concerned about the impact of target flows for anadromous fish on resident fish and wildlife in upriver storage reservoirs; the resident fishery in Lake Roosevelt (Grand Coulee reservoir) was of particular importance. They said that resident fish in Lake Roosevelt should be considered in the same light as salmon; and they urged that the operation of Grand Coulee Dam and Lake Roosevelt could undergo a

complete environmental evaluation of the various mainstem options. They noted that the proposed changes in operations of Grand Coulee would result in unprecedented summer drawdowns with a series of severe environmental consequences. The Colville Confederated Tribes also noted that proposed Section 5.7D.2 contained language requiring monitoring and evaluation of the impact of salmon flows on resident fish and that CBFWA left that out in its comments. The Council should retain this section until it is replaced by something equivalent as a result of the CBFWA upriver/downriver process. The current Lake Roosevelt monitoring program conducted by UCUTs does not adequately address the fisheries concerns with regard to anadromous fish flows on resident fisheries; the program primarily addresses the evaluation of kokanee hatcheries and rainbow trout production programs; does not adequately address naturally producing kokanee and trout or other aquatic species important to the health of Lake Roosevelt ecosystem.

The Direct Service Industries (DSIs) said flow targets cannot be imposed without regard to natural conditions. Although the targets make some effort to distinguish among water years in setting flow targets, its crude approach continues to require hydrosystem operators to offset drought conditions. Instead, the Council should provide a fixed amount of water per year, if good science supports it. The record before the Council conclusively demonstrates that CBFWA flow targets and levels cannot possibly be achieved in many, if not most, years. Perhaps as a negotiating tactic, the fishery agencies and tribes represented by CBFWA have sought flow levels that are impossible to achieve; but note that several fishery agencies and particularly upriver tribes are opposed to radically increased flow regimes (and drawdown) proposals. Chelan County PUD also opposed flow targets and any increases in fish flows until such time as the flow/velocity/survival hypothesis is validated.

BPA said that, given its view of the flow/survival relationship above low flows, BPA has serious questions as to whether Columbia River flow targets will benefit salmon. A limited flow augmentation water supply should be managed on a volume basis; managing by minimum flow targets is an unsound departure from water budget practice. Flow augmentation is best managed on a volume basis instead of a minimum-flow basis, because flow targets often cannot be met at all times anyway and because biological information can be incorporated to determine when best to use augmentation and thus enhance augmentation effectiveness. Strategic water management, such as pulsed flows, may increase the effectiveness of flow augmentation, although this needs a more thorough analysis. Pulsing flow augmentation would provide increased flow levels for individuals of wild stocks that are ready to migrate, and also throughout a greater proportion of their migration period. BPA further commented that efficient use of a limited flow augmentation water supply necessitates using biological information and criteria to augment flows when it will be most effective.

Bonneville also said that for “natural selection reasons,” the region should work to improve the chances of returning adult migrants by using flow augmentation in late summer for adults instead of early summer for juveniles; travel time studies reveal that the extent to which subyearling chinook respond to water velocity (as indexed by flow) is uncertain; but, if they do respond, the effect is neither consistently predictable nor pronounced. Consequently, BPA stated, if the flow/survival relationship described by Hilborn, et al, reflects a true survival advantage during high flow years, it is not apparent that the effect would be associated with increased migration speed; other mechanisms accompanying high flow years, such as spill, may explain the increased survival.

Douglas County PUD commented that the flows proposed in Option 4, Additional Flow and Velocity, instruct the mid-Columbia dams to provide FERC mandated spill and to pass through flow augmentation releases. The PUD wants clarification that these provisions will not be construed too strictly once flow augmentation begins so as not to allow necessary reservoir fill that occurs under normal operations to reverse pool reductions caused by load following, even though these normal operations have no real impact on the bulk movement of flow augmentation releases through this run-of-the-river project.

Findings: The Council adopted the recommended flow targets, in a renumbered Columbia flow and velocity section, Section 5.4. As with the flow objectives in the Snake River, in addition to reviewing the detailed information supplied by CRITFC and others in this process, the Council conducted an amendment process over the summer of 1994 concerning the relationship between flows, river velocity, transportation and salmon survival, and adopted amendments that set out the Council's hypotheses regarding these relationships. Section 5.0E, Mainstem Hypotheses, represents the result of that process, and the Council believes it fairly reflects what is known and unknown about these relationships. Notwithstanding continuing controversy over the relationship between flow augmentation and salmon survival, the best available scientific knowledge shows the reasonableness of concluding that the relationship is positive.

Considering the data and information presented by the fish and wildlife agencies and Indian tribes and others in the current amendment process, the independent scientific review conducted by Dr. Cada, the extensive scientific work that support the mainstem hypotheses, and giving due weight to the authorities, expertise and rights of the agencies and tribes, the Council accepts the agencies' and tribes' judgment on the expected biological value of the recommended objectives, concludes that this judgment is supported by the best available scientific knowledge, and concludes that the recommended flow/velocity targets would protect, mitigate and enhance fish and wildlife.

The Council does not accept these judgments conclusively, however. As the mainstem hypotheses show, the scientific data are not clear, and there are genuine disagreements among capable scientists on these matters. The region must evaluate the biological assumptions that underlie these operations to see if they achieve the expected biological benefits. One of the central purposes of the Mainstem Hypotheses section of the program is to focus research on critical aspects of these relationships. Similarly, in the current amendment process the Council calls for a multi-year evaluation of the relative survival benefits of flow/velocity versus transportation, probably the single most critical issue surrounding efforts to protect juvenile migrants from the effects of the dams. As new information emerges, the region must be prepared to adjust these operational objectives.

The Council rejected the recommendation to incorporate the targets into firm power planning because analysis indicated that it could take another 11 million acre feet of water above the volume called for in the Strategy for Salmon to meet the flow targets. Producing the volume of water needed to meet the flow targets from upriver storage would not allow the system to operate pursuant to the integrated rule curves called for to protect resident fish at Hungry Horse and Libby, as recommended by the Montana Department of Fish, Wildlife and Parks and supported by a number of upper river tribes, by CBFWA in its comments and by people and groups in Montana. This level of flow augmentation also would not allow the system to prevent significant degradation of nutrient retention times at Grand Coulee, as supported by upper river tribes and by CBFWA in its comments. The analysis of Option 4 in Appendix B, attached to the Council's draft amendments (document 94-47) shows these effects. After considering the concerns expressed by the Upper Columbia United Tribes, the Council consulted with the Columbia Basin Fish and Wildlife Authority, which said that the upper and lower basin fish and wildlife agencies and tribes plan to discuss tradeoffs between flow targets for salmon and steelhead and reservoir levels for resident fish in storage reservoirs, and will report to the Council in February and March, 1995. The Council committed to review both the Columbia River targets and the Grand Coulee nutrient retention standard after receiving the Authority's report.

Finally, the Council's analysis showed that if the system were operated solely to meet anadromous fish flow objectives, refill impacts would be enormous (see analysis of Option 4 in Appendix B, attached to the Council's draft amendments, document 94-47). The resulting reservoir levels would have serious implications for resident fish and wildlife, greatly exacerbating the problems the upriver tribes and fish and wildlife agencies already foresee.

In view of these factors, the Council concluded that the adopted measure was a more effective way to protect anadromous fish, resident fish and wildlife, 16 U.S.C. § 839b(h)(7)(C), and a better way to complement the activities of the fish and wildlife agencies and Indian tribes who intend to address upriver-downriver tradeoffs further in early 1995, 16 U.S.C. § 839b(h)(6)(A) Regarding the potential impacts on the region's power supply, see Section 1, the introduction to Section 5, and Appendices B and C (hydropower costs and impacts analysis and the analysis of "Assuring an Adequate, Efficient, Economical, and Reliable Power Supply and the Ability to Carry Out Other Purposes of the Power Act"). The biological benefits of the Council's measures are summarized in Appendix D, "Staff Analysis of Biological Benefits of Mainstem Passage Actions."

Aware of the difficulty of meeting the flow objectives by flow augmentation alone, the Council also called (in Sections 5.4C and 5.4D) for the drawdown of the John Day reservoir to minimum operating pool, for an evaluation of a further drawdown of that reservoir, and for an evaluation of the possibility of other velocity improvements in the system (discussed below in the findings on what was Section 5.6 of the original 1994 program). The Council also adopted in Section 5.6D.5 the recommendation calling for negotiations with Canada to secure additional water for flow augmentation. The Council did not specify a particular amount, but clearly, the more water can be obtained to help meet mainstem flow/velocity objectives and alleviate refill concerns and benefit resident fish populations in storage reservoirs, the better. In response to the UCUTs' suggestion that a portion of this water be specifically dedicated to maintaining nutrient retention times, the Council suggests that this matter be taken up in the discussions between upper and lower basin fish and wildlife agencies and tribes concerning potential tradeoffs between anadromous and resident species. At that time, the nature of any such tradeoffs should be clearer, as should the need for such remedies.

The Council adopted CRITFC's recommended minimum flow target of 120 kcfs at The Dalles during September.

In response to the comment from the Douglas County PUD, the Council's flow/velocity objectives for the Columbia are specified in bi-weekly periods. Accordingly, these flow provisions should not be construed to constrain daily load following operations.

The Council also concludes that no party has recommended less costly alternative measures to achieve the Council's flow/velocity objectives.

Program Section(s): 5.3A.3 (Columbia River flows/runoff forecast at The Dalles)
Source: Confederated Salish and Kootenai Tribes
Recommendation No.: 5-5

Recommendation: Revise Section 5.3A.3 so that storage volumes and flow targets in the Columbia are based on the forecasted runoff volume at Grand Coulee, not The Dalles, to protect flows and reservoir levels in upper Columbia.

Draft: In the draft, the recommendation was proposed as an alternative Section 5.3A.3 in the general Section 5 amendments.

Findings: This recommendation is designed to ensure that the Columbia River is not called on to contribute water to make up for drought or other flow shortfalls in the Snake River. The Confederated Salish and Kootenai Tribes are concerned about impacts on Hungry Horse and Libby reservoirs. The Council staff's

analysis indicates, however, that the result would be to decrease by approximately 85 percent the amount of stored water that could be used for Columbia River flow augmentation for anadromous species in below average water years. The Columbia Basin Fish and Wildlife Authority is facilitating discussions between the upper and lower Basin fish and wildlife agencies and tribes to address this very subject. The Authority expects that those discussions will be completed by next spring. In the meantime, the Council adopted integrated rule curves to protect resident fish and wildlife in Libby and Hungry Horse reservoirs, and a nutrient retention time standard to protect resident fish and wildlife at Grand Coulee. The Council finds that these measures are a more effective way to protect salmon, resident fish and wildlife than the recommended measure, 16 U.S.C. § 839b(h)(7)(C), and to complement the activities of the fish and wildlife agencies and tribes, 16 U.S.C. § 839b(h)(6)(A).

Program Section(s): 5.3B.1 (Columbia summer flows/non-treaty storage)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Delete the text of Section 5.3B.1, which calls for the use of non-treaty storage water in July and August in below-average water years. Replace with a call to evaluate the relationship in July and August between “water temperature, fish size, flow, and survival of subyearling salmon,” and the relationship between temperature and survival of returning adults. PNUCC requests a similar alteration of Section 5.3B.2.

Draft: The draft did not propose to adopt this measure.

Findings: The mainstem hypotheses section of the program provides a framework for addressing the questions raised by the recommendation. Deleting the non-treaty storage measure could only be expected to provide less water for summer flow augmentation and for such evaluations. As such, it would not protect, mitigate or enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(A), and the Council rejected it.

Program Section(s): 5.3B.2 (Columbia summer flows/energy exchanges)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Revise Section 5.3B.2 to state that BPA will seek energy exchanges and other energy alternatives that have a potential for “shaping” (not “increasing”) summer Columbia flows, for the purpose only of facilitating the evaluations of the effects of water temperatures on juvenile fall chinook and returning adult salmon (and no longer also for the purpose of increasing survival of summer migrants).

Draft: The draft did not propose to adopt this measure.

Findings: The Council calls for measures that would increase Columbia River flows in the spring and summer, including through different operations at Grand Coulee and negotiations with Canada regarding their large storage reservoirs. By the same token, energy exchanges and other energy alternatives have the potential for increasing Columbia River flows if needed to meet the Council’s objectives. All will be evaluated as they are implemented. Accordingly, the Council rejected the recommendation because it would not protect, mitigate or enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(A).

SECTION 5.5: DEVELOP, DEMONSTRATE AND IMPLEMENT SNAKE RIVER RESERVOIR DRAWDOWN STRATEGY²

Program Section(s): 5.5 (Snake River drawdown)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-10

Recommendation: Delete almost all of Section 5.5 and replace with a re-focused, specific Snake River drawdown implementation program, as follows:

Section 5.5: Change the title of Section 5.5 [now Section 5.3] to "Implementation of the Snake River Reservoir Drawdown Strategy." Delete introductory paragraph and replace with three that highlight Idaho's phased approach: Snake reservoir drawdown to increase river velocities and survival; drawdown of Lower Granite in 1995 to spillway crest will provide "essential biological data necessary for a long-term commitment" to Snake drawdown strategy; Corps to "initiate measures in support of Lower Granite drawdown immediately;" Lower Granite drawdown is not to be a one-time test but instead "first stage of an adaptive management plan;" knowledge gained to be used to implement "more effective" 1998 drawdown of Little Goose; information gained from 1998 drawdown to be used for 2002 drawdown at all four; biological objective is a river velocity equivalent of 140 kcfs in all but low flow years; adaptive management also necessary for each stage because "it is possible some of the central components of ultimate drawdown strategy" will not be completed in time for Lower Granite drawdown; Council instructs Corps to mitigate any possible negative impacts to salmon "resulting from any element of drawdown strategy being incomplete;" Corps cannot avoid or delay implementation schedule "merely because" an element of the ultimate drawdown strategy is not complete.

Sections 5.5C.1: Delete Section 5.5C.1 (concerning development of interim plans and implementation schedule) and replace with the heart of Idaho's phased implementation plan, broken into three stages, as follows:

Lower Granite drawdown: The Corps, in consultation with fishery managers of Snake basin, is to implement drawdown to spillway crest at Lower Granite from April 15 to at least June 15, starting in 1995 and continuing thereafter. BPA is to fund the modifications necessary for the drawdown. The 1995 drawdown is contingent on the manufacture of dipping baskets capable of handling the smolts that enter the gatewells and the establishment of operational conditions in which the number of smolts will not overwhelm the dipping basket system. The Lower Granite drawdown is to contain the following elements: (1) fishery managers will develop a spill management and monitoring plan for use by the Corps in conjunction with the drawdown to provide 80 percent FPE while providing acceptable adult passage conditions and controlling dissolved gas levels; (2) the Corps is to extend auxiliary water pumps for the adult fish ladders to permit a maximum drawdown to elevation 690; and (3) the Corps will commence refill on or about June 1, minimizing impacts on June flows by shifting a portion of the spring water budget to June. If the dipping baskets are not capable of handling fish in gatewells "or if insurmountable obstacles preclude implementation" of the three elements noted, the Corps is to take immediate action to ensure that a 1996 drawdown can be implemented; the 1996 drawdown should incorporate a lift-tank system to get fish from gatewells.

Lower Granite and Little Goose drawdown: The Corps, in consultation with fishery managers of Snake basin, is to complete modifications to Lower Granite and Little Goose by 1998, including installing either lift tanks or improved dip net baskets or a combination at Lower Granite and "rock weirs on the

² **Note:** This section of the original 1994 Fish and Wildlife Program -- concerning the Snake River drawdown strategy -- has been renumbered Section 5.3 in the amended program.

downstream sides of Lower Granite and Little Goose.” When completed, in consultation with fishery managers of Snake basin, implement drawdown to spillway crest at Lower Granite and Little Goose from April 15 to at least June 15, starting in 1998 and continuing thereafter. BPA is to fund the modifications necessary for the drawdown. The two-pool drawdown is to be consistent with the fishery managers' spill management and monitoring plan.

Lower Snake River drawdown: Based on information gained from the drawdowns of Lower Granite and Little Goose, the Corps is to implement drawdown of all four by 2002. BPA is to fund the modifications necessary for the drawdown. The full lower Snake drawdown is also to be consistent with the fishery managers' spill management and monitoring plan.

Monitoring: Beginning in 1996, the fishery managers are to develop a monitoring program for the Corps to implement to determine whether the drawdowns reduce travel time and sustain an 80 percent FPE rate.

Surface collection: By 1996 the Corps is to develop prototypes for surface guidance and collection of smolts.

Mitigation: The Corps is to develop a mitigation plan to assist “local property owners” in mitigating impacts to buildings, facilities and roads from each stage of the Snake drawdown. Corps is to submit plan to Council no later than two months prior to beginning of Lower Granite drawdown and submit similar plans prior to each subsequent drawdown.

Section 5.5C.3: Revise to call for only the Council (not Council, BPA, Corps and Bureau) to establish a committee to coordinate analyses and oversee development of plans and drawdown actions.

Section 5.5C.4: Revise to state that BPA will fund the coordination and oversight committee established by the Council “based upon a scope of work approved by the Council no later than two months following the adoption of this rule.”

Section 5.5C.7: Delete Section 5.5C.7, which calls for Congress and the Corps to authorize and evaluate dredging to maintain navigation channel.

Draft: The recommendation was included in Option 3 of the draft amendments, Lower Snake Drawdown.

Comments: Drawdown recommendations raise again the same flow/velocity/survival issues already discussed above in Section 5.0E, Mainstem Hypotheses, in the response to comments for the hypotheses rulemaking, and in the findings for Sections 5, 5.2 and 5.3. Drawdown proposals also present additional issues explored in the comments.

Idaho stated that several analyses, including the Council staff's, show that drawdowns have real potential to rebuild Snake River stocks. The Corps' cost estimates and timelines are too high and long; cost and construction time estimates by others have been much less. A one pool drawdown in 1995 will yield valuable information on a number of points, particularly on dam passage, although not on reservoir survival. In response to opponents of drawdowns, IDFG makes the following points: (1) There is no evidence that drawdowns will concentrate predators; in fact, SOR and other Corps documents show that drawdowns will reduce resident fish populations, including squawfish; moreover, spill will disperse predator populations; (2) dissolved gas levels can be controlled by dividing flows between the powerhouse and spillway; and (3) there is no evidence that changes in the food chain caused by drawdown will affect migrating smolts. Idaho noted

that Option 3 would delay drawdown of all four pools until 2002; earlier drawdowns at Lower Granite and Little Goose are possible; and more immediate measures such as are included in Option 5 (Idaho Rivers' recommendation for a 1995 spillway-crest drawdown of all four reservoirs) may be needed. IDFG recommended a 2-month drawdown rather than a 5-month drawdown; IDWR supports only an April 15-June 15 near-spillway drawdown.

Idaho also said that Option 5 correctly characterizes the nature of the emergency, although it raises serious implementation problems for 1995, especially problems with extracting smolts from gatewells and interrupting the water supply for Lyons Ferry Hatchery and other uses. Option 5 should receive priority attention for 1996 and after; the adult trap-and-haul strategy merits careful attention, and should be tested in 1995 to see if it reduces adult mortality between dams. Idaho also submitted comments and reports on the costs of drawdown and the comparative cost-effectiveness of drawdown and flow augmentation.

CBFWA called for implementation of a 4-pool drawdown by 2002, using an adaptive management strategy leading to one of two options: (1) natural river drawdown without dam modification, reconfiguring the river channel; or (2) drawdown to spillway crest and structural modification of the dams. Complete the engineering, biological and economic assessments in 1995 and implement an alternative in 1996. The fish managers should develop a monitoring program to determine whether drawdowns reduce fish travel time and sustain an 80 percent passage efficiency rate. William Stelle, Regional Director of NMFS, said that drawdowns could be an important tool in recovery, and urged the Council to continue to plan and design changes in dams to accommodate drawdowns long term. The Shoshone-Bannock Tribes supported quick implementation of lower Snake River drawdowns and John Day to spillway crest drawdown, as interim steps to control sedimentation and as a first step toward further drawdowns to natural river levels. With natural river levels in the Snake the mudflats that would be exposed as the reservoirs dropped, but eventually they would be revegetated and a new, healthy riparian habitat would develop. The Columbia River Inter-Tribal Fish Commission (CRITFC) supported the CBFWA comments generally, but also stated that while CBFWA calls for "an immediate choice between natural river (dam breach) and spillway crest drawdown," CRITFC "does not believe that these choices are mutually exclusive."

The Save Our Wild Salmon coalition supported expedited implementation of the lower Snake reservoir drawdown, starting at Lower Granite Dam. Hundreds of individuals sent cards, letters and petitions to the Council urging the same.

Idaho Power said that the only compelling flow/survival data for Snake River juvenile migrants is that from the high flow years of 1983 and 1984. In those years, nature provided flows above 140,000 cubic feet per second at Lower Granite Dam, and because of the high flows, most fish were spilled past the hydro projects instead of being barged. The result were high returns for the 1983 and 1984 outmigrations. The only way to duplicate 1984 flow and migration conditions, with the same river velocities and method of dam passage for the fish, would be to draw down the Lower Snake projects and spill the fish past them. Flow augmentation has failed because it has not been able to provide similar conditions to the high flows observed in 1983 and 1984.

The Washington Department of Fish and Wildlife urged the Council to continue to explore the feasibility of spillway crest drawdowns in the lower Snake River and the natural river scenario. WDFW urged the Council not to make a decision at this time that forecloses any survival options. Flow augmentation, drawdowns, and increased survival with spill and improved bypass systems as elements of long-term survival improvements will take years to evaluate and implement fully and all are associated with significant uncertainties. Transportation remains appropriate, too, and the "region should embark on an aggressive, adaptive based approach, developing the capabilities to quickly implement each of the major alternatives while systematically evaluating the critical uncertainties." "The Council should combine this

recommendation with the draft elements regarding program oversight listed under Section 5.02 of Option 2.” The Washington Dept. of Transportation said that if drawdowns take place, it “strongly supports” mitigation plans to address direct and secondary impacts to physical facilities.

The DSIs said that the Council’s assumptions for passage survival in the presence of drawdown are inadequately explained, and appear to represent no more than rank speculation that is contrary to recent data on reservoir survival. Western Montana Electric G & T urged the Council to drop drawdowns because the UW/NMFS data says reservoir mortality is less than supposed. The Columbia River Alliance commented that Snake River drawdowns, even full reservoir drawdowns, will not exceed the survival rate benefits from the transportation program. Chelan County PUD objected to the four pool Snake drawdown on the grounds that it will cause major ecosystem disruption, placing at risk all adult salmon as well as juveniles.

PNGC and PNUCC commented that the Council should follow the Snake River Recovery Team’s approach to Snake River drawdown, which PNGC summarized as follows: (1) collect baseline smolt data at Lower Granite Reservoir for 1995-97; (2) if baseline data indicate that drawdown could significantly increase smolt survival such that the risks and costs are justified, design a biological test of Lower Granite Reservoir drawdown; (3) only if a scientifically sound biological test can be designed and conducted, should a test be implemented. In the meantime the region should continue the Salmon Strategy flows and not alter operations without more information on survival benefits. Council should also “maintain existing navigation system.”

The Port of Portland opposed drawdowns as threatening to disrupt shipping and navigation along entire river system, and with no compelling evidence they will work. The Port said that no assessment has been made of these costs over the long term. The 1992 drawdown test cost shippers \$150,000 per month to ship through Seattle instead of Portland; this could cost Portland, and possibly the whole Pacific Northwest, European and other national markets. Trucking goods is not a viable alternative due to unwanted increase in truck traffic in the Gorge’s scenic area; similarly, additional use of rails would overburden existing rail system; both trucks and rails add more pollution, also, and are less efficient means of transportation. The Council should not adopt drawdowns without a clear case that drawdowns will provide measurable biological benefits, with a clear discussion of impacts on transportation and a plan to mitigate those impacts. The Port added that time periods for drawdown are not realistic; analyses should recognize that with drawdown and refill time, a 2 1/2-month drawdown is really 80 to 125 days, while a 4 1/2-month drawdown stretches to nearly nine months.

The Corps provided only limited comment on Snake River drawdowns. They said that “[d]rawdown has not been scientifically shown to increase fish survival;” that they are unaware of any evidence that supports the drawdown of Lower Granite to benefit fall chinook spawning and rearing; and that drawdown of any Snake reservoirs to spillway by April 1995 is not possible; 1997 would be more realistic.

Mark Reller, Montana representative, said that options that call for drawdowns in lower Snake will reduce the amount of water needed in the Snake to reach flow targets, which means an increased demand on the upper Columbia projects to meet lower Columbia flow targets.

Findings: The Council largely adopted Idaho’s recommendation, in an amended Snake River drawdown section renumbered as Section 5.3. The rationale supporting the recommendation is based on several considerations cited by the fish and wildlife agencies and tribes, and is similar to that discussed in connection with Snake River water volume recommendations, discussed in the findings for Section 5.2. First, the fish and wildlife managers assert that anadromous fish evolved to survive in a natural river environment. Taking steps such as drawdown to move toward natural river conditions can be expected to improve anadromous fish survival on the theory that these fish will survive best in conditions that resemble those in which they evolved. By the same token, they contend, moving toward a swift-flowing river can be expected to

provide a less hospitable habitat for predators, primarily resident fish that adapt well to slow moving, warmer reservoirs, as well as reduced time of exposure to the predators and to warm waters. Especially in the spring, the fish managers say, moving fish down the river faster should allow them to arrive at the estuary and ocean earlier, when environmental conditions are expected to be better, and limit their exposure to predators and other sources of mortality in the reservoirs.

The Council recognizes that there is risk in the drawdown proposals, but the risks are fairly evenly balanced. Commenters point out that there is risk that drawdowns will actually concentrate predators and improve their ability to prey on anadromous fish. However, if that were true, higher pool levels could be expected to reduce predation by dispersing predators, which runs counter to experience. It is at least as likely that higher velocities caused by lower pool levels will reduce exposure to predators and reduce predation overall. It is also possible that drawdowns will be less effective than barge transportation, equally effective, or, as the fish managers suggest, more effective. Without comparative data, we cannot know.

It is true that recent studies of reservoir survival in the top two Snake River reservoirs indicate that survival in those two reservoirs may be higher than previously believed. However, these data do not resolve these issues. As Idaho Fish and Game point out, no report of those studies has been released, and so few parties have had an opportunity to evaluate them. The two weeks of data collection in 1993 was a pilot study only and "not a reliable estimate of reservoir survival." The 1993 Little Goose survival study "showed reservoir mortality for the hatchery release groups within the range estimated in the Sims and Ossiander study," which are the data that undergird much of the case for flow augmentation supported by the fishery managers. Questions have been raised about the accuracy of the study that cannot be answered until a report is released-- e.g., the choice of FGE assumptions at Lower Granite Dam and the sampling methods. Finally, the studies do not even attempt to evaluate the cumulative mortality effects of migration delay through the system. As Idaho said, "[m]any of the problems associated with delayed migration time are cumulative in nature, such as increased stress due to extended migration time and poor fish condition at the time of saltwater entry."

None of these risk factors -- the potential effects on predators, the comparative merits of drawdowns and transportation, or the ultimate message of the studies of Lower Granite and Little Goose pools -- is quantifiable at present, and the question ultimately requires an exercise of judgment. The Council has exercised its judgment giving due weight to the expertise, authorities and legal rights of the fish and wildlife agencies and tribes, and determined that the drawdown recommendation will protect anadromous fish, is supported by the best available scientific knowledge, and otherwise is consistent with Sections 4(h)(5) and (6) of the Northwest Power Act.

However, based on the comments of the Washington Department of Fish and Wildlife and others, the Council also concluded that the relative merits of transportation and flow/velocity augmentation are sufficiently unclear that the region should conduct an evaluation of transportation and flow/velocity augmentation, as well as other options, in order to improve the available scientific knowledge. The nature of this critical evaluation is described in Section 5.0. This can take place even while drawdowns are proceeding. In this way the risks discussed above can be managed, if not altogether avoided.

Including Snake River drawdowns in the combination of spring measures has the additional benefit of allowing the spring flow/velocity equivalent in the Snake River to be achieved with less water out of Dworshak reservoir (and elsewhere) than without drawdowns. This should allow the fish managers to use more Dworshak water for summer juvenile migrants and summer and fall adult migrants.

Regarding drawdown costs, the Council contracted with the Environmental Defense Fund to evaluate the cost-effectiveness of various ways to increase water particle travel time in the Snake and Columbia

Rivers. This evaluation, which is in the record, indicated that water leasing and land following alternatives, which are endorsed elsewhere in the program, are the most cost-effective ways to achieve these objectives. Other analysis indicates, however, that the amount of water that these alternatives can be expected to contribute is to a large extent speculative, and hinges on legal and political matters, and the development of a water market that is only in its infancy. To account for the risk that this water may not be secured, it is prudent to put other options in place. One option is Galloway dam, which EDF believes to be relatively cost-effective, but which cannot be counted on for a major contribution to flows. Beyond this, drawdowns, at various levels and for various lengths of time (short of natural river drawdowns), appear to be the next most cost-effective strategy. Actual costs and construction times (which have an important effect on costs) have been estimated, and appear to be significantly less costly than the remaining options. Within this frame of reference, the Council finds the adopted drawdown strategy to satisfy the requirements of Section 4(h)(6)(C) of the Act.

The adopted measure differs from the recommendation in two respects. First, the recommendation was for Lower Granite to be lowered to spillway crest beginning in 1995, while the adopted measure calls for lowering to elevation 710 feet in 1995, and to elevation 690 (spillway crest) in 1996. The record showed that adult ladder modifications and other changes probably cannot be completed in time for a 1995 drawdown to spillway crest. Second, the recommendation proposed a 1998 drawdown of Little Goose. The record shows that 1998 is probably unachievable even if the Corps were to embark on engineering, NEPA and related work now. Third, the recommendation was to approve drawdown of all four Snake projects now. The Council added explicit checkpoints at which information should be reviewed. This merely makes explicit what is implicit: as experience with drawdowns is gained, the region may wish to make additional decisions. For these reasons, the Council concluded that the adopted measure is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C).

The Council recognized the possibility that undue burdens would be imposed on shippers, and called for mitigation of those impacts.

The Council appreciates that the Recovery Team's report takes a more cautious approach to drawdowns. The Council concluded that the team's report, however, does not supply strong enough reasons for rejecting this recommendation.

As noted above, the Council acknowledges the possibility that Snake River drawdowns will reduce the amount of water needed in the Snake to reach flow targets. The Council also acknowledges that this may increase demand on the upper Columbia projects to meet lower Columbia flow targets. However, the Council has adopted other measures that are intended protect resident fish and wildlife at the upper Columbia projects and yet try to meet the flow targets, including integrated rule curves, a constraint on nutrient retention time reductions, the drawdown of the John Day project to minimum operating pool, and evaluation of other flow/velocity augmentation opportunities, all of which could help relieve pressures on the upper Columbia projects.

Program Section(s): 5.5 (Snake River drawdown)
Source: ODFW
Recommendation No.: 5-8

Recommendation: In 1994-95, operate all Snake reservoirs within one foot of MOP April 15 to December 1. By 1996 complete necessary modifications to adult ladder, juvenile bypass, spillway, tailrace, and turbines at Lower Granite to operate in 1996, in a prototype test, at elevation 695 from April 15 to August 31. If test is "successful" annually operate at spillway crest or level necessary level to achieve velocity

equivalent of 140 kcfs (April 16-June 15), 80 kcfs (June 16-July 15) and 50 kcfs (July 16-August 31). Complete modifications of water intakes, boat ramps, and other reservoir affected.

Complete “expeditiously as possible,” necessary ladder, bypass, spillway, tailrace and turbine modifications to operate Little Goose, Lower Monumental and Ice Harbor at spillway crest level. “Two years after successful prototype testing, annually lower” Little Goose to elevation 595, Lower Monumental to 497 and Ice Harbor to 405 from April 15 to August 31 or to achieve velocity equivalents listed in Section 5.2 amendments. Complete modifications of water intakes, boat ramps, and other reservoir affected. If drawdown to spillway crest “proves to be successful,” modify spillways to allow drawdown of Lower Granite to elevation 686, Little Goose to 586, Lower Monumental to 488 and Ice Harbor to 396 and annually drawdown to achieve velocity equivalents.

Draft: The draft amendments did not specifically propose this recommendation, but Option 3, Lower Snake Drawdown, based on IDFG’s recommendation, is similar.

Comments: The comments summarized in connection with IDFG’s drawdown recommendation (5-10) apply equally to this recommendation.

Findings: The Council largely adopted the recommendation, for the reasons given in connection with IDFG drawdown recommendation.

Program Section(s): 5.5 (Snake River drawdown)
Source: Natural Resources Defense Council, et al.
Recommendation No.: 5-4

Recommendation: By March 1995, the Corps should complete modifications to allow Lower Granite drawdown to near spillway crest, including extensions of emergency exit and pumps of adult fish ladder, installation of gatewell lift-tanks or dip nets, mitigation for other facilities, and resolution of tribal cultural issues. Operate at near spillway crest from April 15 to at least June 15 in 1995; spill to attain 80 percent FPE but not to exceed nitrogen supersaturation standards set by Fish Passage Center; BPA to reimburse Corps for permanent repairs to physical damage.

By March 1996, Corps to complete modifications at Little Goose to allow drawdown to near spillway crest, including extensions of emergency exit and pumps of adult fish ladder, installation of gatewell lift-tanks, dip nets, forebay surface-oriented collectors and/or baffles on spillway gates, mitigation for other facilities, and resolution of tribal cultural issues. Also complete modifications of Lower Granite necessary to allow Little Goose drawdown, including construction of rock weirs to provide passage to adult ladder entrance. In 1996 and 1997 operate both Lower Granite and Little Goose at near spillway crest from April 15 to at least June 15; BPA to reimburse Corps for permanent repairs; and Fish Passage Center to develop, and Corps and NMFS to implement, monitoring program to assess whether these measures reduce travel time and sustain 80 percent FPE; Corps to maintain in fully operational condition PIT-tag detectors.

Following “successful drawdowns” in 1995 and 1996, Corps to immediately begin modifications at Little Goose, Lower Monumental and Ice Harbor to allow drawdown of all four Snake reservoirs to near spillway crest by April 1, 1998. BPA is also to fund an implementation plan, including engineering designs, timetables and costs, for faster or more extensive drawdown options: (a) emergency drawdown of all four to near spillway crest in 1995 and after, providing juvenile passage with spill and adult passage with trap-and-haul until modification of fish ladders; (b) modifications to operate Lower Granite and Little Goose under

“natural river” option and Lower Monumental and Ice Harbor at near spillway crest; and (c) breaching all four lower Snake dams. The Corps is to complete this plan by December 31, 1994.

Draft: In the draft amendments, this recommendation was most closely reflected in the proposed amendment derived from IDFG’s Snake River drawdown recommendation (Option 3, Lower Snake Drawdown), although the NRDC recommendation called for an earlier four-pool drawdown and there were other differences. The recommendation’s call for a “natural river” option is best reflected in the Option 4 drawdown, Lower Snake Drawdown.

With regard to other issues mentioned, amendments calling for the 1996 installation of juvenile PIT-tag detectors at John Day and Bonneville were proposed as a revised Section 5.7B.2 (and then renumbered as a new Section 5.2B.(2) in Option 2, Adaptive Management Introduction, and as a new Section 5.7B.3 in Option 5, Salmon Funding. A proposed revision of Section.6.1B.6 derived from a PNUCC recommendation called for the installation, if feasible, of adult fish PIT-tag detectors in adult passage facilities at mainstem dams as soon as possible. Proposed amendments concerning spill/passage to 80 percent FPE were proposed independent of the drawdown amendments, and are discussed below.

Comments: The comments summarized in connection with IDFG’s drawdown recommendation (5-10) apply equally to this recommendation. In addition, Idaho commented that the proposal for emergency drawdown, trapping and hauling adults, etc., (contained in Option 5 and some elements of this recommendation) presents serious problems that have to be addressed before it could be implemented, but it correctly characterizes the nature of the emergency.

Findings: The Council largely adopted the main part of the recommendation, for the reasons given in connection with IDFG’s drawdown recommendation. The Council rejected the recommendation for Bonneville to fund a plan for emergency drawdown of all four projects to near spillway crest in 1995 and after, spilling to protect juveniles and trapping and hauling returning adults pending modification of fish ladders. As Idaho noted, this proposal poses serious risks for returning adults, and the Council concluded that the adopted measure is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The Council adopted the recommendation to include in the drawdown implementation plans a plan for modifications to operate Lower Granite and Little Goose at natural river levels, as a possible option for implementation rather than a spillway crest drawdown. The Council will review the natural river option at the checkpoints along the way to implementation. Spillway and natural river level options are also part of the evaluation for Ice Harbor and Lower Monumental reservoirs.

Program Section(s): 5.5 (Snake River drawdown)
Source: Idaho Rivers United
Recommendation No.: 5-6

Recommendation: Idaho Rivers called for an emergency Snake drawdown plan: In 1995 the Corps is to draw down all four Snake reservoirs to near spillway crest by April 15 and maintain at least until June 30; and install pumps to keep adult fish ladder at Ice Harbor in operation in time for drawdown. The objective of the drawdown is to attain a velocity equivalent of 140 kcfs at Lower Granite from April 15 to June 30. If “natural inflow” into the lowered Lower Granite is not sufficient to produce 140 kcfs velocity equivalent, the Corps, Bureau and states are to “provide flow augmentation” to make that flow equivalent. These entities will cooperate in any event to secure approximately 800,000 acre feet to refill the lower Snake reservoirs, refilling Ice Harbor first with successive upstream refills. Idaho Rivers also called for an adult migrant trap-and-haul program at Ice Harbor to transport adults to a release above Lower Granite Dam, due to anticipated problems with the adult passage facilities at the lower Snake reservoirs with a 1995 drawdown. The adult trap and haul proposal is further discussed in the findings for Section 6.1A. Idaho Rivers describes this as an emergency measure for the 1995 migration season. It did not recommend action for future years.

Draft: In the draft amendments, Option 5, Lower Snake Drawdown, Additional Snake River Water and Trap and Haul Adult Migrants, reflected this recommendation.

Comments: Idaho commented that the proposal for emergency drawdown, trapping and hauling adults, etc., (contained in Option 5 and this recommendation) presented serious problems that have to be addressed before it could be implemented, but it correctly characterizes the nature of the emergency. Consultation comments from WDFW emphasized the importance of protecting the wild spring chinook run into the Tucannon River above Lower Monumental Dam, one of the healthier spring chinook populations among the Snake River tributaries. The adult trap and haul proposal that is part of this recommendation presents particular and potentially severe survival problems for the adult fish returning to the Tucannon River, as all the transported adults would be released above Lower Granite Dam, two dams above the Tucannon River.

The Council received hundreds of cards, letters and petitions from individuals supporting this recommendation, as well as numerous letters from individuals and businesses opposing the idea. Idaho Senator Larry Craig said that Option 5 is “imaginative fiction” of which the Council should be “embarrassed.” More important, none of the agencies and tribes supported this recommendation; CBFWA did not include it in the Authority’s program comments.

Findings: While the Council adopted elements of this recommendation for implementation after 1995, for the 1995 migration season the Council adopted measures based primarily on flow augmentation and spill. The Council concluded, on the advice of such parties as Idaho Fish and Game, that the risks of trapping and hauling adults are substantial, especially to the important Tucannon run, even if emergency drawdowns were otherwise feasible, which they do not appear to be. The Council finds the adopted measures are a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C), and better complement the activities of the fish agencies and tribes, 16 U.S.C. § 839b(h)(6)(A), (7)(C).

Program Section(s): 5.5 (Snake River drawdown)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: In the middle of CRITFC's recommendations concerning structural improvements to bypass systems, CRITFC also called for the Corps to investigate, by 1997, drawdown to spillway crest and dam breaching at Ice Harbor, Lower Monumental and Little Goose. At Lower Granite the Corps is to "[i]mmediately drawdown pool to spillway crest," and investigate dam breaching by 1997. CRITFC also calls for an investigation, by 1997, drawdown to spillway crest and dam breaching at Ice Harbor, Lower Monumental and Little Goose. At Lower Granite the Corps is to "[i]mmediately drawdown pool to spillway crest," and investigate dam breaching by 1997.

Draft: In the draft, CRITFC's recommendation for a 1995 drawdown of Lower Granite to spillway crest was best reflected in Option 3, Lower Snake Drawdown and, in part, the Option 5 Lower Snake Drawdown. A natural river drawdown option is proposed in Option 4, Lower Snake Drawdown.

Findings: The Council adopted the recommendation for drawdown to spillway crest at Lower Monumental and Little Goose, but rejected the recommendation to immediately lower the Lower Granite pool to spillway crest. The adopted measure calls for lowering Lower Granite to elevation 710 feet in 1995, and to elevation 690 (spillway crest) in 1996. The record showed that adult ladder modifications and other changes probably cannot be completed in time for a 1995 drawdown to spillway crest. Accordingly, the Council finds that the adopted measure is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). In the planning process for the drawdowns, the Council called for an investigation of the option of operating the four lower Snake pools at natural river level. The Council calls for a review of the region's experience with drawdowns prior to 2002, and, depending on what that review shows, drawdown of Ice Harbor and Lower Monumental. Earlier drawdown of those two reservoirs is not practical. It would also preclude the in-river/transportation evaluation, in Section 5.0, and the phased-in evaluation of the biological value of drawdowns, in Section 5.3, both of which are essential elements in the Council's risk management strategy. And the Council's course of action does complement the recommendations and comments of state fishery agencies such as IDFG and WDFW, and appears to be consistent with the views expressed by NMFS. For these reasons, the Council concluded that proceeding with this evaluation process and risk management strategy is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.5A (develop Snake drawdown strategy)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 5.5A to "further define and make the public aware of" what the Council means by "structurally or economically infeasible, biologically imprudent or inconsistent with Sections 4(h)(5)-(7)." Also revise to reflect current situation: Corps has established no date for drawdown implementation and has no plans for drawdown test in 1995; additional testing and research is necessary because there is little information available on biological effectiveness of drawdown and 1993 and 1994 NMFS survival research indicates high survival through Lower Granite pool; no biological drawdown test has been identified that will provide needed information.

Draft: This recommendation was reflected in the PNUCC-based Option 1, Drawdown.

Findings: The Council rejected this recommendation based on its findings that the drawdown strategy the Council adopted is a more effective way to protect, mitigate and enhance fish and wildlife, 16

U.S.C. § 839b(h)(7)(C). The Council's reasoning is given in the findings on IDFG's drawdown recommendation (5-10), above.

Program Section(s): 5.5 (Snake River drawdown strategy)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Delete all of Section 5.5 and replace with a simple paragraph concerning "preparatory steps to a reservoir drawdown testing program." Consideration of a drawdown program cannot begin until results are obtained from research projects collecting "accurate survival data regarding juvenile passage" and evaluating "the relationship (if any) of flow and water velocity to travel time and survival" of juveniles. A drawdown test may be considered once accurate baseline data is in, but only if the research demonstrates a correlation between flows/velocity/travel time and survival. Even then a drawdown test should proceed "only if a scientifically valid, technically sound reservoir drawdown test can be designed." PNUCC intends this paragraph to apply not only to the Snake reservoirs but to John Day as well, see the findings below on recommendations for Section 5.6A of the original 1994 program.

Draft: The recommendation was reflected in the draft amendments in Option 1, Drawdown.

Findings: The Council rejected this recommendation based on its findings that the drawdown strategy the Council adopted is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The Council's reasoning is given in the findings on IDFG's drawdown recommendation (5-10), above.

SECTION 5.6: PURSUE ADDITIONAL MEASURES TO INCREASE SURVIVAL³

Program Section(s): 5.6 (additional measures)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: PNUCC recommended revising the introductory text to Section 5.6 to emphasize that no additional measures -- drawdowns or additional water for augmentation -- should be implemented until proven effective. PNUCC called for the deletion of language stating that additional measures "should begin right away" and setting dates for reports and actions. PNUCC also deleted the language stating that an object of the review process for immediate measures is to "remove impediments to these measures and to implement expeditiously those that achieve rebuilding targets unless they are shown to be structurally or technically infeasible, biologically imprudent, or inconsistent" with the Act. The quoted language would be replaced with language stating that the object of the process is only to identify "future measures. The Council will adopt the measures if they are biologically effective, structurally and economically feasible, and consistent" with the Act.

Draft: In the draft, this recommendation was reflected in Option 1, Additional Flow and Storage.

Findings: The Council rejected this recommendation. The measures the Council adopted are more effective ways to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The Council's

³ **Note:** The provisions in this section of the original 1994 Fish and Wildlife Program have either been deleted or amended and then moved to either Section 5.2 (Snake River flow and velocity) or Section 5.4 (Columbia River flow and velocity) in the amended program.

reasoning is given in the findings above on the Snake River drawdown recommendations, in the findings in this section on the adopted recommendations on the John Day drawdown; in the findings for Section 5.2 concerning additional water from the Snake River Basin, and in the findings in this section concerning new storage in the Snake basin.

Program Section(s): 5.6A (John Day drawdown below minimum irrigation pool)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Delete all of Section 5.6A, with no replacement. PNUCC's explanation indicates clearly that the drawdown evaluation language in PNUCC's replacement Section 5.5 applies to the John Day as well.

Draft: The draft amendments, Option 1, Drawdown, reflected this recommendation.

Findings: The Council rejected this recommendation based on its findings that the John Day drawdown measure the Council adopted is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The Council's reasoning is given in the findings below.

Program Section(s): 5.6A (John Day drawdown)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-10

Recommendation: IDFG recommended that the Council revise Section 5.6A [now Section 5.4C] to call for the Corps and BPA, together with the fishery managers, to implement drawdown of the John Day reservoir to minimum operating pool (MOP) by April 15, 1996. The Corps is to develop a budget by January 1995 to finish design work, extend irrigation pumps, modify passage facilities, move boat ramps and complete mitigation measures; install flip lips on all spillways; and develop a monitoring process to determine whether John Day drawdown reduces predation and travel time. Complete these measures by January 1996 and lower John Day to MOP by April 15 "for duration of the spring migration period." Continue in subsequent years unless drawdowns "would be" structurally or economically infeasible, biologically imprudent or inconsistent with Sections 4(h)(5)-(7) of the Act. IDFG also called on the fishery managers to study, by the end of 1995, the feasibility of lowering John Day to spillway crest, in coordination with the Corps and funded by BPA.

Draft: For the recommendation for a John Day MOP drawdown in 1996, see Option 3, John Day Drawdown to Minimum Operating Pool. A John Day MOP drawdown in 1995 was proposed in Option 2, John Day Drawdown, and Option 5, John Day Drawdown.

The recommendation for a 1995 evaluation of a John Day drawdown to spillway crest was reflected in Options 4 and 5, John Day Spillway Drawdown Evaluation. Option 3, John Day Drawdown to Spillway Evaluation called for evaluation and other actions to allow an implementation decision by the end of 1997. The same proposed amendment was part of Options 2 and 4.

Comments: CBFWA supported the John Day drawdown plan to minimum irrigation pool in 1995, minimum operating pool (MOP) in 1996, April 15-September 30, and by 1998, a complete reconnaissance level analysis of drawdown to spillway crest and natural river level. No member fish agency or tribe objected to the CBFWA position.

CRITFC supported operating the John Day reservoir at the lowest level possible as fast as possible, including a recommendation to evaluate a spillway crest or natural river level drawdown. Among the information submitted by CRITFC was a November 9, 1994, memo from Mal Karr of CRITFC, titled "John Day Reservoir Temperature Regimes." CRITFC summarizes this analysis as a discussion of the "effects of John Day drawdown on temperature regimes in the John Day reservoir," noting that "temperature changes within the reservoir [are] directly dependent upon the time of exposure to heat transfer components." The "analysis concludes that at drawdown to spillway crest, John Day reservoir would be subject to approximately one-fourth of the heat uptake that the reservoir would experience under full pool." The Washington Department of Fish and Wildlife also stated its support for the John Day drawdown to minimum operating pool, and urged the Council to continue to explore the feasibility of spillway crest drawdown. The Yakama Indian Nation and the Confederated Tribes of the Umatilla Indian Reservation supported the CRITFC position on all the flow and drawdown measures, including John Day. The Shoshone-Bannock Tribes stated its support for the spillway and natural river level evaluations of John Day. The Upper Columbia United Tribes and the Colville Confederated Tribes stated that Option 2 was their preferred option out of the mainstem options submitted by the Council for public comment, and a crucial part of Option 2 was the John Day drawdown to MOP with a spillway crest evaluation. The Confederated Salish-Kootenai Tribes stated their support for Options 1 through 3, and Options 2 and 3, again, included the John Day drawdown as a significant element. The environmental groups and many individuals, led by the Save Our Wild Salmon coalition, also called in written testimony and at public hearings, for operation of John Day reservoir at MOP as soon as possible and for the further evaluation of operating at lower levels.

On the other hand, the Douglas County PUD opposed John Day drawdown, saying that the biological benefits and flow/velocity/survival benefits had not been proven. Drawdowns could have adverse effects on mid-Columbia summer/fall chinook rearing and migration "by eliminating the benthic (river bottom) communities and submergent vegetation these fish depend on for food and cover." Drawdowns would also have severe and irrefutable impacts on riparian vegetation and wildlife. PNGC said the biological benefits are unknown since the relationship between smolt survival and flows in the reservoir are unknown; drawdown results in a reduction in water particle travel time of only 0.8 to 1.9 days (8.6 percent) and is not likely to significantly improve smolt survival, while the adverse impacts to adult salmon, wildlife and water supplies are potentially significant. PNGC called instead for smolt survival studies of the reservoir.

The Columbia River Alliance submitted a number comments and analyses objecting to the John Day drawdown to MOP, arguing that it does not have a technical basis and that it would be a meaningless gesture with negative biological impacts, including to the wildlife refuge. The CRA and its allies in the irrigation community submitted a couple of memoranda from their consultant, Darryll Olsen of the Pacific Northwest Project, criticizing the idea of a John Day drawdown to MOP. He said that the Council's consultant Harza, the Corps, the Recovery Team and others were in substantial agreement that John Day drawdown to minimum operating pool provides little or no biological benefit to Snake River or Mid-Columbia salmon, is not a cost-effective alternative, and has significant environmental effects within and along edge of John Day pool. He critiqued a Council staff 1993 analysis, including critical points made in a letter by Don Bevan of the Recovery Team to Council Member Duncan. The CRA also submitted the public record from the Corps' SCS study, which included a large number of letters from people and groups in the agricultural community and connected to the utilities objecting to the John Day drawdown.

The Council received a large number of comments from businesses, public officials and individuals connected to the commercial agricultural community, objecting to the John Day to MOP proposal, in writing and in public hearing testimony. To give some examples, the Council received a proclamation from a Hermiston public hearing signed by 25 mayors, city council members, port officials, electric coop officials, etc. opposing the John Day drawdown. A comment from Bob Hoeffel, consultant for the Oregon Water

Coalition, opposed drawdowns in general and the John Day drawdown in particular on cost and biological grounds, although the OWC stated that “[w]e could even support a degree of drawdown as long as scientific and biological fact show it to provide enough benefit to be cost effective.” C and B Livestock, Inc. emphasized the economic and social costs of John Day drawdown, especially the impact to irrigated agriculture, food processing industry and navigation needs of commercial agriculture. The City of Boardman described possible adverse affects to water quality in John Day pool caused by changes in river operations; main concern is that EPA-required microscopic particulate sampling noted large loss of certain microscopic organisms following changes in operations to increase flows; no data tells yet whether these biota changes will have significant changes on river biology, fish food chain or other characteristics of fish survival, or on human health (Boardman gets water from wells influenced by river). The Oregon Water Resources Department said that studies indicate a John Day drawdown could impact groundwater supplies in adjacent area, and that further study needs to precede any drawdown decision.

Morris Le Fever, a retired USFWS project leader at the Umatilla Wildlife Refuge, described the adverse impact of temporary or permanent John Day drawdown on a wildlife refuge and other riparian habitat and wildlife, due mostly to loss of thousands of acres of riparian/wetland acreage.

As noted in the comments on the Snake River drawdown, the Port of Portland opposed drawdowns as threatening to disrupt shipping and navigation along entire river system, and with no compelling evidence they will work. The Port said that no assessment has been made of these costs over the long term. The 1992 drawdown test cost shippers \$150,000 per month to ship through Seattle instead of Portland; this could cost Portland, and possibly the whole Pacific Northwest, European and other national markets. Trucking goods is not a viable alternative due to unwanted increase in truck traffic in the Gorge’s scenic area; similarly, additional use of rails would overburden existing rail system; both trucks and rails add more pollution, also, and are less efficient means of transportation. The Council should not adopt drawdowns without a clear case that drawdowns will provide measurable biological benefits, with a clear discussion of impacts on transportation and a plan to mitigate those impacts.

The Portland District of the Corps of Engineers suggested discontinuing consideration of operating John Day pool at MOP, based on “available information to date regarding flow/survival relationships in general, biological research in John Day pool and elsewhere, model studies, and appreciation for the small change in water travel time afforded by the proposed operation.” Benefits would be marginal, at best, for yearling migrants and would likely be outweighed by the negative impacts to subyearling migrants due to shallow rearing habitat losses, increased predation, and other negative impacts to resident fish and wildlife. At worst, the John Day drawdown could actually harm the migrants, especially the subyearling migrants, “due to shallow water rearing habitat losses, potential predator competition, and adverse effects associated with poorer passage survival at McNary and John Day projects.” Also, the immediate strategy for listed stocks, absent significant immediate drawdowns on the Snake, must include transport, particularly during lower-than-average flow conditions, yet with Snake River and McNary transport, almost none of the listed stocks would encounter John Day, making any minimal benefits irrelevant. If listed stocks are returned to the river under a spread-the-risk policy, John Day MOP operation would provide only a marginal benefit and because of the negative impacts discussed above, the Corps believes that such a strategy would be ill-advised. John Day operation at MOP does not warrant the significant effort and resources that it would require; the alternative of a John Day drawdown could be brought back later if warranted by flow/survival studies. The Corps also suggested deferring any study and consideration of spillway crest drawdowns while flow/survival studies continue. If pursued, it must include critical studies of flow/survival in John Day pool.

Several commenters pointed out that both Harza and the Snake River Recovery Team found the travel time benefits of the drawdown of John Day to MOP to be too small to justify the expense.

Findings: Revised and renumbered as Section 5.4C, the Council adopted the recommendation to operate John Day at minimum operating pool in 1995, conditioned on full, prior mitigation to affected reservoir water users, and allowing load-following operations outside the fish migration season if needed and unavailable at other projects. The Council also adopted the recommendation to evaluate operation of the project at spillway crest.

The Council's analyses showed that a drawdown from the present minimum irrigation pool levels to minimum operating pool results in water particle travel time reductions of between 0.8 and 1.9 days in the John Day pool alone during the May through August period. In the pool itself, the relative change in water particle travel time is reduced about 14 to 17 percent. This analysis indicates that to achieve a similar reduction in water particle travel time to benefit Snake River migrants as the John Day drawdown to MOP from minimum irrigation pool would require an additional release of about 3.1 million acre-feet of water from upstream storage projects. This volume would be in addition to both the existing 3.45 million acre feet water budget and 3.0 million acre feet operational volumes called for in the Strategy for Salmon. This additional 3.1 million acre feet volume (note that this volume probably cannot feasibly be stored in U. S. facilities, but might be secured from Canadian storage facilities), would also result in additional water particle travel time benefits for mid-Columbia stocks through the mid-Columbia reach of between 0.6 and 1.1 days, while benefiting both Columbia and Snake stocks through the lower Columbia reach by between 0.8 and 1.9 days, as noted above.

To put these travel time benefits into perspective, every small increment in travel time improvement can translate into significant improvements in smolt survival. This is particularly true in the John Day reservoir, which is the longest pool on the mainstem Snake or Columbia rivers (76-miles long) and a noted fish killer. Reiman et al. (1989) estimated, based on their research, that predators in the John Day pool consume an average of 1.9 to 3.3 million juvenile salmon each year. This figure represents between 9-19 percent of estimated number of juvenile salmon entering the reservoir. So, even small reductions in travel time can reduce the smolts' exposure to large numbers of predator species present in the John Day pool, including squawfish and introduced species such as walleye, smallmouth bass, and channel catfish. For example, Reiman estimated that approximately 20,000 and 30,000 chinook smolts are consumed each day in the John Day pool during the months of May and August, respectively.

Benefits from this strategy are higher if fewer fish are transported. Transported fish are removed from the river so that faster flows do not benefit them. The Council's spread-the-risk approach to transportation increases in-river migration and decreases transportation, and thus make measures such as the John Day drawdown that much more important in improving in-river conditions. In addition, John Day drawdown is one of the few in-river improvements the region can make without itself impacting the transportation program. Unlike Snake River drawdowns, transportation can remain fully operational with John Day at minimum operating pool.

Other advantages obtained by the John Day drawdown, as with the Snake River drawdown, stem from the fact that less water is required from up-river storage to meet the spring flow objectives in the lower river. This makes it easier to satisfy the two other biological demands on that water -- flows for summer salmon migrants, and higher reservoir levels in upper river reservoirs to protect resident fish.

For these reasons, and giving due weight to the expertise, authorities and rights of the fish and wildlife agencies and Indian tribes, which approached true consensus on this issue, the Council concluded that operating John Day at minimum operating pool would protect, mitigate and enhance fish and wildlife.

Operating John Day at minimum operating pool can affect the power system's energy capacity, and the Council considered the effect this proposal could have on the adequacy, efficiency, economy and

reliability of the region's power supply. The Corps recently estimated costs for both a 4-month and 12-month John Day pool drawdown at \$65 million and \$99 million, respectively. These costs are October 1992 price level and do not include inflation. Major project cost items include mitigation for impacts to adult fish passage facilities, wildlife habitat, recreation sites, irrigation pump stations, the City of Umatilla's treated sewage effluent outfall pipe and hatchery water supplies. Economic impacts for proposed drawdown operation are substantially derived from lost hydropower generation. The Corps estimates that, for a 4-month drawdown, this loss could be about \$3.8 million annually. For the year-round option, the cost estimate is \$12.3 million. The Corps estimated total average annual costs are nearly \$11 and \$24 million, respectively, for the 4-month and 12-month drawdowns. These annual costs include amortized project and interest during construction, annual O & M, and annual economic costs.

In 1992, BPA staff produced estimates of power system costs and impacts of a John Day drawdown operation. Bonneville estimates that a drawdown to MOP will result in a firm energy loss of only about 1-2 MW, total nonfirm energy losses of about 200 to 500 MW-months annually, and total capacity losses of roughly 1000 MW in May, 400 MW in June, and 100 MW in both July and August. These impacts are for a 4-month drawdown operation only. The first 1000 MW capacity loss in the spring-summer period would have no additional cost. The next increment of capacity loss would be priced at about \$4 per kW-month, about \$2.4 million per year. Capacity losses associated with a year-round drawdown were not estimated, but would be considerably greater than \$2.4 million per year. Council Staff Briefing Paper 94-40 documents these findings further.

With these considerations in mind, the Council made clear in the measure itself that John Day may be operated for load-following purposes outside the fish migration season, if it is needed and capacity is not available at other projects. For a finding on the effect of the program as a whole on the adequacy, efficiency, economy and reliability of the region's power supply, see Section 1.8 and Appendix C.

The Environmental Defense Fund cost-effectiveness evaluation indicates that John Day drawdown to minimum operating pool is a relatively cost-effective way to secure reductions in water particle travel time, which the fish managers believe is a reasonable surrogate for reduced fish travel time and increased survival. The Council's reasoning on the biological merits of drawdowns *per se* is explained in connection with findings on the Snake River drawdown recommendations.

The Council acknowledges concerns over the potential impacts of drawing down the John Day reservoir, and calls for full, prior mitigation to affected reservoir water users before proceeding.

The record indicates that concerns over wildlife impacts associated with the drawdown at John Day will be somewhat alleviated with a year-round drawdown rather than a two to four month drawdown, in which riparian vegetation and associated wildlife habitat would have no opportunity to reestablish itself. It is estimated that an annual drawdown and refill of the John Day reservoir would have a number of negative impacts on wildlife populations. Lowering the pool level by 8 to 11 feet to MOP will result in lowered ground water levels in areas adjacent to the river, withdrawal of water from established marsh and riparian areas, and exposure of presently shallow water habitat. An estimated 8,400 acres of backwater sloughs, marshes, and shallow water areas would be exposed and 2,095 acres of wetland/riparian habitat would be impacted. Of particular concern are the impacts to the Umatilla National Wildlife refuge, and the Willow Creek and Irrigon wildlife areas managed by ODFW.

Most of the impacts would result from the perching of marshes and riparian habitats along the shoreline and from the loss of backwater sloughs from dewatering. Loss of standing water from emergent vegetation communities will preclude nesting or decrease nesting success of species such as diving ducks. Desiccation of marshes and shallow open water habitat will result in the loss of aquatic plant and invertebrate

populations which provide food resources for many bird species. More terrestrially-associated avian and mammalian species dependent on riparian forest and wetland plant communities for nesting and foraging would incur loss of habitat and reduced forage availability. Colonial birds that use offshore islands could be jeopardized due to the possible creation of land bridges associated with drawdown.

However, an annual drawdown of John Day pool may benefit some species which rely on exposed mudflat habitat and very shallow water. During the 1992 drawdown test in the Snake River, it was noted that the mudflats were attractive to such species as black-necked stilts, American avocets, and killdeer.

A permanent drawdown of John Day pool would cause less significant impacts to existing wildlife habitat, as this option would allow for additional land base upon which new habitat would develop over time. It is not known whether the new land base would develop comparably to the existing habitat on the refuge or management areas. Such development would be dependent on topography and soils within the drawdown zone. A rough estimate is that perhaps 25 percent of the existing acreage to be impacted by drawdown could be recovered. Permanent drawdown might also have a positive impact on island habitats. Since the impoundment of John Day pool in 1968 approximately 40 percent of five islands within the pool has been lost (165 acres lost from a base acreage of 410 acres). Most of the losses are caused by fluctuating pool levels, wind generated wave action, and erosive soils. Lowering the pool would expose more island areas, and depending on the operational regime to be used, could reduce the existing impacts causing current island losses.

A drawdown of John Day may exacerbate water supply problems at neighboring fish hatcheries. The hatcheries' water supply is already a critical problem. Mitigation for impacts to hatchery water supplies has been part of the John Day drawdown evaluations and cost estimates.

Considering the benefits and costs of the John Day drawdown to minimum operating pool, the Council concludes that the requirements of Sections 4(h)(5) and (6) of the Act are satisfied.

Determining whether to draw John Day down to spillway crest is an idea worth exploring. The Council makes no judgment at this time, however, on its cost-effectiveness or impacts.

Program Section(s): 5.6A (John Day drawdown)
Source: ODFW
Recommendation No.: 5-8

Recommendation: In 1994-97 operate John Day within one foot of MIP (elevation 263), April 15 to August 31. Beginning in 1998, operate at MOP (elevation 257) for same period. By 1998 complete evaluation of drawing down John Day to lower depths including spillway crest (elevation 210).

Draft: The approach taken in the draft amendments, and the public comments, are summarized in connection with the prior recommendation, IDFG's John Day drawdown recommendation (5-10).

Findings: The Council adopted the recommendation to operate John Day at minimum operating pool in 1995, as noted above, conditioned on full, prior mitigation to affected reservoir water users. The Council also adopted the recommendation to evaluate operation at spillway crest. Provided mitigation can take place, the Council concluded that the adopted measure, which calls for an earlier drawdown than recommended by ODFW, would be a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C), than waiting until 1998.

Program Section(s): 5.6A (John Day drawdown)
Source: Natural Resources Defense Council, et al.; Idaho Rivers United
Recommendation No.: 5-4, 5-6

Recommendation: Operate John Day at MOP from May 1 to August 31, beginning with spring 1995 juvenile migration, with temporary mitigation. No later than January 1, 1996, complete all mitigation measures. Any "reasonable cost" modifications that allow for even deeper drawdown should be made. BPA, through the Corps, is to fund retrofitting of non-federal facilities, such as irrigation pumps; the Corps will develop budget and complete designs for this work by December 31, 1994. BPA is to fund feasibility study of operating John Day at near spillway crest; the Corps is to complete study by December 31, 1995. The Corps is to install PIT-tag detectors at John Day and Bonneville by March 1996; the Fish Passage Center will develop, and Corps and NMFS will implement, monitoring program to assess whether John Day MOP operation reduces travel time and predation of juvenile salmon.

Draft: The approach taken in the draft amendments, and the comments, are summarized above in connection with the John Day recommendation from IDFG (5-10).

Concerning the PIT-tag detectors and other matters, amendments calling for the 1996 installation of juvenile PIT-tag detectors at John Day and Bonneville were proposed as a revised Section 5.7B.2 (and then renumbered as a new Section 5.2B.(2) in Option 2, Adaptive Management Introduction, and as a new Section 5.7B.3 in Option 5, Salmon Funding (which is not really about salmon funding; part of the John Day drawdown proposal recommended by NRDC et al./Idaho Rivers). A proposed revision of Section 6.1B.6 derived from a PNUCC recommendation calls for the installation, if feasible, of adult fish PIT-tag detectors in adult passage facilities at mainstem dams as soon as possible.

Findings: The recommendation was adopted, for reasons given in connection with IDFG's John Day recommendation (5-10). The Council calls in Section 5.4C for the Corps to operate John Day at minimum operating pool in 1995, conditioned on full, prior mitigation to affected reservoir water users. The Council also adopted the recommendation to evaluate operation at spillway crest. The PIT-tag recommendations are discussed elsewhere; see Sections 5.0F.9 and 5.0F.10 (revising and renumbering Section 5.7B from the original program) and Sections 5.0F.13, 5.0F.14 and 6.1B.6 and in findings relevant to those sections.

Program Section(s): 5.6A, 5.6B (John Day drawdown/McNary, Wanapum, Priest Rapids)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: In the middle of CRITFC's recommendations concerning structural improvements to bypass systems, CRITFC also calls for the Corps to immediately draw down John Day reservoir to minimum irrigation pool and investigate modifications to achieve spillway crest drawdown and dam breaching. By 1997 the Corps is also to investigate drawdowns to spillway crest and dam breaching at McNary. And in the section on Priest Rapids and Wanapum, either the Corps or the Grant County PUD (it is unclear which) is to investigate drawdowns, particularly at Wanapum pool.

Draft: With regard to the John Day drawdown recommendation, the approach taken in the draft amendments, and the comments, are summarized above in connection with the IDFG's John Day recommendation (5-10). No proposed amendment discussed a natural river/dam breaching alternative for John Day. An evaluation by 1997 of McNary to spillway crest could be found in Option 2, Evaluate McNary

Drawdown to MOP, and Option 4, McNary Drawdown Evaluation. The Option 4 amendment also called for an evaluation of McNary to natural river elevation. A 1997 evaluation of Wanapum to spillway crest evaluation was in Option 4, Wanapum Drawdown Evaluation. No proposed amendment referred to Priest Rapids.

Findings: The John Day recommendation was adopted, for reasons given in connection with IDFG's recommendation (5-10).. The Council calls for the Corps to operate John Day at minimum operating pool in 1995, conditioned on full, prior mitigation to affected reservoir water users. The Council also adopted the recommendation to evaluate operation at spillway crest. No measure specifically calls for an evaluation of operating John Day at natural river level or for an evaluation of drawdowns at McNary, Priest Rapids or Wanapum. Instead, Section 5.4D.4 calls for an evaluation by 1996 of all the Columbia Basin water storage and hydropower facilities to determine the availability of additional velocity improvements.

Program Section(s): 5.6A (John Day drawdown)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 5.6A to reflect (a) information from SCS Phase I draft report and Recovery Team indicating that proposed operation at minimum operating pool is not likely to produce a significant benefit for fish relative to impacts, and (b) admonition from Senate Appropriations Committee for Corps and Council to coordinate review of plans in light of this information.

Draft: The recommendation was reflected in Option 1, Drawdown.

Findings: The Council considered the information proffered by the Corps, but found that operating John Day at minimum operating pool would protect, mitigate and enhance fish and wildlife, and otherwise satisfy the requirements of Sections 4(h)(5), (6) and (7) of the Northwest Power Act. The Council's reasoning is given in connection with findings on IDFG's John Day recommendation (5-10), above.

Program Section(s): 5.6B (additional storage)
Source: PNUCC
Recommendation No.: 5-1
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: PNUCC recommended revising Section 5.6B.1 to state that evaluation of new storage sites should continue, based on storage site appraisals already completed. The Corps similarly recommended that the Council revise Section 5.6B to reflect the information in Appendix C to the Corps' SCS Phase I draft report regarding the potential for new Snake storage.

Draft: PNUCC's recommendation was reflected in Option 1, Additional Flow and Storage.

Comments: The Bureau of Reclamation said of the three possible new storage sites they have identified, Galloway, Upper Rosevear Gulch and Jacobsen Gulch, the Galloway dam analysis done by the Corps in 1980 needs only to be updated, while the other two will require full blown feasibility studies. The Bureau asked the Council to provide a sense of priority. The Washington Department of Fish and Wildlife commented that the Bureau should proceed with planning, design and environmental law compliance for additional upper Snake River storage, including the potential Galloway storage project for salmon and steelhead flow augmentation.

Findings: The Council accepted these recommendations, revised and renumbered as Section 5.2E, except that the Council did not limit evaluation to already completed appraisals. Further work may be needed to evaluate particular sites. The cost-effectiveness analysis done for the Council by the Environmental Defense Fund shows the Galloway project to be more cost-effective than other storage sites, but with limited potential to help meet flow objectives. Other storage sites need also to be investigated as options, but all projects should be evaluated in order of their cost-effectiveness.

Program Section(s): 5.6C (additional water measures)
Source: Regional Services Inc.
Recommendation No.: 5-7

Recommendation: BPA, the Corps, the Bureau and "other parties" are to "secure" (a) at least 3 million acre feet of water above the amount provided in 1994 "from storage projects sited in the upper Snake and tributaries above Hells Canyon Dam," and (b) at least 5 million acre feet above 1994 amount "from storage projects sited in the upper Columbia River and tributaries above Chief Joseph Dam." The FOEC, in consultation with NMFS, FWS and "other parties," is to "determine the best uses for the additional water storage" called for here, including but not limited to "improving conditions for juvenile and/or adult salmon migration and mitigating impacts on resident fish and wildlife resources." The measure itself does not set a target date, but explanatory material added to the introductory text to Section 5 calls for implementation between 1996 and 2024.

Draft: The recommendation was not included in the draft.

Finding: The Council rejected the recommendation because the adopted recommendations are more effectively protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). There could be significant advantages to changing patterns of water use (see Environmental Defense Fund report), and the Council has called for the use of structural and nonstructural methods, whichever are more cost-effective, to

be used to supply flow augmentation water from the Snake River and other basins. However, reports by Hydrosphere and Bookman-Edmonston Engineers showed that there are significant barriers to water transactions, conservation and other nonstructural alternatives, which make it unlikely that changes of the kind recommended in this recommendation are realistic. Instead, the Council calls for a combination of flow and velocity improvements to achieve mainstem objectives. In particular, drawdown could obviate the need for large-scale changes in water use patterns that are the subject of this recommendation.

Program Section(s): 5.6D (flow augmentation and timing through flood control evaluations and river system investigations)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: CRITFC recommended that the Council call for the evaluation of the opportunity for additional flow augmentation made possible by re-establishing floodplains and taking other steps to move river system operations back toward “historical timing and duration.” The Council, in consultation with fishery agencies and tribes, should undertake a “basinwide comprehensive hydrologic, hydraulic geometry and biological analysis,” to determine “appropriate flow regimes with respect to duration and magnitude to reestablish critical mainstem and estuarine floodplain habitat.” “Aggressively explore relaxing flood control evaluations,” “implement shifting of reservoir release times to meet flood control elevations,” and “modify power sales contracts to move the river hydrograph back toward historical timing and duration.” Implement additional flow augmentation beyond the DFOP flows in 1996 based on this analysis.

Draft: The recommendation was included in Option 4, Mainstem & Estuarine Habitat Restoration.

Findings: The Council adopted the recommendation in Section 5.4D.2 in all respects but one. In view of the Council’s analysis and findings on the DFOP proposal (in the findings on recommendations to amend Section 5.3 of the original 1994 program) concerning the problems and impacts caused by trying to use flow augmentation to meet the DFOP flow targets, the Council could not find that calling for additional flow augmentation before knowing the results of the evaluation would assure the region of an adequate, efficient, economical and reliable power supply or protect upriver resident fish, 16 U.S.C. § 839b(h)(5), (7)(A).

SECTION 5.7: CONDUCT ADDITIONAL RESEARCH AND MONITORING⁴

Program Section(s): 5.7 (additional mainstem research)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: The Corps and BPA should not fund any mainstem research without the consensus agreement of fish agencies and tribes. Beginning in 1995, BPA is to fund: (1) CRITFC and member tribes to develop passive monitoring technologies, including tributary video monitoring, and; (2) fishery agencies and tribes in “comprehensive scale analysis research to determine and monitor critical stock characteristics such as time and size at saltwater entry.”

⁴ **Note:** The provisions in this section of the original 1994 Fish and Wildlife Program have either been deleted or amended and then moved/renumbered as parts of Sections 5.0, 5.5, and 5.6 of the amended program.

Draft: No amendments were proposed that specifically prevent BPA and Corps from funding mainstem research or that directly call for comprehensive scale analysis research. Proposed revisions to Section 4.3C.1 call for the Fishery Managers to develop and submit to the Council by the end of 1994 a “proposal for the use of video counting technology for population monitoring at mainstem dams and at tributary dams and weirs.” Appendix D, Proposed Amendment No. 64, proposes to revise Section 6.1B.5 as requested by the Corps to call for a 1997 feasibility analysis of video monitoring, while CRITFC wanted the Corps to report by 1995.

Findings: The Council agrees that the fishery managers are by expertise and authority essential participants in research activities. Requiring consensus of all fishery managers, however, would authorize a veto of research to which a single agency objects. Research activities should be pursued regardless of whether they threaten the interests or assumptions of management agencies. Creating a minority veto of this kind could make independent research under this program impossible. The Council rejected this recommendation because the adopted measures more effectively protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). The recommendation concerning video monitoring is addressed in the program and findings on Sections 4.3C and 6.1B.5. No specific measure calls for the comprehensive scale analysis recommended. Instead Section 5.0 describes a mainstem experimental program linked to the mainstem hypotheses that has as part of its purpose increasing our understanding of the natural survival processes relating to in-river survival, which should include the study of “critical stock characteristics such as time and size of saltwater entry.” The Council has not specified the technical design of the overall experiment or its many elements, calling instead for the technical aspects of the experiment to be developed under the aegis of the Independent Scientific Group. A comprehensive scale analysis such as recommended here should be considered for inclusion as part of the study.

Program Section(s): 5.7A.1, 5.7A.2 (flow, velocity and salmon survival)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Delete Sections 5.7A.1 and 5.7A.2 because these measures have been completed. Section 5.7A.1 called for an independent evaluation of information and analysis of the river velocity/survival relationship, and Section 5.7A.2 directed the Council to review and possibly amend the program to state the Council’s position on that issue.

Draft: No proposed amendment reflects that the evaluation called for in Section 5.7A.1 has been completed. With regard to Section 5.7A.2, the Council’s flow/survival hypothesis rulemaking is not yet final, as noted and built into Option 2, Adaptive Management Introduction.

Findings: The Council adopted the recommendation in the course of the Mainstem Hypotheses amendment process.

Program Section(s): 5.7A (flow/velocity/survival research)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-9

Recommendation: Delete Section 5.7A. Section 5.7A.1 called for the independent evaluation of information and analysis of the river velocity/survival relationship. Section 5.7A.2 directed the Council to review and possibly amend the program to state the Council’s position on that issue.

Draft: Not deleted in the draft. No proposed amendment reflects that the evaluation called for in Section 5.7A.1 has been completed. With regard to Section 5.7A.2, the Council's flow/survival hypothesis rulemaking is not yet final, as noted and built into Option 2, Adaptive Management Introduction.

Findings: The Council adopted the recommendation in the course of the Mainstem Hypotheses amendment process.

Program Section(s): 5.7A.3 (flow, velocity and salmon survival)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Minor revisions to Section 5.7A.3 to call for continued funding of additional independent scientific evaluations of the flow/velocity/travel time/survival relationship. PNUCC would add express directions for the evaluations, by stating that they "should include: (1) obtaining accurate survival data through the Columbia River system and; (2) determining whether there is a correlation between flow and water velocity and enhanced survival."

Findings: Not proposed in the draft, but the Council calls for continued funding of independent scientific evaluations of these relationships in Section 5.0, Mainstem Passage Experimental Program.

Program Section(s): 5.7B (PIT tags)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise to reflect that Corps is funding design and construction at John Day; BPA is funding design at Bonneville and Corps is funding construction.

Draft: No changes were made to reflect this split in funding responsibility.

Findings: The Council did not change the language of the program as recommended because the measure referred to a number of different projects with different funding arrangements. The Council understands that the Corps is funding design at John Day and Bonneville dams, and is funding construction at John Day, and supports these activities.

Program Section(s): 5.7B (PIT tags)
Source: Natural Resources Defense Council, et al.
Recommendation No.: 5-4

Recommendation: Corps to install PIT-tag detectors at John Day and Bonneville by March 1996; Fish Passage Center to develop, Corps/NMFS to implement, monitoring program to assess whether John Day MOP operation reduces juvenile travel time and predation.

Draft: Option 5, Salmon Funding addressed the recommendation.

Findings: The Council adopted the recommendation in the Mainstem Hypotheses amendment process, Sections 5.0F.9 and 5.0F.10, except that the Council called for this work to be coordinated through a technical group under the Independent Scientific Group. For reasons explained in connection with CRITFC's

monitoring and evaluation recommendation (see the findings on Section 3.(2), the Council finds that in this respect the adopted measure is a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.7C.1 (gas supersaturation study)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 5.7C.1 to reflect (a) that the gas study is to include evaluation of effects of supersaturation on salmon passing through reservoirs, and (b) the Corps is studying and considering projects to reduce gas supersaturation, including revised spill patterns, modified flip-lips and modified spill gates.

[Note: A number of recommendations contain gas study measures as part of spill programs; these have been summarized and responded to at the spill sections, 5.8A.11 and .12.]

Draft: Draft Section 5.7C.1 called for a dissolved gas study that incorporated the Corps' concerns and others. Draft Section 5.7C.2 called for the installation of various gas abatement project modifications and monitoring equipment on mainstem federal projects (some as prototypes, some as permanent changes), not just a study as recommended by the Corps. Draft Section 5.7C.3, reflecting the recommendations of CRITFC especially, called for further development of gas abatement and monitoring systems, further development of the gas spill model, and additional funding for fish agencies and tribes in their efforts to monitor and evaluate gas data.

There were a number of proposed amendments concerning gas abatement and monitoring in the mainstem options, often mixed-in with spill or bypass measures:

- Options 1 and 2, Bypass System: Derived from a PNUCC recommendation, this called for a new Section 5.7E that includes an independent study of, among other things, the feasibility of using spill in conjunction with bypass without violating state water quality standards.
- Option 2, Adaptive Management Introduction, along with Option 2, Spill, outlined a set of gas abatement and monitoring measures in conjunction with spill, FPE and bypass measures. These included a general call for structural changes in the hydro projects to lessen the gas problems with spill. These proposed Option 2 amendments also called for spill to achieve 80 percent FPE, managed "in close cooperation with [NMFS] to ensure appropriate responses to monitoring information for gas bubble trauma." and "within the total dissolved gas guidelines established by state water quality agencies." Option 2, Spill, also called for an exceptions process: "Exceptions to the state standards should be approved by the states on a showing, by [NMFS] and state and tribal fishery managers that the risk of fish mortality from exposure to higher levels of dissolved gas is less than the risk of failure to provide the spill regime that may result in such levels." Option 3, Spill, repeated the Option 2, Spill, proposal.
- Option 4, Summer Spill, repeated the language from Options 2 and 3, Spill, with two differences: First, Option 4, Summer Spill, included CRITFC's recommendation for spill to 80 percent FPE in spring and 90 percent FPE in summer. Second, the Option 4 amendment did not include the call for a state exceptions process. Given the logic of the options, this was probably an oversight. CRITFC called for "controlled spill" as outlined in the DFOP and 1994 agency and tribal spill rationale.

- Option 4, Bypass, based on CRITFC's recommendation, called for gas abatement structures at Rocky Reach, Rock Island and Wanapum dams.
- Option 5 provided a slightly different set of spill/gas measures, based on the NRDC/Idaho Rivers recommendations. Option 5, Spill, called for spill to 80 percent FPE for all juvenile migrants, to be managed "in close cooperation with the Fish Passage Center to ensure appropriate response to monitoring results . . . for gas bubble trauma. "Gas-bubble monitoring shall be considered along with data on temperature, exposure time, passage conditions, and comparative risks of other means of dam passage. The objective shall be to minimize harmful effects of gas-bubble trauma on adults and juveniles without increasing relative risk(s) in dam passage." Option 5, Gas Supersaturation, called for the installation by April 1995 of prototype spillway gate baffles at Lower Granite to improve spill efficiency, control gas supersaturation and increase FPE, installing these at all the other mainstem dams on an "expedited schedule." Prototype surface-collection systems were to be installed by April 1995 at Lower Granite and The Dalles and everywhere else on an expedited schedule, and these were explained as also intended to improve spill efficiency, control gas supersaturation and increase FPE.

Findings: The Corps' recommendation was adopted as part of broader provisions regarding gas supersaturation adopted (and renumbered) in Section 5.6C and 5.6E, discussed below. The Council believes it is important to address gas supersaturation expeditiously.

Program Section(s): 5.7C.1 (gas supersaturation)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Revise Section 5.7C.1 to state expressly that the gas supersaturation study "should focus on the relationship between spill level at each federal project, gas supersaturation level, and symptoms of gas supersaturation in juvenile and adult salmon and other aquatic species." Section 5.7C.1 does not state who will do the study (only that BPA will fund it); PNUCC recommends that the study shall be directed by the "National Marine Fisheries Service Seattle Laboratory Director for the Northwest Fisheries Science Center."

Draft: See above discussion on gas abatement measures. The gas supersaturation study in the proposed revision of Section 5.7C.1 incorporated PNUCC's research concerns. The study was to be funded by BPA and NMFS, but Section 5.7C.1, even as revised for the draft, did not state who will actually do the study.

Findings: The recommendation was adopted as part of the broader provisions regarding gas supersaturation. The Council did not adopt the recommendation to specify who should carry out the study. Because Bonneville and, especially, NMFS are better suited to select the implementer, the Council finds that the adopted measure is in this respect a more effective way to protect, mitigate and enhance fish and wildlife, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): New 5.7E (additional research and monitoring/bypass evaluation)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Fund an independent evaluation of current bypass technology in terms of FGE, FPE, and survival; compare data to Council standards; evaluate “feasibility of using spill in conjunction with mechanical passage measures without violating the states’ water quality standards for gas supersaturation.”

Draft: The recommendation was addressed in Options 1 and 2, Bypass System. Other proposed amendments that concern gas abatement, standards and monitoring have been discussed above, in the discussion of the recommendation from the Corps for revisions to Section 5.7C.1. Other spill and bypass measures are discussed below.

Findings: The Council adopted the recommendation.

SECTION 5.8: COMPLETE INSTALLATION OF BYPASS SCREENS⁵

Program Section(s): 5.8A (improve passage facilities)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: With regard to turbines, no deviations from operating turbines “within 1 percent peak turbine efficiency criteria” without coordination with tribes and fishery agencies. No deviations during peak migration periods. By 1996, the Corps is to “complete the extant turbine index testing program by testing and outfitting all turbine units with electronic 3-D cams which are capable of instantaneous adjustments.” The recommendation was accompanied by a detailed discussion, with references, supporting the biological value of such operations (see pp. 21-27 of the recommendation).

Draft: Options 2 through 4, Turbine Operation called on BPA and the Corps to operate within 1 percent peak efficiency from April through August, “and especially during peak migration periods,” and to “[p]lan and coordinate deviations from the one percent peak efficiency criterion with the fishery agencies and tribes.” This proposed amendment also called on the Corps and BPA to complete the turbine index testing program by 1996, although the proposed amendment did not specifically mention the electronic 3-D cams.

Comments: The Corps stated that all turbine units are currently operated at 1 percent peaking efficiency and that no new action is needed. They suggest that an additional measure should be included for modifications of turbines to make them more “fish friendly” and point out that Congress has provided the Department of Energy with funds to investigate this potential.

Douglas County PUD opposed recommendations to operate turbines to 1 percent of peak efficiencies; Kaplan adjustable blade propeller turbines are designed to provide for optimum relative velocity of water approaching the blade; literature indicates high survival rates across a broad range of operations; no data show that turbine efficiency changes of a few percent have a measurable change in fish survival. Limiting turbine operation to peak efficiency flow levels during high flows means increasing spill at a time when high dissolved gas levels may be toxic to adults and juveniles, and wastes a source of efficient, economical and reliable energy. Chelan PUD opposed the recommendation because of the weak scientific basis for presuming such operational limits will improve survival; increase in startups and shutdowns required when operating in this range may be more detrimental to fish.

⁵ **Note:** This section of the original 1994 Fish and Wildlife Program -- concerning bypass systems and spill -- has been renumbered Section 5.6 in the amended program. The provision concerning gas supersaturation problems associated with spill that was in Section 5.7C.1 in the original 1994 program has been expanded into various provisions in Sections 5.6C and 5.6E.

Findings: The Council adopted the recommendation at Section 5.6D. While the mid-Columbia PUDs disputed the benefits of the recommended operation, given the information in the record in support of this recommendation, and giving due weight to the expertise, authorities and legal rights of the tribes and fish and wildlife agencies, the Council concluded that adopting the recommended measure would protect, mitigate and enhance fish and wildlife and otherwise satisfy the requirements of Sections 4(h)(5-7) of the Act. Sections 5.6A.13, 5.6A.14 and 5.6D.1 call for or allow the Corps and others to complete the turbine index testing program and to make any changes to the turbines or their operation that would facilitate operations at 1 percent peak efficiency should be made. This includes, without specific mention, the installation of electronic 3-D cams where appropriate, which the Council recognizes is already a high priority of both the Corps and CBFWA.

Program Section(s): 5.8A (improve passage facilities)
Source: ODFW
Recommendation No.: 5-8

Recommendation: Operate turbine units within 1 percent of peak operating efficiency during entire migration period; identify ways to improve efficiency of existing turbines; develop and test new turbine designs to improve operational efficiency and fish survival.

Draft: As noted above, Options 2 through 4, Turbine Operation call on BPA and the Corps to operate within 1 percent peak efficiency from April through August, “and especially during peak migration periods,” and to “[p]lan and coordinate deviations from the one percent peak efficiency criterion with the fishery agencies and tribes.” This recommendation also calls on the Corps and BPA to complete the turbine index testing program by 1996. In the general Section 5 amendments, a proposed new Section 5.8A.15, while mostly derived from a Corps recommendation, is also relevant to ODFW’s recommendation on turbine efficiency improvements. It calls on the Corps and others to conduct studies and prototype testing “to develop an improved understanding of the mechanisms of fish mortality in turbines,” and then use this information to “develop biological design criteria to be used in advanced turbine designs or modified unit operations to increase fish survival,” reporting results by 2001. Based on these efforts the Corps and others are to replace, rehabilitate or modify turbine operations.

Findings: The Council adopted the recommendation (as part of the renumbered Section 5.6) for the reasons cited in the above recommendation.

Program Section(s): 5.8 (evaluation of turbine efficiency)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 5.8 to reflect Appendix F to SCS Phase I draft report, evaluating turbine replacement with more efficient units to improve juvenile migration survival.

Draft: Proposed Section 5.8A.15, derived from this Corps recommendation (although without the reference to the SCS report), called on the Corps and others to conduct studies and prototype testing “to develop an improved understanding of the mechanisms of fish mortality in turbines,” and then use this information to “develop biological design criteria to be used in advanced turbine designs or modified unit operations to increase fish survival,” reporting results by 2001. Based on these efforts the Corps and others are to replace, rehabilitate or modify turbine operations.

Findings: The Council adopted the recommendation at Section 5.6A.14.

Program Section(s): 5.8, 5.8A.1, 5.8A.3, 5.8A.11 (complete installation of bypass screens/improve Lower Columbia and Snake River passage)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Edit Section 5.8 in a variety of ways to re-focus the bypass program toward surface collection systems. Change the name of Section 5.8 to Complete Installation of Bypass “Systems” (not “Screens”), and edit the introductory text at three places to note the Council’s interest in the evaluation and installation of surface collection systems. Amend Section 5.8A.1 to call for use of a 90 percent FGE standard as a design criteria for turbine intake screens “and surface collectors,” unless demonstrated to the Council that the standard cannot be achieved based on hydraulic model studies or prototype “powerhouse collection systems” (not “screens”). Add to Section 5.8A.3 to ensure a 98 percent or greater survival rate from the deflector screens “or surface collection entrances” to bypass system outfall. Add a paragraph to Section 5.8A.11 calling for an investigation of the use of surface collection systems at all federal mainstem projects, including an FGE comparison between surface collection systems and existing intake screen designs.

Draft: Option 1, Surface Collection, was generally responsive to this recommendation, while adding a more specific measure deferring consideration of screens at The Dalles if a surface bypass system is prototyped. This proposed amendment was repeated in Options 2 and 3. Also, a general call to compare screens to surface bypass systems was included in the general Section 5 amendments as a revised Section 5.8A.5.

Note that Option 1, Public Utility District Bypass, also called for surface bypass system prototype testing at Rocky Reach, Wanapum and Priest Rapids, with installation of the surface bypass system rather than screens if successful. This proposed amendment was repeated in Option 2, titled Mid-Columbia Dam Passage.

Comments: There was widespread support for development and testing of surface bypass systems, discussed below in connection with ODFW’s bypass recommendation (5-8).

Findings: The Council adopted the recommendation in the various measures of Section 5.6A.

Program Section(s): 5.8A (improve Lower Snake and Columbia River passage)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: The Corps recommended three pages of changes to Section 5.8A, summarized here together:

Section 5.8A: Revise where appropriate to reflect the PIES program.

Section 5.8A.1: Revise to reflect the development of the Fish Passage Plan (FPP) in coordination with the fish agencies and tribes and BPA. The FPP will be implemented, evaluated and revised as specified in the FPP, as operational circumstances warrant, or as required through ESA consultation with NMFS. Revise also to reflect that 90 percent FGE for all species may not be achievable with screens, that Corps should evaluate surface collection systems, and that it might be wise to delay extended-length screen program.

Section 5.8A.2: Section 5.8A.2 calls for installation of juvenile bypass system at The Dalles by March 1998. Revise to reflect that while this is still the schedule, and the Corps is on a path to complete designs for a screened bypass system and award construction contracts by October 1995, this schedule may conflict with Congressional language directing Corps to evaluate effectiveness of screened bypass system versus surface collection system and test prototype surface collection system in 1996. Similar studies may also be conducted at Ice Harbor, which could also alter its installation schedule.

Section 5.8A.3: Revise to reflect greater than 99 percent survival in Lower Granite, Little Goose and Lower Monumental collection facilities in 1993; also that Corps is developing alternative bypass outfall release strategies, including possible use of short-haul barging, as discussed in SCS Phase I draft, Appendix F.

Section 5.8A.5: Revise extended-length screen schedule to call for complete installation at McNary and Lower Granite by December 1996 (instead of March 1995 and March 1996), at Little Goose by May 1996 (instead of March 1996), and at John Day by March 2002 (instead of March 1998), as stated in Appendix F to SCS Phase I Report; schedules may be delayed or eliminated to pursue testing and possible implementation of surface collection systems.

Section 5.8A.7: Delete because work called for -- installation of fish guidance improvements at Bonneville II -- has been completed.

Section 5.8A.8: Revise to reflect that FGE evaluation at Bonneville I has been included in SCS Phase I draft report, Appendix F; rehabilitation of old generating units is on schedule for contract award in late 1994, first turbine work in early 1997, and completion in 2002, all dependent on Congressional funding.

Section 5.8A.10: Revise to reflect Lower Granite juvenile fish facility modification information in SCS Phase I draft report, Appendix E. Corps is coordinating with NMFS on installation of new separator and flume at Lower Granite; completion date not set but will not be March 1996, as currently called for here.

Section 5.8A.11: Delete reference to Lower Monumental - with installation and operation of juvenile bypass facility, voluntary spill is no longer needed. Revise to reflect that Ice Harbor spill is no longer in accordance with Spill Agreement but is governed instead by NMFS biological opinion.

Section 5.8A.13: Revise to state: "Explore promising new approaches to fish bypass technologies, including surface collection, surface spill, or other behavioral devices to guide fish." If results "indicate high efficiency at costs less than screen or other bypass modifications, and show no reason to preclude use of a new technique, propose to the Council incorporation into bypass strategies."

Section 5.8A.14: Revise to reflect cancellation of December 1992 sluiceway pilot study at Ice Harbor since fishery managers did not provide test fish; no studies planned.

Draft: The proposed amendments picked up a number of items that the Corps recommended, though not all. As noted above, Option 1, Surface Collection, was generally responsive to the recommendation to begin the development, testing and installation of surface bypass systems. It also added the specific language about deferring screens at The Dalles while a surface system is tested, with final installation of a juvenile bypass system by 2000. This proposed amendment was repeated in Options 2 and 3.

Option 1, Spill, deleted the direct reference in Section 5.8A.11 to spill at Lower Monumental and added that spill is to be provided in conformance with the Spill Agreement or the NMFS 1994-98 biological opinion.

Option 2, Bypass, revised Section 5.8A.3 to call for the Corps to increase survival in passage by, among other things, relocating bypass outfalls, particularly at Bonneville, and/or by modifying project operations to reduce predation. The same proposed amendment to Section 5.8A.3 was included in the general amendments to Section 5, while a general call to compare screens to surface bypass systems was included in the general Section 5 amendments as a revised Section 5.8A.5.

In the proposed general Section 5 amendments, Section 5.8A.14, concerning the sluiceway study at Ice Harbor, was proposed for deletion.

Appendix D contained a number of the Corps' recommended changes in text to reflect recent developments or changes in dates for completing work or reporting studies, including Proposed Amendments No. 119 (deletions and revisions to Section 5.8A.7 to reflect development of fish guidance improvements at Bonneville, with an added call for continued improvements, especially for subyearling chinook, and revisions to Section 5.8A.8, calling for rehabilitation of old generating units at Bonneville by 2002, with annual reports on attempts to improve fish passage conditions); Proposed Amendment No. 120 (revise Section 5.8A.10 to call for Lower Granite fish separator and flume by 1999); and Proposed Amendment No. 122 (changes in Section 5.8A.5 schedule for extended length screens).

Findings: The Council largely adopted the recommendations in Section 5.6, with two exceptions: (1) The Council did not make the recommended date changes; and (2) the Council rejected the recommendation to lower the 90 percent fish guidance efficiency (FGE) design criterion. The Council understands that this criterion may not be achievable with screens in all conditions for all species, but retaining it as an objective and attempting to achieve it is still desirable. Both aspects of the rejection are based on the Council's finding that they would be a less effective way to protect, mitigate and enhance fish and wildlife, 16 USC § 839b(h)(7)(C).

Program Section(s): 5.8A (Lower Columbia and Snake bypass facilities)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: Short-term elements in a passage improvement program for the federal dams in the lower Columbia and Snake: Beginning in 1995, the Corps is not to operate Bonneville Powerhouse II during juvenile migration "unless desired by the fishery agencies and tribes for adult passage or other temporary operations." By 1996 the Corps, with fishery agencies and tribal consultation, is to complete structural analysis of all mainstem fishways. Provide for immediate structural corrections and point and non-point pollution source correction where needed. Evaluate impact of juvenile bypass systems on adult fall back.

Long-term elements: By 1996 the Corps is also to secure funding for a "PIES II Program" for the following projects, with fishery agency and tribal consultation and approval for each item:

(a) Bonneville Dam: By 1996 investigate systems to run both powerhouses independently; implement by 1998; by 1997 install a prototype juvenile surface flow bypass system at Powerhouse I and a dissolved gas abatement structure at spillway.

(b) The Dalles: By 1997 modify to provide independent operation of turbine units closest to spillway from others to "increase flow net and spill efficiency; by 1998 install prototype surface flow bypass system.

(c) John Day: By 1997 install spillway deflectors; modify juvenile mechanical bypass system, especially collection channel and outfall; by 1998 install prototype surface flow bypass system.

(d) McNary: By 1995 complete evaluation of and modify mechanical bypass system.

(e) Ice Harbor: By 1997 install spillway deflectors; by 1998 install a prototype surface flow system; cease investigation and construction of mechanical bypass system.

(f) Lower Monumental and Little Goose: Immediately complete comprehensive evaluation of mechanical bypass system.

(g) Lower Granite: Minimize operation of current mechanical bypass system.

Draft: The recommendation to discontinue operations of Bonneville Powerhouse II during juvenile migration was not proposed.

Second, a proposed new Section 6.1G called for a structural evaluation by 1996 of all mainstem fishways, making any needed immediate corrections and eliminating point and non-point pollution sources "correctable by minor structural modifications." This amendment, by its location and title, was only relevant to adult fishways, not to the juvenile bypass systems. The proposed new Section 6.1G also included the call for a "comprehensive evaluation of the impact of juvenile bypass systems on adults that fallback through them."

All of CRITFC's long-term elements could be found in Option 4, Bypass, or in the gas abatement structural measures called for in the proposed new Sections 5.7C.2 and 5.7C.3 (in the general Section 5 amendments).

Findings: The Council adopted the recommendation in Sections 5.6A, 5.6E and 6.1G, except with respect to the recommendation to shut down the Bonneville second powerhouse to alleviate problems with the outfall. The cost of shutting down the powerhouse would be very high -- the Council staff estimated the cost in the mid 1980s as at least \$8 million -- while improvements in the bypass outfall may very well cost less and would allow the system to take advantage of the relatively high fish guidance efficiencies experienced as the second powerhouse at certain times of the year. Thus instead of this aspect of the recommendation, the Council adopted measures to relocate the outfall (see Section 5.6A.(3), and to develop a surface collection system, which the Council finds would be less costly ways to achieve the biological objective of reducing smolt mortality associated with the outfall of the Bonneville second powerhouse, 16 USC §§ 839b(h)(6)(C), (7)(B).

Program Section(s): 5.8A (Lower Columbia and Snake bypass facilities)
Source: ODFW
Recommendation No.: 5-8

Recommendation: Two different recommendations from ODFW: First, by 1997 design and test a vertical slot (Wells-type) bypass system on Snake and Columbia rivers. Second, “if site-specific prototype tests prove successful,” install extended-length screens at all Snake and Columbia projects.

Draft: Surface bypass system design and testing were called for in various places. Option 1, Surface Collection, was generally responsive to this recommendation, while also adding a specific measure deferring consideration of screens at The Dalles if a surface bypass system is prototyped. This proposed amendment was repeated in Options 2 and 3. Option 4, Bypass, presented a different version of the same idea. Also, a general call to compare screens to surface bypass systems was included in the general Section 5 amendments as a revised Section 5.8A.5. In addition, Option 1, Public Utility District Bypass, also called for surface bypass system prototype testing at Rocky Reach, Wanapum and Priest Rapids, with installation of the surface bypass system rather than screens if successful. This proposed amendment was repeated in Option 2, although with the slightly different title, Mid-Columbia Dam Passage.

With regard to the second half of ODFW’s recommendation, a proposed revision to Section 5.8A.5 (in the general Section 5 amendments) called on the Corps to continue prototype testing of extended length screens and to install them “if more effective than surface bypass systems.” Note also that the Corps has called for changes in the Section 5.8A.5 schedule for extended length screens, in Appendix D, Proposed Amendment No. 122.

Comments: The concept, testing and development of surface bypass systems garnered wide support, including from CBFWA, Washington Department of Fish and Wildlife, ODFW, Idaho, City of Irrigon, Corps of Engineers, PNUCC, John Harville, PNGC, Columbia River Alliance and many others.

The Corps of Engineers said it is implementing “an expedited and comprehensive plan to investigate the surface bypass concept” at the Corps dams in the lower Snake and Columbia, including pilot studies at Ice Harbor and The Dalles in 1995. One impact would be slipping the construction plan two years for the juvenile bypass and screen system at The Dalles. Chelan County PUD reported that it has tested turbine intake screens at Rocky Reach, and has determined they are ineffective; it is now testing a surface collection system and will install it if and when prototype tests show it to be effective.

IDFG supported the expedited design, testing and implementation of surface collectors, as long as they are not used in connection with transportation; these facilities should be designed to work in connection with lower reservoirs.

Findings: The Council adopted the recommendations in Section 5.6.

Program Section(s): 5.8A.11, 5.8A.12, 5.7C (Lower Columbia and Snake bypass systems/spill/standard)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: CRITFC recommended that in consultation and with concurrence of fishery agencies and tribes, the Corps is to establish bypass system performance standards by 1995. If the standards cannot be met, spill to meet 80 percent FPE for spring migrants and 90 percent FPE for summer migrants. Before 1995 migration season evaluate all bypass systems for impacts on salmon and Pacific lamprey, including impingement and descaling.

Implement “controlled spill” immediately at all mainstem dams, as outlined in DFOP and “1994 agency and tribe spring and summer spill rationale.” For entire migration of early released (March) hatchery salmon, provide spill to achieve an 80 percent FPE.

With regard to gas supersaturation problems associated with spill, the Corps is to fund “an extensive hydroacoustic monitoring system across the entire length of each dam to monitor smolt movement and to improve the timing, duration and volume of spill with the goal of improving spill efficiency and limiting total dissolved gas.” The Corps is also to fund (1) an “extensive dissolved gas monitoring system” to identify “the physical aspects of the gas plumes” in the water column; (2) state and tribal water quality monitoring and evaluation and backup monitoring equipment ready for immediate use; and (3) additional development of “existing gas spill model” with a goal of being able to accurately predict “on a real time basis” gas levels under different river and spill conditions. And, immediately implement operational and structural measures to reduce TDG elevations caused by turbine discharges and install “gas abatement structures” at all projects by 1997.

Draft: Option 4, Summer Spill, called for spill to meet an 80 percent (spring)/90 percent (summer) standard beginning on April 15 at the Snake projects and May 1 at the Columbia. There is no reference in the draft rule to spill for March release of hatchery fish.

The draft did not include a general call for a 1995 evaluation of all bypass systems, and nothing called specifically for a review of bypass system impacts on lamprey or for an analysis of impingement and descaling. On the other hand, a number of the specific bypass measures in Option 4, Bypass, called for 1995 evaluations (e.g., at McNary, Lower Monumental and Little Goose) and for other on-going evaluations and surface bypass design and testing.

The gas abatement structures, hydroacoustic monitoring system, and other gas monitoring and evaluation recommendations can be found in proposed new Sections 5.7C.2 and 5.7C.3 (in the general Section 5 amendments).

Comments: As will be noted below, ODFW, IDFG and the various environmental groups all recommended an 80 percent FPE bypass/spill standard, although only CRITFC raised the standard to 90 percent for summer migrants.

In comments, Idaho supported spill to achieve 80 percent FPE, and stated that dissolved gas standards should be developed by the fish managers and then submitted to water quality agencies. Idaho attached to its comments a number of documents relative to the spill and TDG issues: (1) “Scientific Rationale for Implementing a Summer Spill Program to Increase Juvenile Salmonid Survival in the Snake and Columbia Rivers,” by CRITFC, IDFG, ODFW, USFWS, WDFW (July 15, 1994); (2) a critical analysis in a letter by Backman of CRITFC of a draft of NMFS’ dissolved gas panel report (July 1, 1994); (3) the FPC’s June 22,

1994 system request for June and July flow and spill; (4) a June 13, 1994, letter from Michele DeHart of the FPC to Ed Chaney of NRIC rebutting the CRA and Weitkamp criticisms of the 1994 emergency spill program; (5) DeHart's June 7, 1994 memo on "1994 dissolved gas levels and gas bubble symptom observations"; and (6) FPC's 1993 "Dissolved Gas review and 1993 summary."

CBFWA supported the spill recommendations of CRITFC, Idaho, and ODFW, including CRITFC's call for a 90 percent FPE bypass/spill standard for summer migrants, but only as a long-term objective. Washington Department of Fish and Wildlife endorsed the CBFWA position on spills and gas abatement. Save Our Wild Salmon emphasized spill to pass fish over each dam along the migration route, and for investigation of improved spill methods.

In a discussion of the 1994 emergency spill program, Columbia River Inter-Tribal Fish Commission noted that concerns about spill and the effects on fish of high gas levels should have been "eased" "by the results of an unprecedented monitoring program which failed to find a single fish that died of gas bubble trauma." The reference to the "unprecedented monitoring program" is contrary to the statements by others that one of the biggest problems with the 1994 spill program was the lack of an effective monitoring program. However, these other comment appear to mean the lack of a program for monitoring the benefits of the spill to juvenile survival. CRITFC also expressed exasperation that "the only state water quality standards for which there has been any concerted call for compliance appear to be those relating to dissolved gas." In contrast, the Corps responded to the smolt kill at McNary by saying that it was not unusual to see thermal mortality at McNary.

William Stelle, the Regional Director of NMFS, urged the Council to use spill, with a cap based on dissolved nitrogen levels.

On the other hand, the DSIs said that the 1994 spill program was a vast experiment at massive expense with unknowable results. The Council should not be promoting flow options that require variances from the existing 110 percent TDG standard, and the Council ought to call for independent scientists, not NMFS and the fishery managers, to make any case for variances from water quality standards.

BPA supported a moderate spill program as an interim measure to improve fish passage conditions pending installation of adequate bypass. BPA stated that empirical data on the contribution of spill to increased system survival are lacking, because most studies of the impact of spill on fish survival were conducted 20 years ago or more and the incremental benefit of spill to system survival today is probably less than when past studies were conducted. For salmonid species, according to BPA, total dissolved gas levels of up to 120 percent are reasonable and provide a balance between the risk of detrimental effects of gas on fish survival vs. turbine passage and associated mortality. BPA called for accelerated research on the impact of spill on fish, including improved monitoring for internal signs of gas bubble disease, perhaps through the use of ultrasound.

John Harville, member of the NMFS Recovery Team but speaking for himself, said that he is uneasy at placing high reliance on spill, given gas bubble uncertainties. Chelan County PUD said that at many projects, spill is ineffective in passing fish; the benefits may be minimal while the detrimental effects of gas supersaturation could pose severe problems for adults ascending fishways as they are particularly susceptible to gas bubble disease. Chelan also stated that more conclusive tests of the effects of flip-lips or other gas abatement structures on survival of juvenile fish are needed before installation of additional structures at Columbia and Snake dams. PNGC and PNUCC urged the Council to call for spill at Ice Harbor, John Day, and the Dalles consistent with the 1989 spill memorandum of agreement (incorporated in the Salmon Strategy); spill should not be conducted that would exceed total dissolved gas (TDG) standards.

Oregon DEQ said that total dissolved gas (TDG) standards are violated most of the time at higher levels of spill; water quality standards must be met, and mitigation measures to reduce dissolved gas should be carried out as soon as possible.

The Corps of Engineers suggested that studies be continued to determine the best option for reducing nitrogen supersaturation before complete installation of spillway deflectors. The Corps recommended caution in the installation of deflectors since there remain unanswered questions about the effect on adults. Also, NMFS' spillway data showed a higher mortality during passage through a deflector bay than through a non-deflector bay; although not statistically significant it raises questions. The Corps suggested that action be deferred until the Gas Abatement Study, currently underway, is completed, since this study "may achieve more significant results by looking at more comprehensive modifications. Preliminary tests may occur at Ice Harbor and Lower Granite in 1995, with a prototype test at Lower Granite in 1996." The Corps recommended that the Council include the monitoring plan being developed by the Expert Panel on Dissolved Gas sponsored by NMFS, rather than developing another one. Corps also noted that in several instances 80 percent FPE will not be attainable at all projects within TDG guidelines.

Douglas County PUD questioned the recommendation for summer spill to 90 percent FPE; the proposal did not consider possible adverse effects of nitrogen supersaturation resulting from such "tremendous spill levels"; and would have a "substantial impact to the region's ability to meet electrical demand."

Findings: The Council adopted the recommended spill objectives to achieve 80 percent fish passage efficiency in spring and summer migration periods consistent with state water quality standards, with exceptions from state water quality standards to be sought by fish managers. See Sections 5.6A, 5.6C and 5.6E. The benefits of spill, apart from gas supersaturation, are well documented. Analysis showed that the 90 percent passage efficiency summer standard recommended only by CRITFC was unachievable consistent with such water quality standards, while the 80 percent passage efficiency standard in spring and summer was consistent with the recommendations of other fish and wildlife agencies. Accordingly, the Council concluded that 80 percent efficiency was a more effective way to protect, mitigate and enhance fish and wildlife, 16 USC § 839b(h)(7)(C). The Council endorses spill as a means of passage only until better means are available for passage juvenile migrants past the dams. As commenters noted, spill is a costly measure and the Council hopes its use can be minimized by perfecting mechanical or other less costly means of bypass.

Regarding impacts of bypass systems on lamprey, Section 7.5F.1 already calls for a report on research needs for lamprey passage.

With regard to gas supersaturation problems, the Council adopted the recommendation regarding monitoring and evaluation, including a hydroacoustic monitoring network and continued development of the existing gas spill model to allow accurate predictions. See Section 5.6E.

Regarding a 1995 evaluation of bypass systems, the Council adopted measures for such evaluations at specific projects (John Day, Lower Monumental and Little Goose). Such evaluations also will be conducted in association with tests of surface collection systems at Lower Granite, The Dalles and Bonneville, and in connection with extended length screen development at McNary and Little Goose, authorized in other sections of the program.

Program Section(s): 5.8A.11, 5.8A.12, 5.7C (spill/gas abatement measures)
Source: ODFW
Recommendation No.: 5-8

Recommendation: ODFW's spill and gas abatement measures were similar to the recommendations of CRITFC, with some specifics unique to ODFW: Provide spill to achieve 80 percent FPE at each Snake project from April 15 to July 31 "within guidelines of the state's water quality agencies," and provide spill at each Columbia project May 1 to August 31 "as specified in the 1994 DFOP." Also, install "as expeditiously as possible" flip-lips at Lower Granite, Little Goose and Lower Monumental (two outer bays), Ice Harbor (all bays), McNary (four outer bays), John Day and The Dalles (all bays) and Bonneville (two outer bays). Design and test spillway/stilling basin modifications to further reduce dissolved gas levels, and design and test structural and fish behavioral methods to increase efficiency of spillways and spill.

Draft: Options 2 and 3, Spill, provided for spill to achieve an 80 percent FPE at both Snake projects (April 15 to July 31) and Columbia projects (May 1 to August 31) (Option 5, Spill, is similar but not specific in dates.) For the Snake these reflect ODFW's recommendation. With regard to the gas measures, see Options 2 and 3, Spill, and the proposed new Section 5.7C.2 (in the general Section 5 amendments).

Findings: The Council adopted the recommendation for spill to achieve the recommended fish passage efficiency objectives subject to state water quality standards. The Council also adopted the recommendation for gas abatement structures; flip lips; tests of spillway/stilling basin modifications, and other structural and behavioral methods to increase the efficiency of spillways and spill. See the discussion of the spill recommendations and comments in the findings on CRITFC's recommendation above.

Program Section(s): 5.8A.11, 5.8A.12, 5.7C (spill/gas abatement measures)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-11

Recommendation: Idaho's spill and gas abatement recommendations resembled those of CRITFC and ODFW: Implement a spill program to achieve 80 percent FPE through all projects for both yearling and subyearling migrants, consistent with dissolved gas measures also recommended. Dissolved gas level concerns are based on out-of-date research and do not reflect actual in-river conditions, so fishery managers should develop a spill management and monitoring program to provide safe passage conditions for juveniles and adults; this program will provide the basis for all spill operations. The Corps is to monitor fish conditions for signs of gas bubble trauma in coordination with the Fish Passage Center and in accordance with the spill management and monitoring program. The Corps is to consult with fishery managers to determine whether spill should be reduced due to dissolved gas levels.

To operate projects more efficiently, reduce turbine passage and reduce supersaturation, by April 15, 1996: (1) all turbines must operate at 1 percent of peak efficiency; (2) no unscreened units or units with inoperable screens may operate during migration season (March 1 to December 31); (3) install flip lips where they do not now exist; including Ice Harbor by January 1996; (4) the Ice Harbor bypass system must be completed by January 1996; and (5) investigate new spillway, tainter gate and stilling basin designs to prevent increasing dissolved gas levels. BPA to fund spill management and monitoring program; monitoring will include gas supersaturation and its effects on salmon and steelhead passing through dam turbines, collection and bypass systems, spillways, adult ladders, and other mechanisms, "particularly in connection with mainstem reservoir drawdowns."

Draft: The various spill and gas amendments (and proposals to operate turbines at 1 percent of peak efficiency) were noted in connection with recommendations above. Idaho's recommendation was covered in Option 3, Spill and Turbine Operation, and proposed new Section 5.7C.2 (in general Section 5 amendments).

Findings: The Council adopted the recommendation, as described above.

Program Section(s): 5.8A.11, 5.8A.12, 5.7C (spill/gas abatement measures)
Source: Natural Resources Defense Council, et al.; Idaho Rivers United
Recommendation No.: 5-4, 5-6

Recommendation: NRDC's recommendation corresponded to those of the tribes and agencies: The Corps should provide spill to attain 80 percent FPE for all juvenile migrants. The Fish Passage Center is to develop, and Corps is to implement, a monitoring program for ambient supersaturation levels, symptoms of gas bubble trauma, and systemwide gas and other effects of spill. The Corps should manage spill in close cooperation with the Fish Passage Center to ensure appropriate responses to monitoring information. "Gas-bubble" data is to be considered along with data on temperature, exposure time, passage conditions, and comparative risks of other means of passage. The objective is to minimize harmful effects of gas-bubble trauma on adults and juveniles without increasing relative risks in dam passage.

By April 1995 the Corps should design and install prototype surface-oriented collectors at The Dalles and Lower Granite, and prototype baffles on the spillway gates at Lower Granite, and operate and monitor them to improve spill efficiency, control nitrogen supersaturation and increase FPE. Prototype devices at Lower Granite must be able to operate at near spillway crest. The Corps is to initiate planning for expedited installation of these at all mainstem dams based on 1995 and 1996 monitoring results. Also, the Corps is to complete installation of flip lips and other devices to control supersaturation at all mainstem dams on an expedited schedule, and to test prototypes of "other experimental devices" on an expedited schedule.

Draft: Option 5, Spill (Options 2 and 3, Spill, are similar), and proposed new Section 5.7C.2 addressed this recommendation.

Findings: The Council adopted the recommendation, for the reasons discussed above. However, the Council endorses spill as a means of passage only until better means are available for passage of juvenile migrants past the dams.

Program Section(s): 5.8B (Mid-Columbia passage)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: By 1996, the Mid-Columbia PUDs, with fishery agencies and tribal consultation, should complete structural analysis of all mainstem fishways. Provide for immediate structural corrections and point and non-point pollution source correction where needed.

CRITFC also recommended a number of actions at the Mid-Columbia projects as part of the proposed PIES II program funded by the Corps, with consultation and item approval by fishery agencies and tribes:

(a) Rocky Reach: By 1995 install prototype surface flow system; immediately investigate installation of a sluiceway at units 1-4; repair/modify spillway so "spillbays closest to turbine units can operate"; by 1996 install dissolved gas abatement structures (Chelan County PUD, Sections 5.8B.4, 5.8B.6).

(b) Rock Island: Cease current screen program; avoid operation of powerhouse I; investigate systems to alleviate dissolved gas (Chelan County PUD, Sections 5.8B.5, 5.8B.6).

(c) Priest Rapids and Wanapum: By 1996 install prototype surface flow system; investigate and if feasible install spillway deflectors or other systems to alleviate dissolved gas, particularly at Wanapum (Grant County PUD, Sections 5.8B.7 to 5.8B.10).

Draft: Option 4, Bypass, and proposed new Section 6.1G reflected this recommendation.

Comments: At Rocky Reach, Chelan reported that it has tested turbine intake screens and determined they are ineffective. It is testing a surface collection system and will install it if and when prototype tests show it to be effective. Chelan also stated that CRITFC's recommendation for changes in spillway operations are not supported by studies they cite. At Rock Island, Chelan will conduct prototype testing of a juvenile fish screening and bypass system by 1995. The testing plan is being done with the blessing of the Rock Island Coordinating Committee of which CRITFC is a member, according to Chelan, and therefore it is inconsistent for CRITFC to propose that screen development cease while endorsing the plan of the committee.

Findings: The Council adopted the recommendation (in a renumbered Section 5.6B), except with regard to Rock Island Dam. At Rock Island, a prototype test is called for in the FERC settlement agreement that CRITFC helped negotiate, and the test is scheduled for 1995. Once the test is conducted, all parties will be in a better position to evaluate whether the screening program should be abandoned. In the meantime, the PUD says that it is already avoiding operation of the first powerhouse. The Council suggests that the Rock Island Coordinating Committee would be the best forum to discuss these issues initially. The Council rejects this aspect of the recommendation on the ground that it would be a less effective way to protect, mitigate and enhance fish and wildlife than the program measure, 16 USC § 839b(h)(7)(C).

Program Section(s): 5.8B.4 (complete installation of bypass screens/Rocky Reach)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: Delete end of last sentence in Section 5.8B.4, which calls for Chelan County PUD to evaluate and install as an alternative a bypass system "similar to the surface water downstream passage sluiceways at The Dalles and Ice Harbor dams: PNUCC intends this change to leave Chelan free to consider some sort of Wells-type surface collection system as an alternative.

Draft: The recommendation was addressed in Option 1, Public Utility District Bypass, and Option 2, Mid-Columbia Dam Passage.

Findings: The Council adopted this recommendation (in a section renumbered 5.6B.3).

Program Section(s): New 5.8B.11 (complete installation of bypass screens/
Grant County PUD)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: New Section 5.8B.11 calls for Grant County PUD to explore “promising new approaches to fish bypass technology, including the use of surface collection systems.” If research results “indicate high efficiency” compared to screen modifications and show no reason to preclude use of a new technique, use surface collection instead of turbine intake screens.

Draft: The recommendation was addressed in Option 1, Public Utility District Bypass, and Option 2, Mid-Columbia Dam Passage.

Findings: The Council adopted this recommendation, at Section 5.6B.10.

SECTION 5.9: REDUCE PREDATION⁶

Program Section(s): 5.9 (reduce predation)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: PNUCC recommended significant and lengthy additions to the predation section, including a change in the title of Section 5.9 (and thus a partial shift in focus) to Reduce Predation “and Competition.” The changes are highlighted by recommended edits to the introductory text, and in the substantive measures. The section in the 1994 program began by noting that hydropower development has resulted in a favorable environment for salmon predators. PNUCC recommended revising this to state that “[h]ydropower development, introduction of non-native species, development of some hatchery programs, and greatly increased numbers of seals and seal lions as a result of protection of the Marine Mammals Act, have resulted in an increase in the adverse effects of predation and competition on salmon.” PNUCC also proposed a new sentence at the end of the first paragraph, after the discussion of predation conditions, that noted that the introduction of non-native species and “certain hatchery management practices” have led to increased competition for weak runs. Proposed substantive changes encompassed performance standards and substantive measures for squawfish, shad, other non-native fishes, steelhead, trout, birds, and marine mammals.

Draft: Option 1, Predation and Competition reflected the recommendation. Option 2, Predation and Competition, proposed a scaled-down version of the same.

Comments: PNUCC urged the Council to follow the NMFS Recovery Team recommendations, which this recommendation reflected. The Douglas County PUD and PNGC supported the recommendation. Chelan County PUD supported increased predator control for fish, birds and mammals; but did not believe the predator program should get bogged down in a great deal of unnecessary research.

The Corps of Engineers said that predation control should continue as long as research shows that it is increasing survival to adult returns; competition and predation, especially from introduced species and marine mammals, are major factors affecting survival of some stocks. The Corps supported additional studies to

⁶ **Note:** This section of the original 1994 Fish and Wildlife Program -- concerning predation -- has been renumbered Section 5.7 in the amended program.

gather scientific information on predation and competition but believed that some problems are so severe that they warranted immediate management action. They also supported the use of volitional releases at hatcheries to lessen the impact of massive outmigrations of hatchery fish on wild fish. The Corps suggested that prior to eliminating shad above Bonneville we needed to understand the ecology of the shad and the implications for other species of its elimination.

Idaho Department of Fish and Game said it is unaware of evidence that reducing predation by 50 percent is feasible (PNUCC's recommendation). In 1993, the squawfish program fell far short of this level.

Finding: The Council adopted the recommendation, renumbered as Section 5.7. In response to Idaho Fish and Game's comment, the Council intends the 50 percent reduction in squawfish consumption as an objective. It is a high target, but monitoring and evaluation should tell us whether this is possible.

Program Section(s): 5.9A.1, 5.9B.1 (squawfish performance standard/control actions)
Source: ODFW
Recommendation No.: 5-8

Recommendation: Revise to call for harvest of predator-sized squawfish to achieve an exploitation goal of 10-20 percent; evaluate biological effectiveness; continue to explore different technologies to remove squawfish and increase efficiency of existing technologies.

Draft: Not addressed in a proposed amendment. Option 1, Predation and Competition, and its reduced counterpart in Option 2, included measures for evaluating the effectiveness of the squawfish program and for exploring new and better methods for squawfish removal. Both called for a reduction in the squawfish population "greater than 20 percent," which was more than ODFW called for.

Finding: The Council amended the program to call for more than a 20 percent reduction in the squawfish population, Section 5.7A.1, an increase from the prior program, and the ancillary or indirect measurement of exploitation rates, Section 5.7B.3. The Council intends the 50 percent reduction in squawfish consumption as an objective. It is a high target, but monitoring and evaluation should tell us whether this is possible. If achievable, a 50 percent reduction should be more effective protection, mitigation and enhancement of fish and wildlife than ODFW's recommendation, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.9B (bypass system release sites)
Source: ODFW
Recommendation No.: 5-8

Recommendation: Revise to call for testing and installation of bypass outfall structures that allow for release in different locations, re-location of bypass outfalls to areas of lower predation, and implementation of project operations that reduce predation below bypass outfalls.

Draft: This recommendation was reflected in three places in the draft rule -- in Option 2, Predation and Competition, as part of a revised Section 5.9B; in Option 2, Bypass, as a proposed revision to Section 5.8A.3; and in proposed revisions to Section 5.8A.3 in the general Section 5 amendments. In comments, the Corps of Engineers said that moving bypass outfalls to avoid predators is probably not a long-term solution as predators are likely to respond to shifts in location of the prey base. The Corps suggested the use of short-haul transportation and alternate release strategies rather than moving bypass outfalls.

Finding: The Council adopted the recommendation in Section 5.6A.3, calling both for general consideration of relocating bypass outfalls and specifically for the relocation by 1998 of the outfall at Bonneville Dam. Whether or not this is an effective strategy will be addressed in testing and evaluation.

SECTION 5.10: TRANSPORTATION⁷

Program Section(s): 5.10 (transportation)
Source: CRITFC, ODFW, Natural Resources Defense Council, et al.; Idaho Rivers United
Recommendation No.: 5-2, 5-8, 5-4, 5-6

Recommendation: CRITFC recommended ceasing all transportation of juvenile salmonids. ODFW agreed, adding: "Modify transport and other facilities to allow full-flow bypass and off-line juvenile sampling." NRDC and Idaho Rivers also recommending ceasing the transportation of juvenile salmonids, adding that the fish agencies and tribes may call for transportation "on a one-time basis due to special river conditions beyond human control."

Draft: Option 4, Transportation, was based on CRITFC's recommendation, and thus generally reflected ODFW's as well, although the proposed amendment did not include the additional language from ODFW noted above. Option 5, Transportation, was based on the NRDC/Idaho Rivers recommendation.

Comments:

Some commenters were broadly supportive of the recommendation to end transportation, including CRITFC and the Save Our Wild Salmon coalition.

Others said that transportation is a necessary, but temporary, expedient. Washington Department of Fish and Wildlife commented that notwithstanding the fact that Snake River runs have continued to decline in spite of the transportation of the majority of outmigrating smolts in most years, transportation improvements should be pursued and evaluated as a potential component of a long-term strategy. Fishery managers should devise an experimental program limited to Lower Granite and Little Goose dams: tagged fish should be released for inriver migration as well as transport survival; provide for higher levels of transportation under low-flow conditions; and highest priority for marking and evaluation should be given to studies aimed at analyzing adult returns. In the short-term, transportation of summer migrants should continue under guidelines proposed by fishery managers; experimental in-river releases should be allowed to develop comparative survival information against transported summer migrants. These experiments may have to rely primarily on Lyons Ferry hatchery production.

Idaho Fish and Game urged the Council to emphasize in-river migration over transportation, which should be used only as a last resort. IDFG said that the CRITFC recommendation, included in Option 4, is too rigid in calling for a complete ban. Whether to use transportation should be decided by fish managers, and Option 2's spread-the-risk approach is a good policy. IDFG also said that the Corps should immediately install a fish separator at Lower Granite; otherwise, the proposed transportation improvements will not yield meaningful improvements in smolt survival. Idaho also provided a significant amount of documentation and references on what it believes is the best available science on transportation. CBFWA commented that the fish managers should decide when to stop transportation, with the long term objective of complete elimination of

⁷ Note: This section of the original 1994 Fish and Wildlife Program -- concerning transportation -- has been renumbered Section 5.8 in the amended program.

transportation. CBFWA provided extensive comments on transportation research and reports to justify its scientific position on transportation and to rebut the arguments of those favoring transportation, discussing the behavioral, physiological and genetic impacts of transportation; the relationship to fish disease; homing impairment; impacts from holding fish; and the flaws inherent in the design and conduct of much transportation research. The Shoshone-Bannock Tribes said that transportation of salmon should be used only as a temporary measure until the dams are fixed.

William Stelle, Regional Director of NMFS, said that NMFS supports continued transportation and an evaluation of transportation survival. The UCUTs disagreed with the CRITFC/CBFWA opinion on transportation, saying that transportation is useful under low flow conditions; may be prudent to reduce use of transportation in normal or high flow years.

Other commenters were broadly supportive of the transportation program, e.g., Columbia County, Oregon, Commissioner Dale Heimuller, Port of Portland and City of Irrigon. BPA fully supported transportation as part of an overall salmon recovery effort, on the grounds that, in BPA's view, research shows transported fish nearly always return at a higher rate than inriver migrants. BPA also commented that the regional debate over juvenile fish transportation may dictate some spread-the-risk efforts, but it is imperative that we first evaluate the possible adverse effects associated with "spreading the risk," particularly given the biological information on the benefits of transportation. PNUCC urged maximum transportation, while incorporating the results of on-going research, stating that the use of transportation was recommended by the Snake River Recovery Team and the Mundy 1994 peer review. PNUCC also urged the following improvements in the transportation program: make collection more efficient; acquire new barges to facilitate direct loading; test new release strategies and sites; and develop improved exit portals from barges to reduce stress and predation. PNGC's comments were similar, as were comments of the Columbia River Alliance, which also urged installation of a juvenile salmon collector at Lower Granite Dam. The CRA stated that share-the-risk practices for increased inriver passage should be used only in average to near-average water conditions.

The DSIs contended that the best available science overwhelmingly favors continued reliance on transportation to improve survival of migrating juvenile salmon. The DSIs supported operational measures that maximize the use of transportation at all flow levels. Reducing passage mortality to the natural juvenile migration mortality level -- which may well be achieved through the transportation program alone -- would discharge the Council's job of offsetting mortality arising from the mainstem projects. Chelan County PUD said that research shows that barging still needs improvement to reduce the effects of stress and to improve survival from release to ocean. Chelan recommended reduced loading densities; intensified efforts to separate chinook from steelhead; experimentation with alternative release strategies; and intensified evaluation of transportation versus in-river migration through the lower river. Chelan did not support termination of transportation from McNary because it has shown substantial benefit to subyearling chinook from the mid-Columbia and Hanford reach.

The Corps of Engineers favored continued use of transportation as described in Option 1, saying that there is no scientific evidence that would support leaving more fish in the river, as suggested by a spread the risk approach. "Minimizing transportation would be counterproductive to the Council's goal of doubling fish runs and the requirements placed on federal agencies under the Endangered Species Act (ESA)." According to the Corps, no data demonstrates adverse impacts from transportation in the areas of adult homing or selective mortality to certain populations; indeed, taking such a position would be in direct conflict with the data for steelhead, fall Chinook, and spring Chinook. "In contrast to the CBFWA report which correlated the decline in the Snake River with the reliance on transportation, it is entirely possible that the only reason there are Snake River stocks now is because of the transportation program." The Corps added that transportation should be maximized for all species until survival from in-river migration can be raised to a level above that

provided by transportation; unless in-river survival can be elevated above transport survival for all species under all flow conditions, transport should continue for species where it provides higher survival; and transport cannot be stopped because it is a condition of the National Marine Fisheries Service's Biological Opinion for ESA-listed stocks.

With regard to proposed improvements in transportation, while the Corps supported the use of additional barges if needed, it said that such barges must be specifically designed for transporting fish and are not available for leasing. Additionally, the Corps stated that if there is no difference in truck survival vs. barge survival, the additional expense of increased barging cannot be justified. The Corps was equivocal about noise reduction, saying at one point that research has demonstrated that noise level reduction in barges is unnecessary, and at another point that "[f]urther investigation of noise reduction and alternate designs and construction materials is recommended for the SCS Phase II study."

Mark Reller, State of Montana representative, noted that the Council needs to consider whether the elimination of transportation might decrease the overall survival of steelhead.

Finding: In the mainstem hypotheses rulemaking process, the Council extensively reviewed the scientific and policy debate over the biological value of the juvenile transportation program. Section 5.0E, Mainstem Hypotheses, and the Response to Comments for this particular rulemaking, which contains the response to comments for the mainstem hypotheses rulemaking, explain in detail the Council's review of this issue. The Council agrees that transportation is not a substitute for changes in the river, and that transportation decisions should be made by the fish managers. However, in view of the ongoing scientific debate over the merits of transportation, and the differing views of the fish and wildlife managers shown in the comments, the Council does not conclude that transportation necessarily has no benefits. Rather, the Council believes that it would better complement the activities of the fish and wildlife agencies and Indian tribes by not attempting to resolve this debate as a matter of policy, and instead supporting a spread-the-risk evaluation of transportation versus in-river methods without impeding substantial improvements in in-river passage or transportation. The Council concluded that these measures are a more effective way to protect, mitigate and enhance fish and wildlife than the CRITFC, ODFW, NRDC and Idaho Rivers recommendations, 16 U.S.C. § 839b(h)(7)(C). Provisions adopted by the Council concerning the operation of the transportation program are discussed in the findings immediately below on IDFG's transportation recommendation (5-12), while provisions calling for improvements in the transportation program so long as it continues are discussed below in the findings on PNUCC's substantive recommendation (5-1).

Program Section(s): 5.10 (transportation)
Source: Idaho Department of Fish and Game
Recommendation No.: 5-12

Recommendation: Idaho presented a slightly different transportation recommendation, calling for the deletion of Section 5.10, including all subsections, replacing it with a limited transportation program that began by noting the significant uncertainties regarding the benefits of transportation and stating that the evidence indicates "current transportation methods may have a negative impact on stock fitness" and that 15 years of aggressive transportation has failed to halt decline. Transportation can neither substitute for good in-river conditions or effectively mitigate for bad. Thus, Council must emphasize in-river migration over transportation. The fishery managers, through the Fish Passage Advisory Committee, are best able to decide when and where to transport; transportation is to be based on in-season monitoring of flows and conducted in accordance with a Salmon Transportation Plan prepared annually by FPAC, in coordination with NMFS and Corps.

Idaho recommended a set of conditions to govern transportation: No transportation of yearling chinook migrants except in “emergency situations;” transportation of subyearling migrants may occur in Snake after subyearling migrants are 10 percent of daily total chinook collection at Lower Granite for three consecutive days; subyearling transportation not to occur in Columbia until subyearling migrants are 80 percent of daily total chinook collection at McNary for three consecutive days. Idaho also recommended immediate installation of a new separator at Lower Granite to separate juvenile salmon from juvenile steelhead to permit juvenile salmon to bypass transportation and continue in-river migration.

Draft: The recommendation was included in Option 3, Transportation.

Finding: The Council adopted the recommendation in substance, renumbered to Section 5.8, although not in every detail and not including the ban on yearling migrant transportation except in emergency conditions. The Council adopted changes that agree that transportation is not a substitute for changes in the river, and that transportation decisions should be made by the fish managers. The Council also adopted the proposed terms and conditions for subyearling migration, subject to consultation with NMFS, Section 5.8A.1. In view of the ongoing scientific debate over the merits of transportation, and the differing views of the fish and wildlife managers shown in the comments, the Council did not attempt to specify in every situation the terms and conditions under which transportation should occur, except to call for such decisions to be made in the context of a spread-the-risk evaluation of transportation versus in-river methods. The Council also called for NMFS to develop and ensure implementation of its own evaluation program. See Sections 5.0, 5.8A.2 to 5.8A.4. At the same time, the Council recognizes that an evaluation program has the potential for adversely affecting depressed fish populations through marking and handling stress. The Council calls for NMFS to minimize these impacts and to minimize the number of fish marked, especially in years in which the number of outmigrating fish is unusually low. A separator at Lower Granite Dam will not be necessary if drawdown is implemented. The Council believes that this approach as a whole best complements the activities of the fish and wildlife agencies and the tribes, and helps ensure that the best available scientific knowledge is brought to bear on this question. In these respects, the Council concluded that the adopted measures are a more effective way to protect, mitigate and enhance fish and wildlife than the recommendation, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.10 (transportation)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: PNUCC proposed amendments to much of Section 5.10, with the intent of improving and supporting the use of transportation in line with the recommendations of the NMFS Recovery Team. PNUCC also sought a different rhetorical stance by the Council. The position PNUCC would have the Council take is best highlighted in the changes PNUCC proposed to the introductory text to Section 5.10, which would have been altered greatly (compared to minor changes PNUCC recommended to implementing measures). PNUCC would have deleted all but the first paragraph and replaced it with three new ones, emphasizing that transportation in the near-term provides the best hope for listed species and weak-stock recovery; plays an important role in mix of techniques to decrease mortality, especially as an alternative to in-river migration in “deleterious” river conditions; and significantly increases survival over inriver migration in low flow years, despite efforts to enhance passage conditions.

PNUCC’s text revisions also stated that “the benefits for some species exposed to certain flow conditions remain unquantified;” benefits appear to vary widely among species, between collection points and in different passage conditions; steelhead and fall chinook (“at least in the Columbia”) seem to be benefit the most; “benefits for spring and summer chinook and sockeye are less clear;” and “most scientists who have

examined the issue believe that transportation can increase fish survival under some conditions. For these reasons, “data are necessary to properly manage and implement transportation measures.”

Ultimately, however, PNUCC would emphasize that a “functional, comprehensive transportation program exists that has proven beneficial” to juvenile migrants. The Fish Transportation Oversight Team (FTOT), to be comprised of biologists from the Corps, NMFS and IDFG is to amend the existing program “to incorporate improvements based on peer reviewed scientific literature; in particular, the recommendations of the Snake River Salmon Recovery Team.” Monitor, review, and conduct an annual testing program to measure effectiveness of program and “modify if new data warrants.”

Draft: While Option 1 was based partly on PNUCC’s recommendation for continued transportation, it did not incorporate the recommendation for wholesale changes in the introductory text. The introductory text revisions in Option 2, Transportation, are intended to reflect the uncertainties with transportation, a spread-the-risk policy and an adaptive management experiment to evaluate transportation, and did not reflect PNUCC’s views. Comments on transportation were discussed in connection with the CRITFC, ODFW, NRDC recommendations, above. Note that the Corps commented that FTOT no longer exists, replaced by other management entities.

Finding: The Council rejected the recommendation. The Council concluded that the adopted recommendations better complement the existing and future activities of the fish and wildlife agencies and Indian tribes, 16 U.S.C. § 839b(h)(6)(A), better ensure that the best available scientific knowledge is brought to bear on this question, 16 U.S.C. § 839b(h)(6)(B), and accordingly will more effectively protect, mitigate and enhance fish and wildlife than this recommendation, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.10A.1 to 5.10A.3, 5.10A.5, 5.10A.7 to 5.10A.10 (transportation)
Source: PNUCC
Recommendation No.: 5-1

Recommendation: PNUCC proposed amendments to eight of the twelve subsections to Section 5.10. The changes were not extensive, and are summarized here:

Section 5.10A.1: Revise Section 5.10A.1 to call for “FTOT” (not the “Fishery Managers”) to transport “during conditions when the available scientific evidence indicates that the transportation benefit ratio is 1:1 or greater” (more specific than present call to transport when scientific evidence indicates survival to adult will be greater with transportation than without).

Section 5.10A.2: Revise only to the extent that it will be “FTOT” not “Fishery Managers” that will provide test fish and participate in transportation evaluation.

Section 5.10A.3: Revise to add NMFS and delete tribes from the list of entities that comprise FTOT, and delete requirement that FTOT submit annual guidelines and report to FOEC (just to Council).

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Section 5.10A.5: Delete last two sentences concerning coordination of transportation research with the Fish Passage Development and Evaluation Program and the call for a report to the Council in 1993 of an outline of transportation evaluation. Add a sentence to state that transportation evaluation “should include the testing of release strategies and locations” below Bonneville.

Section 5.10A.7: Revise this section to call for the Corps to fund transport expenses in accordance with provisions developed by “FTOT and the Snake River Recovery Team” (not “fish and wildlife agencies

and the tribes”). Also add that the Corps is to “acquire additional barges immediately” to facilitate “direct loading to barges” from the bypass systems and “tests of transported smolt release strategies and locations.”

Section 5.10A.8: Add to the fall chinook transportation evaluation that the Corps should investigate “design changes to the barges’ exit portals to minimize smolt stress and predation during and after release.” State explicitly that the evaluation is to be used to modify and improve the transportation program.

Section 5.10A.9: Add to this list of actions to be taken to improve transportation facilities and operations: (a) an evaluation of the “usefulness of surface collection systems” for “safer transportation;” (b) an explicit statement that release operations should be improved by dispersing fish “at varied locations below Bonneville Dam and near the estuary;” and, (c) use survival rates through reservoirs and past dams to “determine whether collection from the dams or from a new facility at the head of Lower Granite Reservoir is the most effective path to follow.” The one-time call for a status report to the Council on transportation improvements is turned into an annual reporting requirement.

Section 5.10A.10: Revise to delete the use of the term “preliminary” to describe the evaluations called for in this section, and change the one-time report to an annual report. Also, delete most of the net pen evaluation language and revise to call for an evaluation of the feasibility and benefits of net pens “in conjunction with, or in lieu of, existing barges.”

Draft: Some of these recommendations were proposed in the draft amendments. The two transportation amendments in Option 1, both titled Transportation, called for an investigation of design changes in barge exits, an evaluation of the possibility and benefits of reducing noise in the barges, the acquisition of enough barges to allow for direct loading, a maximum holding time in the barges of 12 hours, and an evaluation of different smolt release strategies. Option 2, Adaptive Management Introduction, described the Council’s transportation hypothesis for experimental study and an outline of needed improvements in transportation. Option 2, Transportation (two different amendments with this name) further described the nature of the controversy over transportation, the nature of the spread-the-risk transportation policy, and the various improvements needed in the transportation system, which were similar to or repeated from the Option 1 amendments. The remaining aspects of the recommendation were not proposed in the draft.

Finding: As the Corps pointed out in its comments, FTOT no longer exists, and so the first three recommendations are moot. Regarding the recommendation for an evaluation of the usefulness of surface collection systems for safer transportation, the Council adopted measures to develop surface bypass systems in Section 5.6 of the program. Sections 5.8A.5 to 5.8A.7 call for improved facilities and operations, and thereby covers many of PNUCC’s concern and specific recommendations for improvement, while also respecting that the fish managers will make judgments regarding the extent to which surface bypass systems will be used for transportation. The recommendation to use survival rates through reservoirs and past dams to “determine whether collection from the dams or from a new facility at the head of Lower Granite Reservoir is the most effective path to follow,” should be appropriately addressed by the spread-the-risk evaluation. The Council deleted the language in Section 5.8A.2 (former Section 5.10A.5) as recommended, and called for a spread-the-risk transportation evaluation. The program already includes measures to explore alternative release sites below Bonneville Dam, Section 5.8A.6. The Council adopted the recommendation to investigate design changes to barge exit portals, in the same section.

Regarding the suggested revision to former Section 5.10A.1 to call for transport “during conditions when the available scientific evidence indicates that the transportation benefit ratio is 1:1 or greater,” the Council concluded that it would more effectively complement the activities of the fish and wildlife agencies and Indian tribes by leaving such transportation judgments to them, within the context of a spread-the-risk evaluation,

16 U.S.C. § 839b(h)(6)(A), (7)(B). The Council did not call for an expansion of the existing net pen provision, but did continue the current evaluation. Additional information will need to be obtained on this concept before widespread use is in order. Based on materials submitted in the FERC proceeding for the Priest Rapids project, it does not appear that more widespread use of net pen transportation complements the activities of the fish and wildlife agencies and Indian tribes, 16 U.S.C. § 839b(h)(6)(A), and so the existing measure is a more effective way to protect, mitigate and enhance fish and wildlife than the recommendation, 16 U.S.C. § 839b(h)(7)(C). The Council did not adopt the recommendation that the Corps “acquire additional barges immediately” to facilitate “direct loading to barges” from the bypass systems and “tests of transported smolt release strategies and locations.” The spread-the-risk strategy should reduce the need for additional barges even with measures to decrease loading densities, and additional barges may not be needed. The Council called instead simply for the Corps to take whatever steps are needed to permit direct loading. In this respect, the adopted measure is less costly than the recommended measure, 16 U.S.C. § 839b(h)(6)(C), and therefore a more effective way to protect, mitigate and enhance fish and wildlife than the recommendation, 16 U.S.C. § 839b(h)(7)(C).

Program Section(s): 5.10 (transportation)

Source: Corps of Engineers

Recommendation No.: 5-1

Recommendation: The Corps recommended a number of minor changes to the transportation sections, which are summarized together here:

Sections 5.10A.2, 5.10A.5: Revise to encourage fishery managers to provide test fish for “research to establish current inriver survival and current transport survival levels.”

Section 5.10A.4: Revise to note that FTOT annual work plan process has been incorporated into Corps’ Fish Passage Plan and is now titled “Corps of Engineers Juvenile Fish Transportation Plan.”

Sections 5.10A.8 to 5.10A.10: Revise to reflect evaluations and schedules in SCS Phase I draft report concerning improvements in transportation facilities and operations, including new barges, barge chillers, reducing barge loading densities, shading holding raceways, dispersed release strategies, upstream juvenile fish collection facilities, use of net pens, etc. Call for final SCS Phase I report by scheduled date of October 1994. Call for 9 to 11 additional barges to achieve direct loading as recommended by Recovery Team and NMFS.

Section 5.10A.8: Revise to note that information indicates further evaluation of barge refrigeration should be a low priority. Also revise to note that Corps has evaluated use of barges for fall chinook, that trucking stress and mortality rates should be reevaluated, and to state that it is unreasonable to barge fall chinook unless trucking stress and mortality are found to be significantly higher than barging mortality.

Section 5.10A.10: Revise to call for further consideration of net pen and upstream collection concepts. Delete call for further consideration of pipelines and canals.

Draft: See analysis of PNUCC’s transportation recommendation above.

Finding: See analysis of PNUCC’s transportation recommendation above.

Program Section(s): 5.10A.10(2) (smolt transportation channel)

Source: Fish Passage, Inc.
Recommendation No.: 5-13

Recommendation: Boylan Pipeline. Section 5.10A.10(2) calls on the Corps to study the feasibility of an alternate stream channel or pipeline for smolt transport. Fish Passage, Inc. stated that it was not seeking to amend this section, but rather that a study of its proposed Boylan Pipeline would implement this measure.

Draft: Proposed revisions to Section 5.10A.10 called for expedited testing and evaluation of a pipeline idea. In comment, the Corps of Engineers, which has preliminarily evaluated the pipeline concept, stated that a submerged pipeline was not supported by scientific information.

Finding: The Council deleted the measure calling for evaluation of the pipeline concept, finding it to be unsupported by the best available scientific knowledge, 16 U.S.C. §§ 839b(h)(6)(B), (7)(B).

SECTION 6: ADULT SALMON MIGRATION

Program Section(s): 6 (introductory text)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: The last sentence of the third paragraph of the introductory text to Section 6 states that reducing passage mortality “could increase significantly the number of adult salmon available for harvest and production.” PNUCC would alter this to say that reducing passage mortality “could increase significantly adult salmon escapement.”

Draft: This recommendation was incorporated into the draft by revising the sentence to state that reducing passage mortality could increase significantly the number of adult salmon available for “harvest and escapement.”

Finding: The Council adopted the recommendation.

Program Section(s): 6 (introductory text)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: Evaluate the impact of marine mammal and harvest related injuries. PNUCC recommended adding a paragraph at the end of the introductory text to Section 6 stating: “Furthermore, the increase in marine mammal wounds observed in migrating adults requires evaluation to determine their contribution to adult loss between dams and their contribution to the incidence of disease at passage facilities. The incidence of harvest related injuries also needs to be evaluated to identify the relationship between harvest and adult loss between dams, and disease observed at passage facilities.” PNUCC also recommended a substantive change to Section 6.1B.4, which this language reflected.

Draft: The draft did not propose this language in section 6, but addressed it in section 5.9.

Finding: The substance of this recommendation is addressed below, in connection with the recommendation for Section 6.1B.4.

Program Section(s): 6.1A.1 (mainstem operations and facilities/adult passage)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Study the effects of increased spill for juveniles on adult passage and develop methods for modifying adult passage facilities to compensate.

Draft: Proposed in the draft amendments as a new Section 6.1B.4.

Finding: The Council adopted the recommendation at Section 6.1B.4, changing only the implementing agency, from the Corps to NMFS.

Program Section(s): 6.1A.4 (mainstem operations and facilities/adult passage)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Section 6.1A.4 describes projects to upgrade adult passage facilities. Add to the list, from System Configuration Study (SCS), Phase I Draft Report: (1) additional ladders at Lower Granite and Little Goose; (2) increasing attraction water for fish ladder collection channels and entrances; (3) adult collection channel modifications at McNary; and (4) adult channel extensions at Lower Granite.

Draft: Proposed as additions to Section 6.1A.4.

Finding: The Council adopted the recommendation, and added a reference to the fish passage committee created in Section 5.3B.14.

Program Section(s): 6.1A.5 (mainstem operations and facilities/adult passage)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 6.1A.5 to delete the reference to “two additional” biologists to inspect juvenile and adult fishways. Inspections will be performed by lead and assistant biologist based at Lower Monumental and by other project staff.

Draft: Included as proposed revision to Section 6.1A.5.

Finding: The Council adopted the recommendation, and revised the measure to call for “an adequate number of trained staff.”

Program Section(s): 6.1A (mainstem operations and facilities/adult passage)
Source: Idaho Rivers United
Recommendation No.: 5-6

Recommendation: Ice Harbor adult trap and haul with drawdown. As a measure associated with its proposal for a spillway-crest drawdown of the four lower Snake reservoirs in 1995, Idaho Rivers proposed that by 1995 adults be trapped and transported from just below Ice Harbor to a release near Lewiston above Lower Granite Dam. The Corps would design and install the necessary facilities and conduct the trap and haul operation pursuant to protocols developed by the fishery agencies and tribes and in consultation and cooperation with those agencies and tribes.

Draft: The recommendation was included in Option 5, Trap & Haul Adult Migrants.

Finding: The Council addressed this recommendation in the findings in Section 5.5 responding to Idaho Rivers’ drawdown recommendation. As noted there, the Council concluded that the risks of adult transportation, or trap-and-haul, especially the important Tucannon run, outweigh the potential benefits of emergency drawdown. The fishery managers also did not support the trap-and-haul recommendation.

Program Section(s): 6.1A (mainstem operations and facilities/adult passage)
Source: ODFW
Recommendation No.: 5-8

Recommendation: To minimize delays in adult migration and to enhance survival of adults at projects and in reservoirs, ODFW recommended that (1) all fishways be operated according to criteria in DFOP; (2) all turbines be operated within 1 percent of peak operating efficiency during entire migration period; (3) eliminate power peaking and zero-flow operations; (4) operate spillways and turbines to enhance passage; (5) reduce fish ladder water temperatures; (6) install additional fish ladders; (7) install additional auxiliary water systems for attraction flow and improve entrances/exits of ladder systems.

Draft: This recommendation was included in Options 2 through 4, Turbine Operation and in proposed revisions to Section 6.1A.1, with two deviations. First, the proposed language called for fishways to be operated according to “agreed-upon criteria,” not according to DFOP criteria. Second, the proposed amendment called for the Corps to “minimize” power peaking, not eliminate it.

Comments: CBFWA supported the ODFW recommendation. Comments concerning the 1 percent efficiency were summarized above, in the findings on this issue in Section 5.8. Douglas County PUD did not specifically oppose this recommendation, but it did oppose a CRITFC recommendation that would have established ramping rates for flow fluctuations and drastically restricted peaking capabilities, contending that recommendations such as these were not supported by data as to their benefits yet could severely impact load following capabilities.

Finding: The Council adopted almost all of this recommendation in either Sections 5.6D (1 percent peak efficiency; see the discussion in findings above under former Section 5.8) or 6.1A, retaining the two modifications from the draft. First, instead of calling for reference to DFOP criteria, the Council called in Sections 5.3B.14, 5.3B.15 and 6.1A.1 for a fish passage committee and existing technical groups to work with fishery managers and project operators to evaluate and develop agreed-upon passage standards and criteria. The DFOP criteria and the Corps' Fish Passage criteria are virtually identical and extremely technical. The Council finds that it would be better for a group of technical experts to help the fish managers and project operators resolve the technical issues on operating criteria, and in this respect the Council did not adopt this recommendation, as a less effective way to protect, mitigate and enhance fish and wildlife, 16 USC § 839b(h)(7)(C). Second, with regard to peaking, the Council called for an evaluation of minimizing power peaking operations, rather than eliminating them. As the region's power system is currently configured, eliminating hydropower peaking capability would have enormous impacts. The Council cannot approve such a measure now, and still assure the region an adequate, efficient, economical and reliable power supply, 16 USC § 839b(h)(5). However, an evaluation of this concept may lead to better understanding of constraints and opportunities for minimizing the effects of flow fluctuations on salmon. The Council rejected the recommendation to implement such rates now, because the Council could not adopt it and still assure the region an adequate, efficient, economical and reliable power supply.

Program Section(s): 6.1A (mainstem operations and facilities/adult passage)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: Reduce use of power peaking and establish appropriate ramping rates for daily flow fluctuations at mainstem Columbia and Snake River dams. No more than 10 percent reduction or increase in total flow per 24 hour period. Beneficial impacts on adult passage are one justification.

Draft: This recommendation was in the proposed revision to Section 6.1A.1 and in Option 4, Constraints on Flow Variation (as a proposed revision to Section 5.1D).

Finding: The Council addressed this recommendation above with regard to Section 6.1A.1 and in the findings for Section 5.1D.4 (ramping rates).

Program Section(s): 6.1A (mainstem operations and facilities/adult passage)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: Inspect and modify adult fishways to conform to criteria in DFOP. The Corps will fund the tribes and fishery agencies' "frequent independent inspection and monitoring of adult fishways." The Corps should fund CRITFC "to complete development of an automated counting system capable of real time monitoring of adult passage at all mainstem dams on a 24 hour basis."

Draft: The recommendation was incorporated in various proposed amendments. Proposed Section 6.1A.2 called for the Corps to complete by the end of 1996 an evaluation of all mainstem adult passage facilities and then to make facility improvements as necessary. (Proposed Section 6.1G called separately for the Corps and the Mid-Columbia PUDs to complete a structural analysis of all mainstem fishways by 1996 and to make any needed immediate corrections to structural elements such as diffuser gratings and orifices.). Proposed revisions to Section 6.1A.1 called for the Corps to operate fishways according to "agreed-upon criteria," although not according to DFOP criteria. Proposed revisions to Section 6.1A.5 called on the Corps to regularly inspect the adult and juvenile passage facilities on a frequent basis (and not for the Corps to fund the fish agencies and tribes to do this).

With regard to "an automated counting system" ("such as video counting" according to CRITFC's explanation attached to their recommendation), existing Section 6.1B.5 called for a feasibility study by the end of 1993 from the Corps and BPA on the use of video counting or other automatic counting systems at adult facilities. The Corps proposed to change the date for the report to 1997. Appendix D, Proposed Amendment No. 64 (CRITFC wanted a full evaluation by 1995 in another recommendation). On the other hand, a proposed addition to Section 4.3C.1 called for the fish managers to submit to the Council by the end of 1994 a "proposal for the use of video counting technology for population monitoring at mainstem dams and at tributary dams and weirs." CRITFC recommended passive monitoring systems wherever possible; in that light note also the proposed revision to Section 6.1B.6, based on a PNUCC recommendation, that called on BPA and the Corps to install if feasible adult PIT-tag detectors in adult passage facilities at all mainstem dams.

CBFWA supported CRITFC's automatic video counting recommendation. The Corps of Engineers did not, stating that the automatic video counting of adults as recommended and developed by CRITFC is not considered adequate by the Corps or WDFW to replace manual counting and that further development is needed.

Finding: The Council largely adopted this recommendation in Section 6.1A and 6.1B. As noted in the finding on ODFW's recommendation above, instead of calling for reference to DFOP criteria, the Council called for a fish passage committee and existing technical groups to work with fishery managers and project operators to develop criteria. The DFOP criteria and the Corps' Fish Passage criteria are virtually identical and extremely technical. The Council finds that it would be more effective for the fish passage committee and existing technical groups to help the fish managers and project operators to resolve these technical issues, 16 USC § 839b(h)(7)(C). The Council left the video counting evaluation measure essentially intact, Section 6.1B.5, because the evaluation the Council calls for in the program has not yet been submitted, and so the Council cannot yet determine whether such monitoring would be effective, 16 USC §§ 839b(h)(5), (7)(C). The Council notes, however that the Corps criticizes this technology while failing to conduct the evaluation to determine whether the technology would be effective. The Council encourages the Corps to submit the evaluation report as soon as possible.

Program Section(s): 6.1A, 6.1E (mainstem and Mid-Columbia adult passage facilities)

Source: CRITFC
Recommendation No.: 5-2

Recommendation: CRITFC recommended a number of shorter-term and longer-term measures to improve the adult passage facilities and their operations. The short term measures: By 1996 the Corps and Mid-Columbia PUDs, with fishery agency and tribal consultation, will complete structural analysis of all adult fishways. Provide for immediate structural correction and point and non-point pollution source correction where needed. [This last recommendation apparently duplicated a recommendation made in another section of CRITFC's mainstem recommendations package: By 1995 the Corps should resolve all water quality problems at Portland District projects identified in PIES. At same time initiate a similar comprehensive review of passage facilities in Walla Walla District projects, correcting water quality problems by 1996.] Include in this analysis a comprehensive evaluation of impact of juvenile bypass systems on adult fall back.

As a long-term measure, the Corps is to secure funding for a "PIES II Program" which will provide funding for the following:

(a) Bonneville Dam: By 1997 correct all adult fishway modifications and improvements identified in PIES I.

(b) Lower Monumental, Little Goose, and Lower Granite: By 1995 complete modifications to lower adult fishway entrances to meet an 8 foot or greater depth criteria.

(c) Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells: By 1996 (1995 at Priest Rapids), correct all adult fishway deficiencies, including additional pumps at Rock Island and hydraulic problems in junction pools at Wells and Rocky Reach.

Draft: With regard to the fishway analysis, see the proposed revisions to Section 6.1A.2 and proposed new Section 6.1G. For the long-term measures, a proposed addition to Section 6.1A.4 called on the Corps to complete adult fishway modifications and improvements at Bonneville by 1997. No proposed amendment called on the Corps to take precisely the action recommended at Lower Monumental and Little Goose, but a proposed addition to Section 6.1A.1 called on the Corps to operate all existing fishways according to criteria and to "improve entrances and exits of existing ladders," and a proposed addition to Section 6.1A.4 called on the Corps to "construct adult collection channel extensions at Lower Granite and Little Goose dams by 1998. The recommendations concerning the mid-Columbia dams are at Sections 6.1E.2, 6.1E.3, 6.1E.4, 6.1E.5.

Comments: Chelan County PUD said that proposed measures for adult fishways call for the correction of deficiencies at PUD dams that have not yet been defined; Chelan cites a NMFS report of adult passage which indicated successful passage at all PUD dams; nothing in the report recommends additional pumps at Rock Island Dam. Douglas County PUD said that recent adult passage studies in mid-Columbia indicate excellent adult passage conditions. The PUD cited a 1994 NMFS study soon to be finalized, which indicates no significant adult passage problems at Wells or other mid-Columbia projects. Douglas is unaware of any adult fishway deficiencies or hydraulic problems in the junction pools at Wells, and strongly objects to inclusion of proposals specific to Wells project not raised first with District through process stipulated in Wells Settlement Agreement.

Finding: The Council largely adopted the recommendation in Sections 6.1A, 6.1E and 6.1G, adding in connection with the Mid-Columbia projects that this work should be coordinated through the appropriate coordinating committees in the FERC settlement processes. The Council approved (in Section 6.1A.4)

construction of adult collection channel extensions after a review of their need by a fish passage committee described in the program at Section 5.3B.14.

Program Section(s): 6.1B.4 (adult salmon research)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: Existing Section 6.1B.4 directs the Corps, BPA and Fishery Managers to identify, address and report on the causes of interdam adult losses, “including those not caused by dams.” PNUCC would change the quoted language to say “including marine mammal wounds, injuries related to harvest, and other factors unrelated to dams.” This section asks for a report in January 1994; PNUCC would extend the reporting date for an unspecified time.

Draft: The draft did not propose this language in Section 6, but addressed it in Section 5.9. Section 6.1B.4, which calls for a study of the cause of adult losses between dams, was inadvertently omitted from the draft amendments.

Finding: The Council adopted this recommendation, in that Sections 5.7B.28, 5.7B.29, 5.7B.31 and 5.7B.32 call for investigation of marine mammal predation on salmon, the incidence of removal of salmon from fishing gear, and studies to validate causes of scarring and size and species preference. Section 6.1B.7 already calls for studies of fish diseases associated with passage facilities. Former Section 6.1B.4, concerning the evaluation of inter-dam losses, was restored in the final document as Section 6.1B.8. The Council agrees that the reporting date should be extended in accordance with the lower Columbia River adult passage studies.

Program Section(s): 6.1B.6 (adult salmon research/adult PIT-tag detectors)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: Revise Section 6.1B.6 to state not that BPA will continue research and development of adult PIT-tag detectors, but instead that some unnamed entity or entities (the caption identifying Bonneville as the implementing entity is shown crossed-out) is to “[i]ninstall” such detectors “as soon as technically feasible.”

Draft: The proposed revision to Section 6.1B.6 called on BPA and the Corps, based on the PNUCC recommendation, to install if feasible adult PIT-tag detectors in adult passage facilities at all mainstem dams as soon as possible.

Finding: The Council adopted the revision it proposed in its draft, at Section 6.1B.6. The Council calls for the National Marine Fisheries Service to be included as an implementer of this measure, and calls for its implementation “as soon as possible,” which in substance is the same as the recommended language. Section 5.0F.13 also calls for an evaluation of the merits of adult PIT-tag detectors.

Program Section(s): 6.1B.6 (adult salmon research/adult PIT-tag detectors)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: PNUCC would delete the portion of Section 6.1B.6 stating that research on adult PIT-tag detectors should include “consideration of the capability of removing selected fish stocks for transportation.” No explanation was given for this proposed change.

Draft: The recommendation was not included in the draft.

Finding: The Council rejected the recommendation because in the future the region may need the capability to selectively remove adult fish. The recommendation would not protect, mitigate and enhance fish, 16 USC §§ 839b(h)(5), (7)(A).

Program Section(s): 6.1B, 6.1D.7 (adult salmon research)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise various sections of Section 6.1B and Section 6.1D.7 to reflect:

(1) FPDEP Index of Projected Fish Research (March 1994).

(2) From SCS Phase I Draft Report, promote research particularly in three areas: (a) mortality levels of adult fish passing through turbines, (b) possible modifications to adult fish ladders, such as shad barriers, and (c) water temperature control. With regard to temperatures, revise Section 6.1B.2, which calls for the evaluation of potential methods to decrease water temperatures. Given the Corps’ data showing consistent temperatures upstream, downstream and in ladders, specifically study whether lowered water temperatures in ladders might produce temperature gradient, delaying migration or causing mortality.

(3) Revise Sections 6.1B.3 and 6.1D.7 to state that Snake River adult fish passage study (report was due December 1993) will extend until at least summer 1995 and final report and recommendations not expected before end of 1995.

(4) Revise Section 6.1B.5 to continue research on use of video-based counting. Completion date for research and development is not known.

Draft: Proposed new Section 6.1G called for a comprehensive evaluation of the impact of the juvenile bypass system on adults who fall back, which could include an evaluation of adult fish turbine mortality. New Section 5.8A.15 [now Section 5.6A.14] called on the Corps and others to study the mechanisms of fish mortality in turbines, which could include the issue of adult mortality. Proposed additions to Section 6.1A.1 and 6.1A.4 called for various improvements, general and specific, structural and operational, in adult fish ladders, which could encompass an evaluation of shad barriers.

A proposed addition to Section 6.1A.1, in response to an ODFW recommendation, called for the Corps, in consultation with fish agencies and tribes, to evaluate and reduce fish ladder water temperatures. Meanwhile, in Appendix D, Proposed Amendment No. 123 incorporated the Corps’ recommendation to modify Section 6.1B.4 to call for the Corps to continue evaluating temperature matters in the adult fish ladders, particularly at the Snake projects, and to “[i]nvestigate whether lowered water temperature in the ladders would create a temperature gradient, delaying adult migration or causing mortality.”

Appendix D, Proposed Amendment Nos. 123 and 124 extended the date for the Snake River adult passage studies to December 1997 to December 1997. And, Appendix D, Proposed Amendment No. 64 extended the date for the Corps report on video counting technology to 1997.

Finding: The Council adopted these recommendations, with date changes.

Program Section(s): 6.1C.2 (improve flows for naturally spawning fall chinook)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: Delete Section 6.1C.2, which calls for the fish and wildlife agencies, tribes, and Grant County PUD to evaluate and report on the effectiveness of the Vernita Bar flow plan at Priest Rapids Dam. PNUCC recommends this deletion because “Priest Rapids is a private facility and is a FERC responsibility.”

Draft: Not included in the draft amendments.

Finding: The PUD is subject to FERC jurisdiction. FERC, in turn, is required to comply with the terms of 16 U.S.C. § 839b(h)(11)(A)(ii). It is therefore appropriate to include such measures in the program.

Program Section(s): 6.1C, 6.1D (Snake River fall chinook flows and temperatures)
Source: CRITFC
Recommendation No.: 5-2

Recommendation: As noted in the Section 5 discussion, CRITFC’s recommended flow regime includes flows for adult fall chinook. CRITFC recommended late season flow measures for the Snake, some that benefit both late migrating juveniles and returning adults, and some that are intended specifically for adults. These measures included:

(a) From Dworshak, 1.0 million acre feet July through September, in 1995-98.

(b) From Brownlee, in 1995, 50,000 acre feet in August and 100,000 acre feet in September; in 1996; 100,000 acre feet in August and 100,000 acre feet in September; in 1997 and 1998, 140,000 acre feet in August and 100,000 acre feet f in September. These volumes are to be shaped by the Fishery Managers, no refill, pass inflow. Draft in October for Hells Canyon Complex fall chinook plan.

(c) From the Upper Snake, in 1995, 1.427 million acre feet from April through September; in 1996-98, 1.927 million acre feet. The volume from the Upper Snake “should be shaped to benefit juvenile migrations, allowing use of Dworshak water supplies for temperature abatement, specifically targeted for adult fall chinook and steelhead.”

In addition, for the lower Columbia CRITFC recommended a minimum flow of 120 kcfs at The Dalles Dam during September to decrease migration time for end of sub-yearling migration through lower Columbia and “to reduce delay, inter-dam loss and increase spawning for adult fall chinook and steelhead.”

Draft: The flow augmentation volumes were in Option 4, Additional Flow and Velocity (DFOP), and Additional Brownlee Water. A proposed addition to Section 5.1A.2 (in the general Section 5

amendments), called generally on the FOEC “[i]n resolving conflicts, carefully consider the value of retaining cold water in the Dworshak project to help control temperatures for Snake River fall chinook returning adults.” Option 4, Water Temperature Reduction, called specifically for the retention of at least 400,000 acre feet in Dworshak for temperature control, as a revision to Section 5.1A concerning FOEC operations. CRITFC did not recommend this or any other particular volume to be retained in Dworshak for temperature control. A proposed revision to Section 6.1D.1 -- reflecting the workings of the NMFS Biological Opinion -- provided that only if Dworshak is above elevation of 1520 feet at the end of July can its use for temperature control be considered by the FOEC, while Section 5.2B.2 allows for the drafting of Dworshak to that elevation by the end of July if needed to meet the summer flow target.

Finding: This recommendation is addressed in the findings on Section 5.2 and the former Section 5.3 (now Section 5.4). The Council adopted the recommendation for additional drafts from Brownlee, for an additional million acre-feet, and for the September flow target at The Dalles in that section. The Council accepts the need to continue evaluation of temperature control for fall chinook, and the possible use of Dworshak for that purpose, but leaves to the fish managers and the Fish Operations Executive Committee discussions about whether to shift water from spring to summer to late summer for this and other purposes.

Program Section(s): 6.1D.1, 6.1D.4 (Snake River fall chinook temperature control/
Dworshak draft)

Source: ODFW

Recommendation No.: 5-8

Recommendation: ODFW recommended that to “[m]inimize delay and enhance survival of adults in reservoirs,” the Council should call for the Corps and fish managers to “[r]elease and evaluate cool water releases from Dworshak Reservoir.”

Draft: With regard to flow augmentation and cool water releases to benefit adult fall chinook, see immediately above. Note that the draft amendments did not alter the temperature control evaluation called for in Section 6.1D.4, which already seems to be responsive to ODFW’s recommendation. In Appendix D, Proposed Amendment No. 122, the Corps proposed to change the date for the report on the temperature control study to December 1994.

Finding: With regard to flow augmentation and cool water releases to benefit adult fall chinook, see immediately above.

Program Section(s): 6.1C, 6.1D (Snake River fall chinook flows)
Source: Natural Resources Defense Council
Recommendation No.: 5-4

Recommendation: From 1996 on, Idaho Power should provide from Brownlee 100,000 acre feet in August and again in September, shaped by Fishery Managers, with inflow passed through and no refill. Other portions of their proposal (to be discussed in detail in the outline for Section 5 recommendations) may be generally relevant to adult fall chinook, but are not specifically related to the timing of the fall return and so will not be mentioned here.

Draft: The recommendation was addressed in Option 4, Additional Brownlee Water.

Finding: The Council adopted the recommendation, as discussed in the findings on Section 5.2, above.

Program Section(s): 6.1D.1 (Snake River fall chinook temperature control/Dworshak draft)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Given high kokanee losses and gas supersaturation levels above 120 percent due to July Dworshak releases, revise Section 6.1D.1 to expedite study and implementation of remedial measures, if such releases are going to continue. Note and expedite schedule of BPA-funded studies of deterrents to kokanee entrainment.

Finding: Deferred to the resident fish amendment process scheduled to begin in January 1995.

Program Section(s): 6.1D.2 (Snake River temperatures)
Source: PNUCC
Recommendation No.: 6-1

Recommendation: Delete Section 6.1D.2, which asks "Relevant Parties" to pursue funding for recreational and commercial facility modifications to allow Dworshak to operate at the reduced levels that result from August and September fall chinook temperature releases. PNUCC recommended this deletion as part of its overall concern that the Council should not be mitigating for mitigation.

Draft: The draft did not address this recommendation.

Finding: The Council believes that mitigating such impacts may properly be considered part of the cost of such measures. The question is not whether such impacts may be mitigated, but whether, under Section 4(h)(6)(C), there is a less costly way to achieve the biological objective to which Dworshak releases are directed.

Program Section(s): 6.1D.4 (Snake River fall chinook temperature control/evaluation)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: Revise Section 6.1D.4 to note that report of evaluation of cool water releases from Dworshak and Hells Canyon Complex will be submitted December 1994, not 1993.

Draft: The recommendation was included in Appendix D, Proposed Amendment No. 122.

Finding: The Council adopted the recommendation.

SECTION 7: COORDINATED SALMON PRODUCTION AND HABITAT

Program Section(s): 7.1, 7.2, 7.3A to 7.3B.3, 7.4A (coordinate habitat and production processes; improve existing hatchery production; supplementation plans; new production initiatives)
Source: CRITFC
Recommendation No.: 7-3

Recommendation: The Columbia River Inter-Tribal Fish Commission (CRITFC) proposed to delete these sections -- the bulk of the program's production measures -- and replace them with CRITFC's detailed Tribal Restoration Plan/Subbasin Plans. The subbasin plans call for the implementation of specific production and habitat measures in the Wind, Little White Salmon, Big White Salmon, Klickitat, Hood, Deschutes, Umatilla, Mid-Columbia, Walla Walla, Yakima, Wenatchee, Entiat, Methow, Okanogan, Snake Mainstem, Tucannon, Clearwater, Salmon, Grande Ronde, Imnaha, and Lower Columbia and Snake River subbasins. (During the comment period CRITFC submitted a John Day River subbasin plan that had been left out of the recommendation.) CRITFC proposed that Bonneville Power Administration (BPA) fund the subbasin projects specified, which in general called for "the construction of acclimation and adult trapping facilities, habitat restoration, protection and enhancement, and the outplanting of juvenile salmon." Production facilities using artificial propagation were to be consistent with the supplementation section of the Integrated System Plan.

The Council received a number of public comments in support of the subbasin planning approach, especially within the subregional process, but not necessarily in support of CRITFC's recommended subbasin plans. Of most importance, while the Columbia Basin Fish and Wildlife Authority (CBFWA) agreed with CRITFC that most of the production initiatives should take place within the subbasin planning process, CBFWA was not, however, ready to agree completely with CRITFC's proposed subbasin plans in the Tribal Restoration Plan. CBFWA believed existing subbasin plans should be reviewed and updated, with a priority on weak fish populations and incorporating the Policies and Procedures Implementation Plan developed by the Integrated Hatchery Operations Team. Implementation plans and schedules should be developed in the next year, with subbasins that have weak stocks receiving immediate attention. CBFWA stated that the revised subbasin plans will be submitted to the Council and BPA for funding. The whole subbasin planning process is to shift into the subregional process when that process is established. Because the plans will address supplementation, artificial production and natural stock protection, CBFWA concurred with CRITFC's recommendation deleting the sections from the program that CRITFC recommended be deleted. CBFWA also supported the proposed changes in the subregional process proposed in Section 3.1D.

CRITFC's own comments did not contest CBFWA's position on this issue, stating only that it would defer to any specific production and habitat comments of the Yakama Nation and the Confederated Tribes of

the Umatilla Reservation. The Umatilla Tribes did not in the end submit any comments. The Yakama Nation did comment, but did not contest CBFWA's position, either. The Yakama Nation commented instead that the agencies and tribes should be given high deference "within the subregional teams in recommending projects for implementation;" that the list in Section 3.1D.1 of the guidelines or criteria for qualifying project recommendations in the subregional process should be deleted (CBFWA did not delete this section in its comments, and neither had CRITFC in its recommendation); and that fish and wildlife managers should be responsible for setting the conditions under which projects are selected and implemented.

The Upper Columbia United Tribes (UCUTs) did support the adoption of CRITFC's restoration plan as recommended, which was the only comment of unqualified support. The Shoshone-Bannock Tribes criticized portions of CRITFC's subbasin plan for the Salmon subbasin, and favored instead the use of the subregional process to update, review, coordinate, revise, and implement the subbasin plans. The Washington Department of Fish and Wildlife (WDFW) supported the CBFWA comments, especially the idea of focusing on an implementation process starting from the subbasin plans. The Idaho Department of Fish and Game (IDFG) submitted its own Anadromous Fish Management Plan, which incorporated a subbasin plan approach based also on the ISP system planning effort and also incorporating supplementation activities, but IDFG's view of the elements of the subbasin plans did not necessarily correspond to CRITFC's. BPA saw the restoration plan as incomplete, but a good starting place for rebuilding efforts with various conditions. The Corps of Engineers did not provide extensive comments on CRITFC's subbasin plans, but did state that the Integrated System Plan provides adequate production goals at this time and that the Council should adopt those goals and measures and shift the Council's focus to habitat, harvest and ocean survival.

Others commenters rejected the Columbia Basin Tribal Restoration Plan, usually because the plan would significantly increase hatchery supplementation throughout the Columbia Basin (Pacific Northwest Generating Cooperative (PNGC), Douglas County PUD, Chelan County PUD) and because it did not provide for peer review or coordination with other fishery management agencies (Douglas County PUD, Chelan County PUD). Chelan County PUD also opposed the Tribal because it was inconsistent with hatchery reprogramming and supplementation strategies currently endorsed by the Mid-Columbia coordinating committee and the Rock Island Coordinating Committee, and Chelan suggested changes in the subregional process, in that the Council should direct the implementors to include on each subregional team local representation by hydro operators and land management agencies to assure that annual work plans are feasible and receive local cooperation. PNGC proposed instead the appointment of an independent scientific group to evaluate all supplementation and production initiatives, in essence superseding or overseeing the results of the subbasin planning process.

Oregon Trout also wanted the Council to establish an independent scientific group to review all production, supplementation and hatchery proposals and require NEPA review of all new production proposals. While Oregon Trout did not specifically comment on CRITFC's subbasin plans, it did comment that it was opposed to supplementation at any level beyond narrow experiments, while CRITFC's restoration plan in essence took supplementation from the experimental to the implementation stage. Oregon Trout recommended instead that to guide future production and supplementation decisions, the Council and the fishery managers needed to develop new management plan(s) based on well-defined conservation management units and information on biological diversity within those units, and include a process for an independent audit of implementation. Oregon Trout submitted with its comments dozens of scientific reports, papers and journal articles concerning the inter-related issues of production, supplementation, the adverse impacts of production activities on wild fish, and the preservation of genetic resources. Similar but less extensive comments either opposed to or only cautiously supportive of supplementation as an experimental program came from the Columbia River Alliance and the Okanogan Resource Council.

NMFS did not comment directly on the subbasin plans. NMFS did indicate to the Council that NMFS will take a very cautious approach to the use of supplementation and other artificial production methods to try

to increase weak stock numbers, calling for “further research to determine whether controlled propagation programs can increase natural production population abundance.” NMFS production policy is focused more on ending the adverse effects of artificial production on wild populations and genetic resources than on the use of supplementation to increase the numbers of naturally spawning fish.

Finding: On this record, and after careful consideration, the Council partially adopted CRITFC’s subbasin plan recommendation, as modified by CBFWA in its comments. The Council has adopted in Section 7.0 CRITFC’s recommendation to use the subbasin plans and the Tribal Restoration Plan as the foundation for the region’s fish and wildlife program, especially all production and habitat matters. The Council called for the fish managers to expeditiously update the subbasin plans in 1995 and submit them to the Council for review and approval. The Council also called on the fish managers, while the process of updating took its course, to develop immediate action plans for production and habitat measures that require prompt implementation in 1995 and 1996. The Council did not adopt the specific subbasin plans in CRITFC’s Tribal Restoration Plan, as the Council understood from CBFWA’s comments, and agrees with CBFWA, that the subbasin plans should be updated and implemented with the acceptance of all the fish managers for each subbasin, not just the CRITFC tribes. Thus the Council’s decision to call for revision of the subbasin plans, rather than adopting now the CRITFC plans better complements the existing and future activities of the fish agencies and tribes, 16 U.S.C. § 839(h)(6)(A). CRITFC is concerned about the delay in the updating and implementation of the subbasin plans, and the Council is, too. The Council is committed to updating and implementing the subbasin plans quickly, and it set the dates for submitting the updated plans to the Council with the intent that the quick action CRITFC desires will occur. The scope of the updating should reflect the limited amount of time available and the importance of meeting the submission date in order to secure timely implementation.

The action plans and the subbasin plan updates are to be based on CRITFC’s Tribal Restoration Plan, the Integrated System Plan and other information. The subregional process, once it is developed and operating, will be the forum for continued review and revision of the subbasin plans. The Council also revised Section 3.1D, Subregional Process, Section 7.3A, Regional Assessment of Supplementation, and Section 7.3B, Final Planning and Implementation of Proposed Additional High Priority Supplementation Experiments to correspond to the increased focus on the subbasin plan process.

The Council did not adopt CRITFC’s recommendation to delete most of Sections 7.1 through 7.4. CBFWA explained that the subbasin plans and the implementation actions will contain the necessary justifications, requirements, and responses to concerns about supplementation activities, artificial production, and genetic resource and natural stock protection. The Council agrees that the subbasin plans and planning process should if possible incorporate and subsume these concerns and provisions. But subbasin plans that can be implemented have not yet been developed, and the subbasin plan revision process has not even yet begun. Until the subbasin plan revision process has actually internalized these provisions and policies and has produced subbasin plans and action plans that can be implemented under present circumstances, the Council believes it would not be prudent to delete the substantive production provisions from the program. Section 7.1 primarily addresses how to conserve genetic diversity and wild and natural populations while rebuilding weak stocks. Section 7.2 contains a number of measures to improve existing hatchery production, which had been identified as one of the significant problems in the petitions to list Snake River chinook as endangered species. Section 7.3 outlines a framework and process for developing and implementing supplementation plans. Finally, Section 7.4A establishes guidelines for identifying, evaluating, and implementing new production initiatives. These sections support the principles set forth in the program’s goal and the general biological objectives expressed throughout the production section and other parts of the program. The Phase Two and Three record for the Strategy for Salmon was filled with recommendations, comments, and independent scientific analyses concerning the need for a revolution in production policies and actions to protect and promote genetic diversity and natural and wild populations. The provisions at issue were

developed to respond to those concerns. It is too soon to delete them, even under the knowledge that the subbasin planning process will address these concerns, requirements and policies. To delete these provisions would mean a program that is less effective at present in protecting, mitigating, and enhancing the survival of fish. 16 U.S.C. § 839(h)(5), (7)(C). The Council will be willing to revisit this issue as the subbasin plans are revised, reviewed and implemented.

Program Section(s): 7.1B (evaluation of carrying capacity)

Source: CRITFC

Recommendation No.: 5-2

Source: PNUCC

Recommendation No: 7-4

Recommendations: CRITFC recommended an immediate assessment of the remaining and potential estuary habitat. It also called generally for actions to protect estuary wetlands and habitat, for the development and implementation of methods to restore and create a diversity of habitat, especially through "restoration of habitat structure such as large woody debris" and "sustained peaking flows which drive river and estuarine process such as hydraulic geometry and nutrient transport." CRITFC called for actions to reestablish the "tidal prism" without causing significant flooding of developed areas and for an evaluation of all proposals for hydro-development, water withdrawals, navigation projects and shoreline development for impacts on estuary ecology.

PNUCC recommended a few specific elements of an estuarine and near shore analysis, as an addition to Section 7.1B.1. PNUCC recommended that the evaluation "identify residency time of juvenile salmonids, and their level of smoltification. Management measures to protect and improve estuary habitat as well as increase the productivity of the estuary should also be identified." PNUCC also recommended development of a "monitoring program to identify optimal timing for residency in the estuary and the near shore environment."

CBFWA incorporated CRITFC's recommendation and some of PNUCC's language in its comments. CBFWA stressed the need to evaluate the ecological interactions between non-native fishes, which have thrived as a result of habitat and flow changes caused by reservoir storage and the hydroelectric system (e.g., shad), and salmon carrying capacity and limiting factors.

Finding: The Council adopted PNUCC's recommendation, and it adopted CRITFC's recommendation, although not CRITFC's specific language. The main changes are revisions to Section 7.1A (former Section 7.1B). This section as revised calls for an evaluation of estuary, plume and near shore estuary habitat ecology, salmon survival, carrying capacity and limiting factors (along with an evaluation of the same things in the tributaries, mainstem and marine areas). This analysis is to include, among other things, "an evaluation of the effects of the alteration and timing of the ocean plume as caused by the construction and operation of the hydroelectric system," and the analysis is to "identify residency time of juvenile salmonids, and their level of smoltification." "Management measures to protect and improve estuary habitat as well as increase the productivity of the estuary should also be identified." The section retains the existing language calling for the evaluation to include recommendations for "management responses to fluctuating estuary and ocean conditions." The analysis should also "propose a monitoring program to identify optimal timing for residency in the estuary and the near shore environment."

New Section 7.1A.3 calls for Oregon, Washington and the federal government to "identify management measures," "based on existing information" that can be "implemented immediately to provide better protection and improve estuarine productivity." These measures are to "[i]nclude identification of

seasonal water volume needs in the estuary for fish and wildlife,” with a report to the Council by mid-1995 “on opportunities, needed actions, timeframe and funding sources to implement recommendations.” Revised Section 7.1A.4 calls on the same group to “[e]xplore the expanding scope of the Columbia River Estuary Bi-State Study to include all of the Columbia River Basin. If feasible, this would be more effective in addressing comprehensively all interrelated water quality and quantity aspects of the basin. Also, explore the feasibility of participation of the Columbia Basin in the Environmental Protection Agency national estuaries of significance program.” New Section 7.1A.5 calls on the Council to “[b]egin rulemaking in winter 1995 to identify measures aimed at improving estuary conditions and survival for salmon and steelhead. Review results of the Columbia River Estuary Bi-State Study as well as other pertinent information to develop these measures.”

The Council also adopted a new provision, Section 5.4D.2, which is responsive to this recommendation and to another CRITFC recommendation. Section 5.6D.2 calls for a Mainstem Estuarine Habitat Restoration Analysis, which includes a basinwide comprehensive hydrologic, hydraulic geometry and biological analysis to determine appropriate flow duration and magnitude needed to reestablish critical mainstem and estuarine floodplain habitat. Finally, also of some relevance to this recommendation is a revision to Section 7.8J.2 that calls on NMFS to fund an evaluation of water withdrawals, depletions and return flows on the natural hydrograph and to compare the magnitude of these effects to the magnitude of effects caused by upstream storage. NMFS is then to develop hydrographs of the Columbia and Snake mainstems, analyze the cumulative effects of future withdrawals and recommend measures in response.

Program Section(s): 7.1I.1, 7.1J, 7.1J.1 (adjust total number of hatchery fish to stay within basin carrying capacity; production planning)
Source: PNUCC
Recommendation No.: 7-4

Recommendation: In line with PNUCC’s recommendation to eliminate mixed-stock fisheries and replace them with terminal fisheries, analyzed in the findings on Section 8 below, PNUCC recommended revising these three sections in the 1994 program in various ways to reduce production designated for harvest augmentation by 50 percent and to reprogram production to support tributary and terminal fisheries and not mixed-stock fisheries. PNUCC also recommended revising Section 7.1J.1 to call for “the opening of the Production Advisory Committee of the Columbia River Management Plan to all interested parties, and to then develop an Integrated Hatchery Production Plan. The plan will coordinate basin-wide production, and address levels of production, species mix, stock selection, return timing and location for release. In addition, the plan will account for fisheries contribution, economic benefits, elimination of mixed-stocks, and the creation of terminal and tributary fisheries.”

The Council received a few public comments calling for the reduction of hatchery production designated for harvest augmentation (e.g., from the DSIs). PNUCC added in its comments that harvest measures and hatchery production must be linked, with hatchery reprogramming “to support only natural escapement and terminal fisheries.” Both the Columbia River Alliance and Okanogan Resource Council commented that expenditures for hatcheries should be eliminated except where it can be demonstrated that hatchery or supplementation practices do not directly or indirectly cause disease, competition problems or harvest practices that will cause incidental catch of wild stocks. Agencies and tribes and others, such as the Northwest Forest Resource Council, noted, however, that artificial production of some sort may be the only way to make up for the loss of a large amount of the historical habitat production base, regardless of mainstem system losses. Artificial production will continue in some form, and the challenge of overcoming the problems caused by past hatchery practices requires concerted fisheries management efforts today to use hatchery production programs that are complementary to wild fish populations.

Finding: The Council adopted a subbasin approach to production in Section 7.0 which is to be supportive of enhancement activities geared towards stocks that contribute to adequately managed fisheries (see Section 8.3A.1). The updating of subbasin plans should include many of the elements specified by PNUCC in its proposed production plan, including considerations of reprogramming hatchery facilities to benefit wild and natural stocks. But the Council did not adopt PNUCC's recommendation to the extent that it focused on reducing hatchery production that contributes to mixed stock fisheries. The findings in Section 8 explain why the Council could not adopt PNUCC's recommendation to completely eliminate mixed-stock fisheries. In addition, the Council recognizes the commitment of the parties to the *U.S. v. Oregon* litigation to rebuild upriver runs partly through prudent use of production planning. Restricting hatchery production by an arbitrary 50 percent with an intent simply to reduce harvest does not complement the activities of the federal and state fish and wildlife agencies and Indian tribes, 16 U.S.C. § 839(h)(6)(A), and may be in conflict with the legal rights of Indian tribes in the region whose treaty harvest rights have been defined in *U.S. v. Oregon*, 16 U.S.C. § 839(h)(6)(D).

Program Section(s): 7.4D (captive brood stocks)
Source: Pacific Rim International
Recommendation No.: 7-11

Recommendation: Revise Section 7.4D to call for BPA to immediately begin funding private captive breeding programs.

The fish agencies and tribes have a captive broodstock program for Snake River sockeye and are considering development of a program for Snake River fall chinook. The Yakama Indian Nation provided general comments on the agency and tribal program, stating that the Yakama Nation supported careful monitoring of captive broodstock efforts and that the Snake River fall chinook population should not be included in a biologically risky captive broodstock experiment at this time, as captive broodstock programs should be reserved as a "last gasp" strategy to maintain a population.

Finding: As noted above, the fish managers have a captive broodstock program for Snake River sockeye and are considering development of a program for Snake River fall chinook, as recognized in Sections 7.4D, 7.5A and 7.5B. The Council is not in a position to call for the funding of private captive broodstock programs, as to do so would not complement the activities of the fish agencies and tribes, 16 U.S.C. § 839(h)(6)(A). The Council recommends that the PRI direct its recommendation for funding for private programs to the fish agencies, especially to NMFS.

Program Section(s): New 7.4J.4 (production initiatives)
Source: Yakama Indian Nation
Recommendation No.: 7-10

Recommendation: The Yakama Nation recommended adding a Section 7.4J.4 calling on BPA to fund the Department of Energy and Yakama Nation to recommend and evaluate options for using the K-Basins on the Hanford Nuclear Reservation for the artificial propagation of fall chinook, coho and sturgeon.

The Yakama Nation submitted comments restating their support for this measure. Additional comments in support came from the Richland, Washington, office of the U.S. Department of Energy, from the Westinghouse Hanford Company, and from two individuals who are employees of the company and work in

support of DOE's Hanford Economic Transition program (B.N. Anderson/D.I. Herborn). These comments added further information on the program and successes so far.

Findings: Adopted as new Sections 7.4J.4 and 7.4J.5.

Program Section(s): 7.4 (production initiatives)
Source: Corps of Engineers
Recommendation No.: 5-3

Recommendation: The Corps of Engineers recommended an evaluation and possible changes in the "John Day Mitigation Hatchery program" proposed in 1992, including releasing hatchery fish above McNary rather than current release below Bonneville, based on a letter from the Oregon Department of Fish and Wildlife.

Finding: The Council did not adopt this recommendation, as various sections in the program, such as Section 7.4J.1, already allow for consideration of release above McNary Dam. The Corps may pursue this matter as part of program implementation.

Program Section(s): 7.5G (Pacific lamprey)
Source: CRITFC
Recommendation No.: 7-9

Recommendation: CRITFC recommended adding language to Section 7.5G [now Section 7.5F] calling on the BPA, the Corps and the Bureau of Reclamation to fund research "to determine passage, habitat, and life history issues that limit lamprey recovery" and to fund "recovery actions recommended by lamprey passage, habitat, and life history research studies."

Finding: Adopted as a revision to Section 7.5F.

Program Section(s): 7.6 (habitat goals, policies and objectives)
Source: CRITFC
Recommendation No.: 7-2

Recommendation:

CRITFC recommended substantially revising Section 7.6 with new introductory language, a new habitat program goal (existing Section 7.6 had objectives but no specifically stated, single, habitat goal), and revised or new habitat objectives, policies and performance standards (renamed "watershed objectives" in later CBFWA comments). CRITFC's deletions included Section 7.6D, which called for BPA to develop a priority funding process by December 1992. CRITFC replaced this section with a discussion of ratepayer funding and BPA funding procedures in the introductory text.

In general, CRITFC called for more detailed, specific and restrictive policies, objectives and standards than are now in the Council's program. The proposed program goal called for the program "to achieve and sustain levels of habitat and species productivity as a means of fully mitigating fish losses caused by construction and operation of the federal and non-federal hydroelectric system." The proposed

introductory text focused primarily on justifying this program goal, by describing the historic progression of habitat degradation throughout the basin, the present serious problems with populations and habitat, the importance of drastic efforts at habitat restoration and improvement in meeting rebuilding schedules, the general nature of the habitat measures and standards called for, the propriety under the Power Act of using ratepayer funds to pay for a significant portion of the habitat improvements, and more.

Five habitat objectives were listed: (1) ensure that all human activities in a subbasin are coordinated in a comprehensive watershed management program; (2) maintain habitat at least at its current level of quality and abundance; improve degraded habitat; increase habitat quantity by improving access to areas within historic range; (3) promote adoption of and compliance with biologically-based habitat performance standards set by the Council or with state water quality standards, whichever are more stringent, and promote the adoption of these standards into state and federal land and water management plans; (4) implement habitat protection and restoration activities designed to comply with the new performance standards; and (5) institute a comprehensive program of monitoring, data collection, analysis, reporting and adaptive management.

Twelve habitat policies were listed: (1) improve coordination of land and water activities, encouraging local coordination and cooperation, especially the participation of private parties with public land and resources managers; (2) develop and implement procedures to ensure compliance with habitat objectives and with relevant federal, state, local and tribal laws and regulations; (3) give highest priority to prevention of fish habitat degradation regardless of current quality; in habitat restoration, give priority to areas not meeting the new performance standards or state water quality standards where one or more weak stocks exist or there are significant opportunities for expansion; (4) recommend that all national forest plans and BLM land management plans include quantitative fish habitat objectives that ensure consistency with the Council's performance standards and with rebuilding goals and schedules developed by the Council and in the *U.S. v. Oregon* litigation; (5) Council, in consultation with and giving due weight to the fish agencies and tribes, will determine whether Forest Service and BLM plans are consistent with habitat objectives and performance standards and state water quality standards and will recommend actions to resolve inconsistencies; (6) to assure that Forest Service and BLM management actions are consistent with habitat objectives, etc., recommend that Forest Service and BLM conduct thorough environmental analyses for all land disturbing activities and conduct post-project habitat, population and water quality monitoring; (7) to be eligible for project funding under the Council's Fish and Wildlife Program, Forest Service and BLM must require that land management activities support and not undermine benefits of habitat protection or enhancement projects; (8) annually review Forest Service and BLM land management activities, with the federal agencies collecting and reporting specified data necessary for the review; the Council in consultation with fish agencies and tribes will recommend actions to Forest Service and BLM to assure consistency; (9) recommend that Oregon Water Resources Department, the Idaho Department of Water Resources, and the Washington Department of Ecology halt further issuance of consumptive water rights unless a finding can be made, in consultation with fish agencies and tribes, that existing instream flows meet anadromous fish needs for all life-stages; same agencies should investigate options for increasing minimum stream flows, particularly water conservation and improved watershed management; (10) all relevant agencies provide elevated funding for implementation of this program, with cost and effort sharing; (11) encourage the involvement of volunteers and educational institutions in cooperative habitat enhancement projects and watershed management; and (12) develop a program for stream channel restoration, emphasizing non-structural methods and establishing and using native plant nurseries.

CRITFC then recommended a set of minimum performance standards, in a new Section 7.6D. The introductory text to the new Section 7.6D and Section 7.6D.4, contained general standards and admonitions concerning land management activities, best management practices, and efforts not to allow further degradation of good or bad quality streams. These general statements included, among other things, recognition of the integrated nature of watersheds and cumulative watershed impacts; the necessity to protect

and restore not just fish-bearing streams, but also related small perennial, intermittent, and non-fish-bearing streams; establishment of riparian and floodplain reserves so that “natural ecological functions . . . can naturally re-emerge,” rather than rely on structural and other mitigation efforts; and coordination of all activities in a watershed with the potential to generate sediment.

The proposed minimum performance standards then included “Biologically-based habitat standards”: (1) surface fine sediment less than 20 percent in spawning habitat, with no increases in fine sediment levels; (2) cobble embeddedness less than 30 percent in rearing habitat, with no increases in cobble embeddedness; (3) no disturbance of soil or vegetation until these standards are met; any increase in fine sediment or cobble embeddedness (even if the area meets the 20 percent or 30 percent standards) triggers the same prohibition; (4) no increase in sediment delivery; (5) establish riparian reserves (“no vegetation removal or soil disturbance within a distance equal to one site potential tree height to 300 feet of floodplain edge”); focus on reducing impacts within riparian reserves; (6) “provide consistent long-term source of large woody debris via establishment of riparian reserves”; (7) maintain greater than 90 percent of streambanks in stable condition; if less, suspend riparian grazing, vegetation removal and road construction; (8) fully protect floodplains by means of riparian reserves; remove floodplain impacts, such as roads and mining operations; prohibit and remove riprap and similar channel controls; ensure channel maintenance with adequate annual instream flows; (9) try to maintain water temperatures below 60 degrees; no increases in water temperatures; no removal of stream shading; when temperatures exceed 60 degrees, suspend upstream riparian grazing and begin other efforts at control; (10) in interim, enforce existing water quality standards; rapidly revise standards to adequately protect salmonids; (11) eliminate transport of toxic chemicals along salmon streams and storage of toxics in watersheds with salmon habitat; and (12) suspend approvals for new surface or groundwater withdrawals; study and where necessary obtain additional water to increase instream flows.

“Land management performance standards” included (1) no vegetation or soil disturbance “within a minimum of one site potential, old growth tree height from the outer edge of the floodplain;” (2) in more sensitive areas (“where additional risk of degradation is untenable”), no vegetation or soil disturbance within a minimum of 300 feet from the edge of the floodplain; (3) obliterate, relocate, re-vegetate, and/or upgrade roads in riparian zones; (4) no further road construction “until the majority of watersheds have had measurable improvement”; (5) no entry in existing roadless areas until “vast bulk of watersheds” show measurable improvement; (6) temporarily suspend riparian grazing along or upstream of areas not meeting standards; suspend any on-going grazing where habitat data is unavailable; and (7) immediately screen unscreened diversions; cease diversions until screened; conduct on-going inspections of screens; meter all diversions for approach velocity. Finally when developing performance standards, do not use “approaches based on ‘range of natural variability.’”

Sections 7.6D.1 to 7.6D.3 then established an updated process whereby the various local watershed managers, in consultation with the Council, land managers, and fish agencies and tribes, are to develop more comprehensive and specific sets of habitat performance standards for each watershed that are at least as stringent as the minimum performance standards. The Council is to review proposed performance standards “for consistency with the Council’s baseline set of standards and the goal of fully meeting the biological requirements of native fish species and fully supporting the productive capability of the stream for native fish species.”

Draft amendments

The Council’s draft amendments reflected much of what CRITFC recommended, with some modifications. The areas in which the draft modified the CRITFC recommendation are as follows:

The draft amendments did not include the revisions to the introductory text of Section 7.6 as recommended by CRITFC or the new habitat goal recommended by CRITFC. Draft revisions to Section 7.8A were intended to reflect CRITFC's various recommendations calling on the Forest Service and the BLM to manage consistent with the proposed habitat standards. Otherwise, the habitat objectives and policies were not revised as recommended by CRITFC, partly on the grounds that much of the recommended language was already covered by existing language.

Concerning the habitat performance standards, the draft amendments did not include many of the general standards and objectives for land and habitat management that CRITFC recommended. One exception was the proposed addition of a sentence to Section 7.6C.5 stating that "[i]n addition, where possible, manage riparian and floodplain areas to promote the protection and re-establishment of natural ecological functions and, thereby, protect and improve salmon and steelhead habitat." This is similar to, but not the same as, or as direct and specific as, one of CRITFC's recommended revisions to land management, which called for the "[e]stablishment of riparian and floodplain reserves throughout entire anadromous stream systems (extending to headwaters) so that all natural ecological functions (e.g., pool formation and maintenance, large woody debris recruitment, bank protection by rooted vegetation, and creation and operation of wetlands and off-channel habitats) can naturally re-emerge and exert their influence in restoring habitat diversity and quality."

CRITFC had recommended a performance standard development, review and implementation process whereby local watershed managers, etc., developed more comprehensive and specific performance standards at least as stringent as the standards to be established in the Council's program. The Council was then to review standards developed "for consistency with the Council's baseline set of standards and the goal of fully meeting the biological requirements of native fish species and fully supporting the productive capability of the stream for native fish species." The process set forth in the proposed revisions to Sections 7.6C.1, 7.6C.2, 7.6C.3, 7.6C.4, and 7.6C.5 was similar, though not quite the same. It called for local watershed managers and others to develop and adopt habitat performance standards. These locally-adopted standards were to be "consistent, in terms of biological consequences," with the standards developed by the Council, and the local managers are to explain to the Council the "biological rationale" for any "departures from the approach and standards provided" in the Council's program."

With regard to the performance standards themselves, the Council's intent was to substantially incorporate in the draft CRITFC's recommended standards, with some modifications that reflected both the Council's lack of authority to be a direct management or planning authority in this area and the Council's view that the focus in habitat planning and management should be on the subbasin planning and local collaborative watershed processes, and the habitat standards and measures to be developed within these processes. The most important task for the Council is to provide biologically-based habitat objectives for the subbasin and watershed planning processes, and then to allow the planners to decide how best to implement these objectives or adopt watershed specific objectives that are biologically equivalent. To note the comparison between the recommendation and the draft:

- CRITFC called for sediment levels "less than" 20 percent. The proposed standard called for sediment levels "no greater than" 20 percent. The proposed standards did incorporate the cobble embeddedness standard precisely as recommended.
- CRITFC recommended no increase in sediment delivery or cobble embeddedness anywhere, even where the percentage standard is being met. The proposed amendment called for no increase in sediment input "[i]n subbasins currently limited by sediment problems."
- CRITFC recommended prescriptive management directions when standards are not meant. Thus CRITFC recommended that when the sediment or cobble embeddedness standards are violated or

when any increase in sediment or cobble embeddedness occurs, certain management responses should occur: no further ground disturbance or vegetation removal, suspension of on-going activities, and initiation of active restoration, such as road obliteration and re-vegetation. The proposed standards did not include these specific management directives. Rather, the proposed amendments recommended that roads should be reduced as necessary to meet sediment and other water quality standards and that riparian grazing should be temporarily suspended alongside or upstream of areas that do not meet habitat standards as necessary to meet compliance.

- CRITFC recommended the creation of “riparian reserves,” which they defined in the habitat standards as “no vegetation removal or soil disturbance within a distance equal to one site potential tree height to 300 feet of floodplain edge.” In their land management standards they defined the reserves slightly differently, calling for no vegetation removal or soil disturbance within “a minimum of one site potential, old growth tree height from the outer edge of the floodplain along all streams” and, “[i]n more sensitive situations where additional risk of degradation is untenable, there should be no vegetation removal or soil disturbance within a minimum of 300 feet from the edge of the floodplain along all streams.” Then, CRITFC linked various standards, such as pools, large woody debris, channel complexity, etc., to the adoption of these reserves. The proposed standards called for the establishment of “riparian areas,” in which vegetation removal or soil disturbance will not be allowed. Along fish-bearing streams the riparian areas are to be “on each side of the stream equal to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greater.” The two descriptions appeared to call for riparian zones that were functionally the same in size. The proposed language allowed for smaller riparian zones along other types of streams. CRITFC did not make this distinction. The proposed amendments did not fully subsume other issues and standards into the “riparian areas” standard in the way that CRITFC did, proposing to retain numerical objectives for pool frequency, for example.
- With regard to bank stability, CRITFC recommended maintaining “greater than” 90 percent of streambanks in stable condition. The proposed standard was slightly revised to call for maintaining “at least” 90 percent of streambanks in stable condition.
- CRITFC recommended a channel complexity standard in which floodplains are “fully protected via riparian reserves and channel forming flows by obtaining adequate in-stream flows.” The proposed amendments did not precisely replicate this recommendation, having instead the “riparian areas” noted above, no specific tie between the riparian areas and channel morphology, no general standard on in-stream flows, and a specific, numerical “stream morphology” standard.
- As part of its channel complexity standard, CRITFC recommended a prohibition on “channelization/channel armoring (riprap) and to “[r]emove riprap.” The proposed standards did not include this recommendation, and a proposed revision to Section 7.8D.1 called for the “[u]se of non-structural methods as the first choice for protecting and improving riparian areas and streambeds,” which was not as stringent as CRITFC wanted.
- With regard to water temperatures, CRITFC recommended an objective of less than 60 degrees in spawning and rearing habitat, no increases in water temperatures, and management actions (suspend grazing, road obliteration, riparian planting) whenever temperatures exceed 60 degrees. The proposed amendments called for a summer temperature standard of less than 68 degrees, and they did not include a general prohibition on increases in temperature. The proposed standards did not include the specific management response recommended, but they did state that roads should be reduced as necessary to meet sediment and other water quality standards and that riparian grazing should be

temporarily suspended alongside or upstream of areas that do not meet habitat standards as necessary to meet compliance.

- With regard to general water quality, CRITFC recommended meeting state and federal water quality standards as an interim minimum, while water quality standards are developed necessary to adequately protect salmonids. Also, CRITFC recommended eliminating the transport or storage of toxic chemicals in certain areas. The proposed standards called for compliance with existing state and federal water quality standards, with no specific call for developing better standards.

Comments on the recommendation and the draft amendments

CBFWA

CBFWA's comments accepted much of what the Council proposed, including some of the modifications the Council made in CRITFC's recommendation. CBFWA also altered some of the Council's proposed language, partly to recover some of CRITFC's original language and partly to suggest new language. Besides some general editing, CBFWA's changes in the Council's draft rule were as follows: With regard to what the Council then called Habitat Objectives, the rewrite of Section 7.6A.2 reflected the fishery manager opinion that it was not necessary to prioritize the types of actions; protection and enhancement are needed for all stocks; access to inaccessible habitat should be provided when and if it is feasible.

With regard to the Council's Habitat Policies, CBFWA moved all the language on the federal land managers into one section. The new section reflected the policies the fishery managers felt that the federal land management agencies should be held to. The CBFWA re-write of Section 7.6B.7 reflected CRITFC's recommendation that priority should not have to be given to projects that have been integrated into broader watershed improvement efforts or to promote agreements with private landowners.

With regard to the Habitat Performance Standards in Section 7.6C, CBFWA changed the term to "Habitat Objectives," while the specific "Watershed Health Performance Standards" recommended by CRITFC and mostly set forth by the Council were incorporated with very minor modifications and renamed "Watershed Objectives." CBFWA emphasized, as CRITFC did, the need for specific but more simplified and unified habitat objectives that do not need to be modified locally. CBFWA noted that PACFISH standards and guidelines have been used but modified to add greater protection and improvement of anadromous fish habitat.

Also, CBFWA revised Section 7.6C.2 expands the provision calling for land managers to institute a program to monitor progress in achieving the watershed objectives. Other changes in many provisions added monitoring and evaluation language.

Other comments

Extensive public comment split over the recommendation to have the Council adopt the stricter performance standards/objectives, and the prescriptive means of enforcing the standards. The Council's proposed amendments (or the even more strict CRITFC recommendation) were supported by CBFWA, CRITFC, the Yakama Nation, WDFW (although it wanted to keep the name "performance standard"), Oregon DEQ and the Corps of Engineers.

The Council also received sometimes quite lengthy comments in opposition or of concern. Perhaps most notably, IDFG questioned whether there should be a single set of habitat standards applicable throughout the range of anadromous fish which occupy a wide range of environments. IDFG illustrated this

concern by noting that pool riffle ratios in two minimally disturbed and quite productive watersheds in the Clearwater National Forest were closer to 20:80 than to the 50:50 ratio considered to reflect undisturbed conditions; few reaches exist with ratios as high as 50:50. IDFG also stated that in some areas natural conditions are well below the standards the Council would establish, and the condition of different watersheds can vary substantially depending on the characteristics of the different geomorphic provinces in which the watersheds are located. To provide more detail and concerns about the potential problems of a single set of standards, IDFG attached as an appendix the State of Idaho's comments on the Forest Service/BLM's PACFISH process. IDFG suggested that a better approach would be to establish riparian management goals, standards, and guidelines based on the geomorphic and climatic characteristics of a watershed, so that the land management agency or the private owner could then conduct a watershed analysis to establish riparian reserves, riparian objectives, and the management practices that would allow achievement of appropriate objectives.

The Oregon Department of Forestry had similar comments: ODF was concerned that the uniform application of specific performance standards might not be practical or able to be implemented on all lands. Any performance standards recommended by the Council should also recognize that federal and non-federal lands should provide different standards for providing habitat. Standards also need to be flexible in terms of differences between regions and between watersheds and stream reaches in a watershed; for example, with the draft amendments proposing large woody debris standards, the whole region or each subregion might end up with a single minimum standard that may be effective for certain stream sizes, ineffective for large streams, and excessive for very small fish-bearing streams. ODF suggested using an approach similar to ODF's new 1994 Forest Practice Rules, which address riparian aquatic and water quality protection by considering all functions holistically and yet without one set or even a multiple set of specific performance standards that are to fit every stream. The rules focus instead on streamside vegetation, for example, as opposed to an approach that emphasizes only one or two discrete functions (i.e., woody debris or shade). This avoids the need to develop multiple performance levels relative to shade, woody debris, pool frequency, etc. ODF submitted a copy of its draft analysis and explanation for its new rules, "The Oregon Forest Practices Act Water Protection Rules: The science, policy considerations, and logic behind the rules" (September 1994).

With regard to the land management performance standards especially, ODF suggested incorporating additional explanation to address the possible conflicts and agreements between the proposed performance standards and existing agency policy standards and rules. ODF also suggested that urban areas should be included and recognized for their contribution to habitat needs. Finally ODF was concerned about the eastside forest timber harvest performance standard, stating that precluding the cutting of any 150-year-old and older live standing dominant or co-dominant ponderosa pine does not consider stand specific needs nor does it recognize the multiple uses of different ownerships.

The Oregon Water Resources Department stated simply that several of the performance standards would be difficult to implement, especially where they preclude activities having any impact, and that the Council should consider "no net loss" provisions in lieu of absolute prohibitions.

Timber and forest resource companies submitted comments very similar to ODF's and to each other, including comments from Boise Cascade, Associated Oregon Loggers, and the Northwest Forest Resource Council. The latter group began by stating that the Council offered no evidence to support the position that significant habitat degradation continues to occur throughout the Columbia Basin, requiring a more onerous set of performance standards. The proposed objectives and standards could undermine existing economic uses of land and water resources, without biological gain. NFRC also stated that it was inappropriate to apply performance standards derived primarily from westside federal forests and the FEMAT/PACFISH processes to lands on the eastside, given the broad and complex geologic area and various land uses. It suggested that the Council adopt more technically defensible standards that address individual stream conditions and public

processes seeking to define and reach specific desirable future conditions, rather than generic standards. The existing language of Section 7.6 was much preferred compared to the proposed revisions, as technically more defensible than the FEMAT/PACFISH habitat features proposed. NFRC called the riparian reserves prescriptions for disaster. Road standards proposed had no scientific basis; road building standards and other associated mitigation measures have been significantly strengthened in forest plans and should be given time to demonstrate their ability to meet the desired objectives. And the proposed measure of prohibiting harvest of trees greater than 20 inches in diameter had no scientific basis, because age, size and species restrictions on timber harvesting have no direct cause and effect relationship to riparian and aquatic habitat function. Riparian timber screens as currently applied on National Forests on the Eastside have been counterproductive to goals seeking to restore forest health. With regard to streambed and channel standards and measures, NFRC recommended using conservatively applied structural methods to protect and improve riparian areas and streambeds in order to provide interim benefits for fish.

In sum, NFRC commented that the Council should not limit its alternatives to the range of PACFISH riparian management objectives and should instead use an open public scoping process (e.g., as in the Eastside Ecosystem Management Project) to explore alternatives to PACFISH standards and guidelines; “Council should respect this process and not circumvent the law (e.g. NEPA) by urging the agencies to limit the range of alternatives.” On private lands, the Council should emphasize cooperation more than indicated in the draft rule in order to yield significantly greater benefits on private lands than could be achieved on federal forest lands.

Boise Cascade adopted by reference the comments of the Northwest Forest Resource Council and added a few of its own. Boise Cascade expressed both legal and scientific concerns about the Council’s proposed habitat standards and other habitat provisions. The proposed habitat standards in Section 7.6 do “not appear to be within the legal authority of the Council.” They were sufficiently controversial that the Council should present these kind of standards and policies separate from a rulemaking focused on an anadromous fish plan involving hydroelectric projects. The Council’s focus should be mainstem survival, not on the relatively minor issues originating from aquatic and riparian habitat conditions on forest lands. The Council ignored local planning groups, state agencies, landowners, and certain ESA mandated site-specific recovery plans in the development of the draft amendments; if such input were attained the Council “could provide recommendations for positive practices rather than punitive standards.” Boise Cascade questioned the scientific validity of the Council’s numerical standards for in-channel and other habitat conditions and the chances of success. It also stated that the Council should delete the performance standards for timber harvest, forest roads, and livestock grazing. Boise Cascade echoed the comments from the Oregon Department of Forestry that a better approach and source of principles could be found in the Oregon Forest Practices Act.

To summarize other comments more briefly, the Chelan County PUD objected to the biological origin and legal standing of the proposed standards, and questioned the legal validity and enforcement potential of the minimum setback requirements, logging prohibitions and other measures, since local or state requirements may take precedence. The Wallowa County, Oregon, Chamber of Commerce opposed the proposed habitat performance standards and land management restrictions that would flow from these standards. The Chamber supported instead Oregon’s new riparian standards. The Council should remove references to or use of PACFISH guidelines and standards as not appropriate; confine its efforts to hydro-related matters; roads are not Council’s job, nor are off-site efforts; there is no connection between timber harvest as currently practiced and habitat concerns or proposed standards and regulations on forestry; site-specific plans and actions based on local input, such as watershed plans, are the appropriate process and Council should support those strongly as the habitat portions of the program. Lengthy comments similar to all of the above and adding much particular detail about one watershed came from the Board of Directors of the Grand Ronde Model Watershed Program and from the Wallowa County representatives on that Board. Their main conclusion was that the Council needed to state more clearly that these are interim standards to be replaced by locally developed

standards, that performance standards must be developed locally, based on local information, and should be guidelines or objectives and not standards. The Columbia River Alliance resubmitted the Phase Three comments of the Northwest Irrigation Utilities that opposed the involvement of the Council in the implementation of habitat programs and in the establishment of prescriptive habitat standards or directives. The CRA favored instead a cooperative approach calling on the fishery managers and the BPA to join with the local agencies and land owners in a coordinated, cooperative process to develop land management guidelines and cost-shared habitat improvement projects. And the Resource Organization on Timber Supply (ROOTS), of Lewiston commented that the habitat standards and measures called for by CRITFC in this recommendation and in the subbasin plans were not necessary and should not be adopted, as they are based on logging and road building standards of the past, while current timber harvest practices on federal and on private lands under current forest practices regulations and concepts do not harm riparian habitat.

BPA added that the concept of habitat standards has considerable merit and should be pursued, but that there are problems with the standards proposed in the amendments. The list is incomplete, for one, (flows are missing, for example). BPA particularly noted that a big problem with the proposed standards is that they really were management directives that went beyond standards. BPA concluded that there needs to be interagency coordination of this work, including the documentation of existing habitat conditions. BPA would delete the proposed habitat and land management performance standards/objectives in lieu of BPA's proposal for a new Section 7.6C.1, which calls on land managers, including private landowners, to convene by April 30, 1995, to develop "Watershed Health Habitat Performance Standards and Land Management Directives." BPA would also delete Section 7.6C.4, which establishes a schedule for land management agencies and tribes to provide the Council with habitat performance standards. Instead BPA prefers a different schedule that calls for reporting progress on developing, not completing, performance standards.

Finally, the Forest Service briefly and generally commented that it supported the establishment of biological objectives tied to performance standards, noting that the Forest Service and BLM are developing various riparian management objectives, standards, etc. in the PACFISH process (and in the President's Forest Plan), which "once adopted . . . will establish interim management direction, including performance standards, for Federal lands." The Forest Service stated that it is critical to coordinate development of the Council's objectives and standards with these processes. The Forest Service did not specifically comment on the watershed and land management standards recommended by CRITFC and proposed in Council's draft.

Finding: The Council substantially adopted CRITFC's recommendation, with some modifications, in a revised Section 7.6 introduction; the revision of and addition to what was Section 7.6A (habitat objectives) into Section 7.6A, Habitat Goal; a slightly revised Section 7.6B, Habitat Policies; a new Section 7.6C, Coordinated Habitat Planning; a major revision of what was Section 7.6C (habitat performance standards) into Section 7.6D, Habitat Objectives; the deletion of what was Appendix B to the original 1994 program (reference habitat performance standards); and the creation of a new Appendix A, Habitat Recommendations. To reiterate from above, the modifications primarily reflect the reality of the Council's limited role in land and riparian habitat

management, and, more important, the Council's belief that the subbasin planning and local collaborative watershed planning processes are the best forums for addressing habitat issues.

The Council modified its draft provisions to correspond more closely to what CRITFC recommended and CBFWA suggested in its comments. For some examples: CBFWA rewrote much of the introductory text that begins Section 7.6 to reflect CRITFC's recommended language on habitat problems and needs. The Council incorporated this language. The Council adopted a habitat program goal in Section 7.6A, which, while not precisely what CRITFC recommended (and CBFWA did not include CRITFC's goal), did state the overall goal to "protect and improve habitat conditions to ensure compatibility with the biological needs of

salmon, steelhead and other fish and wildlife species.” Revisions to Section 7.6D (former Section 7.6C), along with other revisions to Section 7.8A, strengthened the Council’s call on the federal land managers to act consistent with the Council’s habitat goal, policies and objectives and to monitor, report and address inconsistencies. And with regard to the specific objective on water temperatures, the Council closed the gap with the CRITFC recommendation by altering the draft objective to “[a]ttempt to maintain temperatures in historically usable spawning and rearing habitat at less than 60 degrees F. Under all circumstances, do not exceed 68 degrees F throughout each watershed.” Section 7.6D (water quality).

The centerpiece of CRITFC’s recommendation was the set of tough, specific watershed objectives -- sediment, cobble embeddedness, bank stability, water temperature and the like. The Council has accepted CRITFC’s and CBFWA’s judgment on the expected biological value of these objectives. See Section 7.6D. As public and private land managers work hard over the next decade to try to restore riparian and streambed habitat, the Council believes they should aim to achieve these objectives or be able to demonstrate why a different approach is equally effective. Local watershed managers and subbasin planners are free to develop locally-specific approaches, standards and objectives -- in fact, the Council encourages them to do so, in cooperative watershed and subbasin planning forums. But the locally developed standards should provide biological benefits that are functionally equivalent to what the general objectives are intended to achieve, and the Council expects the local managers to report the biological rationale for standards and approaches that differ from the Council’s objectives. (See Sections 7.6C, 7.6D (introduction), and 7.8A.) A number of the comments indicated reasonable concerns about some of the proposed land management objectives, especially the timber harvest objective. The Council believed on this record that it would be more effective to state that the “objectives” for these types of land activities (timber harvest, new road construction, etc.) should be to meet the watershed objectives of sediment, water temperature, etc. Section 7.6D. The Council has also incorporated CBFWA’s habitat program introductory language and stated a habitat program goal to “protect and improve habitat conditions to ensure compatibility with the biological needs of salmon, steelhead and other fish and wildlife species.”

The Council characterized CRITFC’s prescriptive management directions as recommendations for actions that collaborative watershed and subbasin planners and land managers should consider when the objectives are not met, and the Council placed these recommendations in Appendix A. This is consistent with the Council’s legal role with regard to land management activities that affect habitat -- the Council can recommend and guide but has no management, funding or other authority. It is also consistent with the Council’s view of who the most appropriate and effective entities are to make these decisions. Some of the objectives themselves were modified in minor ways with this limitation on the Council’s authority in mind. For example, while the Council adopted an objective describing riparian areas in which managers should take special care, the Council did not adopt the recommendation to call these areas riparian reserves and forbid any soil disturbance or vegetation removal. The Council believes its approach is more consistent with its legal authority and will be more effective than to adopt a directive that is ignored. 16 U.S.C. § 839b(h)(7)(C).

CBFWA and other groups submitted comments that suggested further substantive amendments to the habitat section of the program which had neither been recommended nor proposed by the Council and subject to public review and comment. The Council was unable to consider incorporating these suggestions into the program during this administrative process without violating its obligations under the Northwest Power Act and the Administrative Procedures Act to provide an opportunity for notice and public comment on substantive changes to the program.

Program Section(s): 7.1E, 7.6C, 7.7B, 7.8A, 7.8C, 7.8D, 7.8E, 7.10A.5
Source: Forest Service
Recommendation No.: 7-6

The Forest Service recommended a number of changes to these sections to reflect the Forest Service's on-going environmental analyses and planning and management initiatives, as described below:

Section 7.1E.2 (wild and naturally spawning population policy)

Recommendation: The Forest Service recommended revising this section to reference the upcoming NMFS recovery plan. The Forest Service also commented with regard to this section (and others) that the Council needs to be aware that the Forest Service plans to incorporate PACFISH directives into the Eastside and Upper Columbia River Basin EISs and, for those forests not covered by these EISs, to follow aquatic strategies outlined in the Record of Decision for the President's Forest Plan to manage anadromous fish watersheds within the range of the northern spotted owl.

Finding: The Council revised Sections 7.1D.1 and 7.1D.2 (former Sections 7.1E.1 and 7.1E.2) to note that among the factors to be considered in developing and implementing the wild and natural spawning population program are "[r]ecovery plans and other products developed under the Endangered Species Act for Columbia River Basin species." Note also that Section 7.8A has been revised to include references to the policies, objectives and standards in PACFISH, the President's Forest Plan and the other planning, management, and environmental study initiatives as factors for implementation in land management, along with the policies, objectives and standards developed by the Council.

Section 7.6C.1 (habitat performance standards)

Recommendation: The Forest Service recommended review by the Council of the "riparian management objectives" the Forest Service has developed for managing riparian/anadromous fish habitat for consistency with the Council's performance standards and other portions of the program. The Forest Service did not specifically recommend amendment of the program for this purpose. The Forest Service stated that its standards, which were not submitted with this recommendation, address stream temperatures, large woody debris, stream bank stability, bank angles and other issues and included a "monitoring protocol" to measure the effectiveness of the objectives.

Finding: This was not a recommendation requiring amendment of the program, as it asked only for the Council staff to review the Forest Service's riparian management objectives for consistency with the Council's program. The Council has revised the portion of the program containing the habitat goal, policies and objectives in response to a CRITFC recommendation, as described above, and thus the Forest Service may wish to review these amendments before requesting Council review of its objectives.

Sections 7.8A.1 to 7.8A5 (implement state, federal and tribal habitat improvements)

Recommendation: The Forest Service recommended a number of changes to the following sections to incorporate the Forest Service's on-going environmental analyses and planning and management initiatives.

Section 7.8A.1 (Anadromous Fish Habitat Policy implementation). The Forest Service recommended revising this section to call for continued implementation of the Columbia River Basin Anadromous Fish Habitat Policy and Implementation Guide (signed January 1991), and stating that key elements of the Anadromous Fish Habitat Policy will be incorporated in and implemented through the President's Forest Plan (northern spotted owl forests) or PACFISH (non-northern spotted owl forests).

Section 7.8A.2 (recovery actions where standards not met). The Forest Service recommended that this section be rewritten to reflect and call for the Forest Service, through the Columbia River Basin Assessment and Eastside and Upper Columbia River Basin EISs, to “identify fish restoration measures and Forest health concerns and develop strategies to enhance the aquatic habitats for the production of anadromous fish and reduce the impacts of catastrophic disease infestations that may infect threatened salmon and steelhead habitat.”

Section 7.8A.3 (review land management plans). The Forest Service recommended that this section be revised to reflect and call for the Forest Service, through the Eastside and Upper Columbia River Basin EISs, to “evaluate and develop [in the land management plans] a range of alternatives that display PACFISH riparian management objectives (performance standards).”

Section 7.8A.4 [now Section 7.8A.5] (livestock management plans). The Forest Service recommended that the Council call for the Forest Service to continue to improve livestock management and to update livestock management plans, including, through the Eastside and Upper Columbia River Basin EISs, the incorporation of PACFISH riparian management objectives, standards, and guides.

Section 7.8A.5 [now Section 7.8A.6] (annual report). The Forest Service recommended that this section be revised to call for the Forest Service to report to the Council annually “the effectiveness of Federal land management actions to maintain and restore salmon and steelhead habitats within the Columbia River Basin on Federal lands.”

Finding: The Council largely adopted these recommendations, although not in the form and language submitted by the Forest Service. The Council amended Section 7.8A to include references to the policies, objectives and standards in PACFISH, the President’s Forest Plan and the Forest Service’s other planning, management and environmental study initiatives as factors to be considered (along with the goal, policies and objectives called for by the Council) in the revision of land management and livestock management plans and in the implementation of land management decisions. The Council did not adopt the Forest Service’s precise revisions (which both added and deleted language) because the effect would have been to exclude the BLM planning and management process and to delete substantive areas of the program calling on the land managers to design activities to at least maintain the quality and quantity of existing habitat and to seek means to accelerate the implementation of the Anadromous Fish Habitat Plan. Adopting the Forest Service’s precise recommendations thus would not complement the activities of the fish agencies and tribes and would be less effective than the amendments adopted in protecting, mitigating, and enhancing fish and wildlife. 16 U.S.C § 839(h)(6)(A), (7)(B), (C).

Program Section(s): New 7.8D.2 (standards for streambanks and streambeds)
Source: CRITFC
Recommendation No.: 7-1

Recommendation: CRITFC recommended adding a provision calling on BPA to “fund tribes to develop native plant nurseries for use in restoration of watershed plant diversity.”

The draft rule incorporated this recommendation with modifications, particularly enlarging the funding obligation to “Bonneville, Tribes and Federal, State, and Private Agencies” and not restricting nursery development to tribes alone. CBFWA did not alter this language in its comments. The Corps of Engineers supported the need for additional native plant nurseries.

Howard Jaeger of the Washington Association Conservation District's Plant & Materials Center submitted a memorandum in response to a consultation request from Council Member Bottiger, in which Jaeger noted that the non-profit center he is associated with (and which has links to other, similar non-profit groups, centers and nurseries in the region) have the precise mission of producing conservation and native plant materials in support of conservation programs for conserving soil, improving water quality and enhancing fish and wildlife habitat. Council Member Bottiger reported receiving information of this type from others, who indicated that there was an existing source of a supply of native plant materials, and from low-cost non-profit organizations, and that these sources simply need to be supported and utilized better.

Finding: The Council adopted this recommendation with a minor modification. Section 7.8D.2 calls on BPA "to evaluate the adequacy and capacity of existing native plant nurseries to supply plant materials for use in protecting and improving riparian and other habitat." BPA is to submit that evaluation to the Council by June 30, 1995. If the existing supplies are found to be inadequate, then BPA, the tribes, federal and state agencies and others are to bring the existing nurseries up to capacity and, as needed, fund the development of additional nurseries. CRITFC justified the need for native plant materials in its recommendation, but did not describe the number of existing sources or explain that these do not have the ability to meet the need. If it is true that low cost sources of sufficient native plant materials exist for the extensive purposes that the fish managers and land manages have in mind to restore watershed plant diversity, then using those sources rather than funding new sources could be the least cost alternative for achieving the same end, 16 U.S.C § 839(h)(6)(C), (7)(B). The Council expects to be notified quickly whether sufficient sources really do exist, and if not, it expects additional nurseries to be funded consistent with CRITFC's recommendation.

Program Section(s): 7.8F (water regulation -- water spreading)
Source: WaterWatch of Oregon
Recommendation No.: 7-5

Recommendation: WaterWatch proposed a new Section 7.8F.3 calling for the Bureau of Reclamation to "identify and resolve" water spreading activities at reclamation projects" and take "all steps required by federal and state law" to reallocate that water for instream uses. If water spreaders seek official approval of unauthorized uses, approve "only if environmental impacts are fully mitigated."

The draft rule modified WaterWatch's recommendation to call for the Bureau to identify, quantify and value all instances of water spreading and then "[p]ropose alternative approaches for addressing this issue including alternatives that provide incentives for water conservation, that would make water available for instream uses, and that recognize whether instream needs are satisfied."

WaterWatch submitted further comments and information and continued to support its more stringent recommendation calling more directly for all water spreading to stop and for that water to be dedicated to instream flows. Others supported WaterWatch, including the Confederated Tribes of the Umatilla Reservation, CBFWA, CRITFC, Save Our Wild Salmon, American Rivers and Oregon Trout.

Other commenters opposed any significant Council action on water spreading (e.g., the Oregon Water Coalition and the Oregon Water Resources Congress) and/or advised caution in relying on water spreading as a solution to in-stream flow problems (Oregon Water Resources Congress, Oregon Water Resources Department and Bureau of Reclamation). The Oregon Water Resources Congress, for example, commented that if the Council decides to include a water spreading measure in the program, the Council must ensure that consideration is given to a host of factors, including the protection of existing rights, providing for conservation incentives (which is reportedly the source of some of the spread water), promoting instream uses, and mitigating environmental impacts. The Idaho Water Resources Department was similarly concerned with protecting private water rights under Idaho water law, and noted that simply ending an instance of water

spreading upstream does not guarantee that the water can be dedicated to lower river salmon flows because Idaho has no authority to curtail the valid water rights of downstream rights holders. The Bureau of Reclamation's own comments particularly focused on this point -- the Bureau did not believe there will be a significant firm yield of water from investigations into water spreading, if only given the difficulty under state water law in dedicating the water saved and stored in Bureau reservoirs to salmon flows rather than to water rights held on the remaining eligible land base.

Finding: As Section 7.8F.3, the Council adopted the language proposed in the draft, which represents a modified version of WaterWatch's recommendation. The Council understands the need and desire to end what appears to be in many instances illegal consumptive uses of water and to be able to rededicate as much of that water as possible to instream uses. The problem is in how to ensure that any of this water is dedicated to instream flows, given the realities of the state water law of prior appropriation (which the Bureau must act consistent with under the Reclamation Act and which the Council must respect under the Power Act) in over appropriated, arid basins, and given the Council's lack of authority in this area, 16 U.S.C. § 839g(h). This situation is too uncertain simply to direct that water formerly spread be dedicated to instream flows; junior right holders may simply appropriate the water downstream and the legal means to stop them may be lacking. Changes in state or federal law and/or cooperative agreements among private water users, the Bureau and the states will likely be necessary at least in part to allow some or all of this water to pass in-stream. The Council sees more value at this point in stating an objective of dedicating as much of this water as possible to instream uses and urging the Bureau and the states to determine how this can be done. The Council also adopted Section 7.8H.4 urging the states to evaluate adopting statutes or regulations that call for water conservation programs with a goal of 25 percent more water conservation efficiency regionwide. All or a substantial portion of the conserved water is to be dedicated to instream uses. The Council has concluded that these measures would be a more effective way to free up some of this water to protect, mitigate and enhance fish than the recommended language from WaterWatch. 16 U.S.C § 839(h)(7)(C).

Program Section(s): 7.8F (water regulation -- water quality monitoring/
dredging assessment)
Source: CRITFC
Recommendation No.: 5-2

Recommendations: CRITFC recommended two water quality measures that were grouped together in Section 7.8F. First, CRITFC recommended that the Corps of Engineers fund in 1995 "a network of water quality monitoring stations" in the Snake and lower Columbia "capable of instantaneous telemetry." Second, the Corps, with fish agency and tribal consultation and approval, is to fund a comprehensive assessment of all existing and planned dredging activities in the Columbia and Snake mainstems.

CBFWA supported both recommendations in its comments. The only other responsive comment came from the Port of Portland, which was of the opinion that the recommendation for a comprehensive dredging assessment by January 1996 needed more time for evaluation, primarily because water quality studies need to be coordinated and this proposal might very well duplicate studies now under way.

Finding: Adopted as new Sections 7.8F.4 [inadvertently repeated in modified form at Section 5.6C.3] and 7.8F.5. The Council expects the Corps and the fish managers to take into consideration the Port of Portland's concerns when they design the dredging assessment.

Program Section(s): New 7.8G.4 and 7.8G.5 (water leasing pilot projects)
Source: Environmental Defense Fund

Recommendation No.: 7-7
Source: Bureau of Reclamation
Recommendation No.: 7-8

Recommendation: The Environmental Defense Fund (EDF) and the Bureau of Reclamation both recommended that the Council call for the Bureau of Reclamation to implement a water leasing and transfer pilot program for instream flow enhancement in the Yakima subbasin. EDF specified that the Bureau is to fund 3/4 and BPA 1/4 of the pilot program; the Bureau stated that the Bureau, the BPA and “other relevant parties” would share responsibility for implementing the pilot program. According to the Bureau, the “goal” of the pilot program would be to deliver “at least 50 cubic feet per second of additional instream flows at the Parker gauging station for a six week period during each of three pilot-program water years.”

In the draft rule the Council proposed not only the Yakima basin pilot project, but also three other pilot projects in the Snake River basin to be identified by the Bureau and BPA working with the states. The Bureau questioned the three additional programs. The Bureau recommended a program in the Yakima basin because it was part of the Bureau’s on-going water conservation demonstration project and because Washington had modified state law to allow for this leasing program. Since 1991, the Bureau and others have in general been trying to rent, lease or buy water in the Snake Basin under existing Idaho and Oregon water law, and so the Bureau was unclear what the new program provision adds to these efforts.

Finding: The Council adopted and added to these recommendations. New Sections 7.8G.4 and 7.8G.5 call for four water leasing and transfer pilot programs, one in the Yakima subbasin and three in the subbasins of the Snake River, to be identified by the Bureau and BPA working with the states. The cost share for the Yakima project is as recommended by EDF. Different cost share formulas apply to the other projects, recognizing the varying impacts of hydropower developments in different parts of the basin. The Council decided not to state particular flow improvements goal for these projects, stating only that the parties to these pilot program are to “[i]dentify goals for each demonstration project in cubic feet per second of additional instream flows measured at specific points at certain times of the year.” The Council is aware of and supports the various efforts of the Bureau and others to obtain water from willing sellers (including lessors) in the Snake basin. In fact the Council has sufficient hopes in the promise of these efforts to call in Section 5.2A.3 for the Bureau and Idaho to provide one million acre-feet of additional water from the upper Snake basin by 1998 through willing buyer/seller transactions and other means. The Council intends by the water leasing pilot programs to further encourage and facilitate, not supplant, these efforts -- to provide support for an additional arrangement or institutional structure to help bring some of this water to the leasing market.

Program Section(s): 7.9A.1, 7.9A.3 to 7.9A.6, 7.10A.6, 7.10E, 7.10I
Source: Corps of Engineers
Recommendation No.: 5-3

The Corps of Engineers recommended a number of relatively minor changes to Sections 7.9 and 7.10 that were partially adopted, as follows:

Section 7.9A.1 (Willamette subbasin/Detroit Dam)

Recommendation: The Corps recommended that Section 7.9A.1 be revised to note that the feasibility study for installation of devices to control temperature of water discharged from Detroit Dam will not be completed by the specified time (March 1996). The Corps’ present efforts are focused on a similar study at Cougar and Blue River dams called for by Section 7.9A.2 and which should be completed by the

specified date (April 1995). Information obtained in Cougar/Blue River study should be useful for evaluation of Detroit Dam and other projects.

Finding: This recommendation called for a change in a report date, not for a substantive measure to protect, mitigate and enhance fish. Because the date set for reporting is still a year and a half in the future, the Council prefers to leave the date as set in hopes that the Corps will find a way to complete the study at least by sometime in 1996. The Council requests that the Corps inform the Council sometime in 1995 about the probable date for completion of this study.

Sections 7.9A.3 to 7.9A.6 (Willamette subbasin/minimum flow analysis and agreement)

Recommendation: The Corps recommended revision of these sections to note that yearly flows for the Willamette River are developed in consultation with ODFW and OWRD and that feasibility studies for developing minimum flows for the Willamette have not begun, although reconnaissance studies have been completed. (Note that in the public comments, WaterWatch stated its support for the language in Section 7.9A calling for use of stored water for minimum flows in Willamette basin.)

Finding: The Council accepted this recommendation by revising Section 7.9A.6 calling for the Corps, the Bureau and the Fishery Managers to “meet minimum flows established annually by the state natural resource agencies in consultation with the Corps of Engineers while permanent flow guidelines for the Willamette are being developed. In setting minimum flows, consider needs for water volume in the estuary for fish and wildlife.”

Section 7.10A.6 (mainstem diversion screening projects)

Recommendation: The existing Section 7.10A.6 called on the Corps of Engineers to periodically inspect the diversion screens in the mainstem Columbia and Snake Rivers. The Corps of Engineers recommended that Section 7.10A.6 be revised to note that the states are funded by BPA to inspect the diversion screens, not the Corps, and that states report defective screens to the Corps, which is involved in the modification process only through its permitting authority. The Corps stated that it does not fund repairs, the upgrading of existing screens or the installation of new screens.

The draft amendments incorporated this recommendation. CBFWA partially opposed the revision. CBFWA agreed that the state anadromous fish screen programs, which are familiar with fish screen criteria, should conduct the inspections. But CBFWA noted that because a Corps Section 10/404 permit is needed to install an intake in the mainstem, and adequate fish screening must be a condition of these permits, the Corps has the ultimate legal responsibility to periodically monitor project actions to determine if the fish screens are adequate to protect juvenile salmon, as required by the permit conditions. Thus the Corps should be the entity that funds the diversion screen inspections and makes the ultimate determinations as to whether screens are in place and operating correctly and whether and when repairs and modifications are required.

Finding: Given CBFWA’s comments, the Council decided to revise this section (Section 7.10A.6) only to call for the Corps to fund the screen inspections, instead of calling for the Corps to perform the inspections. Revising the section further at this point, on this information, might leave the inspection program without an ultimately responsible entity, which would be less effective than the revised language in protecting fish. If the Corps desires to pursue this point, it should return to the Council with additional information indicating why BPA is or should be the funding source, and not the Corps, for the diversion screen inspection program in the mainstem, and, more important, why the Corps does not have the ultimate legal responsibility to ensure that diversion owners have installed screens that operate adequately.

Sections 7.10E (Green Peter Dam) and 7.10I (Foster Dam)

Recommendation: The Corps asked that Section 7.10E.1 be revised to note that the Corps has requested funding for a study to determine the effect of fluctuating flows at Green Peter Dam on steelhead runs in South and Middle Santiam Rivers, and that Section 7.10I.1 be revised to note that the Corps has requested funding to investigate alternative methods of providing adequate downstream fish passage at Foster Dam.

Finding: The existing language calls on the Corps to conduct these evaluations. There is no need to amend the sections to note the Corps' progress in requesting funding.

Program Section(s): 7.10B (Condit Dam)
Source: PacifiCorp
Recommendation No.: 7-12

Recommendation: PacifiCorp recommended revising the introductory text of Section 7.10B and the implementing measure Section 7.10B.1 to call for PacifiCorp to fund independent studies for three years "to resolve critical uncertainties associated with the proposed reintroduction of anadromous fish into the White Salmon River above Condit Dam." If upon completion of the study NMFS and FWS prescribe passage at Condit, PacifiCorp is to fund construction and annual operation and maintenance for the upstream and downstream passage facilities. If passage is not prescribed, PacifiCorp will fund "anadromous fish enhancement activities" developed in an agreement between PacifiCorp, NMFS, USFWS, the Washington Department of Fish and Wildlife and the Yakama Indian Nation. While the three-year study is in progress, WDFW and the Yakama Nation are to "conduct a public process" to revise the subbasin plans for the White Salmon, Wind, Little White Salmon and Klickitat subbasins to reflect on-going studies and the developments associated with the *U.S. v. Oregon* settlement, the ESA process, and the Council's fish and wildlife program.

PacifiCorp's reasons for this recommendation were partly explained in the revisions it proposed for Section 7.10B. These text amendments described the FERC relicensing procedure for Condit Dam; noted that NMFS and USFWS have the right to insist in that proceeding that PacifiCorp install fish passage facilities; and outlined the dispute between PacifiCorp and the various agencies over whether fish passage at Condit would actually help achieve the management objectives in the White Salmon River Subbasin Plan, an issue the various studies are intended to resolve.

The draft contained four alternative approaches for revising Section 7.10B on Condit Dam. Two alternatives reflected the views of the agencies and tribes, calling for passage facilities or dam removal. Alternative 3 was intended to reflect, although not mirror, PacifiCorp's recommendation, calling for further consultations with fishery managers to determine an agreed-to approach to passage. It did not correspond precisely to PacifiCorp's recommendation. The fourth was the existing program language, calling for passage.

PacifiCorp submitted comments noting that none of the alternatives precisely matched the recommendation and attached the recommendation again. PacifiCorp emphasized that it was not necessarily opposing fish passage at the dam, simply that there was a need to fund short-term research to analyze the critical uncertainties surrounding salmon reintroduction and a need to resolve this issue within the context of revising the White Salmon River subbasin plan and developing a plan for restoring White Salmon River fisheries. A short-term study with a deferred passage decision was appropriate "because there are currently no fishery objectives for the White Salmon and adjacent basins." PacifiCorp also submitted to the Council an analysis just produced by the Forest Service and submitted to FERC. This report contained the preliminary findings of the Forest Service under Sections 7(a) and 7(b) of the Wild and Scenic Rivers Act for the Condit Dam relicensing. The Forest Service stated that it was unable to determine on the current information whether

providing for passage at Condit and thus the reintroduction of anadromous fish above Condit Dam would adversely affect the resident rainbow trout fishery in the White Salmon above Condit Dam. Forest Service requested this issue be part of the FERC DEIS.

Some commenters supported PacifiCorp's position of additional study to determine if reintroduction was a wise decision. These included Oregon Trout, the White Salmon River Steelheaders, the Oregon Water Coalition, PNGC, and the Pacific Northwest Waterways Association. The comments of Oregon Trout and the White Salmon River Steelheaders were the most extensive, and they corresponded roughly to what PacifiCorp's independent consultant had stated -- salmon passage could be supported if it could be demonstrated that native salmon from the subbasin were being reintroduced to an area of historic access, rather than the new introduction of a species that was never present and might adversely affect resident fish. Further evaluation was needed to resolve this uncertainty.

Many more commenters, including the fish agencies and tribes, supported the position that the agencies and tribes have taken since the early 1980's calling for passage or dam removal and opposing additional study based on their view that it has been demonstrated that salmon once occupied this area and could be and should be properly reintroduced. The Council's record includes comments submitted in direct response to the Council's proposed program language and copies of comments or license conditions submitted to FERC and copied to the Council. These include comments and conditions from NMFS, CBFWA, the UCUTs, the Yakama Nation, Pacific Fishery Management Council, a coalition of environmental groups led by American Rivers, Friends of the White Salmon River -Trout Lake Chapter, American Whitewater Affiliation, Don Wilner and R.S. Hinton & Assoc. NMFS confirmed its official position is passage or dam removal as called for in its FERC comments.

Finding: The Council's revised program language notes that FERC is preparing an environmental analysis and will probably prepare an EIS as part of the Condit relicensing proceedings. The EA/EIS and the comments and conditions submitted by the fish managers and others "will provide a basis for determining the optimum means for providing anadromous fish access to historic range on the White Salmon River." The Council's language recognizes that FERC will make that decision in consultation with the fish agencies and tribes. The Council does not believe further study beyond this EIS is warranted as it would at the least not complement the activities of the fish agencies and tribes, 16 U.S.C § 839(h)(6)(A), (7)(B).

SECTION 8: SALMON HARVEST

Program Section(s): 8, 8.1, 8.2, 8.3, 8.4, 8.5
Source: PNUCC
Recommendation No.: 8-1

The Pacific Northwest Utilities Conference Committee (PNUCC) recommended a set of specific amendments to Section 8 that would call for: (1) the use of the Snake River Salmon Recovery Team's recommended escapement objectives; (2) the elimination of mixed-stock fisheries and the promotion of terminal fisheries, known-stock fisheries and other fisheries where the harvest of weak stocks can be prevented; (3) improvements in the techniques for estimating adult returns; (4) improvements in the reporting of harvest data; and (5) reductions in the ocean harvest of Canadian fish by Washington fishers to obtain corresponding reduction in the harvest of Columbia River fish by Canadian fishers. The Council adopted some of these recommended amendments, although the Council did not usually adopt PNUCC's specific language, and rejected others, as described below:

Use Recovery Team's recommended escapement objectives.

Recommendation: PNUCC recommended that the Council call for the fishery managers to use the escapement objectives recommended by the Recovery Team in lieu of the program's call for the fishery managers to develop management goals, rebuilding schedules and escapement objectives for use in managing harvest. More specifically, PNUCC recommended these changes:

Section 8.1A.1 (management goals and escapement objectives). PNUCC recommended deleting the language calling for the fishery managers to develop management goals and escapement objectives, replacing it with the directive to "[u]se escapement goals established by the Recovery Team." Second, PNUCC recommended replacing the language calling for harvest to be managed "to meet rebuilding targets," with language calling for harvest to be managed "to exceed escapement objectives." PNUCC would also delete the caveat or qualifier in that sentence concerning "the uncertainties associated with escapement objectives." Third, PNUCC recommended altering the last sentence to state that a failure to manage for spawning escapement objectives "will" [not "could"] jeopardize Council support for future funding of production and habitat measures.

Section 8.1B (rebuilding schedules). PNUCC recommended deleting all of Section 8.1B, concerning the fishery managers' development, review, and revision of escapement objectives and rebuilding schedules.

Section 8.1C.1 (consultation). PNUCC recommended editing this section to state that the fishery managers are to consult with the Council yearly concerning the consistency of harvest management and harvest rates with the established escapement objectives, eliminating references to "management goals" and "rebuilding schedules."

Section 8.2A.1 (harvest management). Edit this section to call for fishery managers to "[m]anage fisheries to provide escapement that allows for the weakest stocks to rebuild and exceed escapement goals."

A few public comments supported the idea of adopting the Recovery Team's escapement objectives into the program, most notably from the Corps of Engineers. Harvest comments received from the state and federal fishery agencies and tribes -- from the Columbia Basin Fish & Wildlife Authority (CBFWA, the coalition of all the basin's federal and state fishery agencies and tribes), the Columbia River Inter-Tribal Fish Commission (CRITFC, representing the four lower Columbia treaty fisheries tribes), the Yakama Indian Nation, the Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fish and Game (WDFW), Idaho Department of Fish & Game (IDFG), and the Pacific Fishery Management Council (PFMC) -- did not expressly comment on the use of the Recovery Team's escapement objectives. The agencies and tribes' objection to the use of the Recovery Team's escapement objectives can be inferred, however, from the fact that CBFWA's proposed program re-write, which CBFWA submitted as a comment, retained the existing language in the program, from other comments from agencies and tribes as to how they planned to manage or approach the issue of fisheries, which did not include use of the Recovery Team's objectives. Even more important is the fact that the agencies and tribes objected to a number of Council initiatives in the management of harvest because these are, in CBFWA's view, provisions that "contravene the statutory management and operational responsibilities of the fishery management agencies" and are inconsistent with the tribes' treaty fishing rights. The agencies and tribes expressed a clear preference for resolving harvest issues through the *U.S. v. Oregon* framework and, as noted by PFMC in its comments, by following what NMFS eventually develops as part of the Snake River Recovery Plan. The Bonneville Power Administration (BPA) commented that it agreed with the Council that stock-specific management goals and escapement objectives should be established for each stock, without reference to the Recovery Team's recommended objectives.

Finding: On this record, the Council rejected PNUCC's recommendation to adopt the Recovery Team's escapement objectives as not complementing the activities of federal and state fish and wildlife agencies and appropriate Indian tribes. 16 U.S.C. § 839b(h)(6)(A). The Recovery Team's recommendations have been reported to NMFS and to the agencies and tribes generally, and NMFS and the others will decide whether and how to incorporate these objectives in the recovery plan and in the *U.S. v. Oregon* harvest management process. The Council continues to call in Section 8.1A.1 for the fishery managers to develop and submit to the Council escapement objectives, which the Council understands may be developed as part of the general biological framework for the program called for in Section 4. The Council did adopt PNUCC's recommendation for revising Section 8.1A.1 to state that a failure to manage for escapement objectives, when developed, "will" [not "could"] jeopardize Council support for future funding of production and habitat measures.

Eliminate mixed-stock fisheries; promote terminal fisheries, known-stock fisheries and other fisheries where the harvest of weak stocks can be prevented.

Recommendation: PNUCC recommended a number of specific amendments that add up to a call for an end to mixed-stock fisheries, a shift to terminal fisheries and other types of fisheries to prevent harvest of weak stocks, and other steps in the direction of more restrictive harvest management to protect weak stocks:

Section 8 (salmon harvest) and Section 8.2 (adopt harvest rates and regimes). PNUCC recommended editorial changes to the introductory text to Section 8 as a whole and to Section 8.2 to reflect the substantive changes it also recommended, including calling for a "complete moratorium on all ocean and mainstem mixed-stock fisheries until such time that all weak stocks are fully recovered and exceeding escapement goals."

Section 8.2A (harvest management). PNUCC recommended replacing Section 8.2A.1, which concerns harvest management regimes and harvest reductions, with language calling for the fishery managers to "[w]ork to eliminate mixed-stock fisheries, shifting harvest to tributary and terminal harvest areas that do not impact weak stocks (see Section 8.3). Manage fisheries to provide escapement that allows for the weakest stocks to rebuild and exceed escapement goals."

Section 8.2B through 8.2F (harvest management -- sockeye, fall chinook, spring chinook, summer chinook, voluntary harvest reduction for all fisheries). Consistent with its call for the elimination of mixed-stock fisheries, PNUCC also recommended deletion of all of these sections, which concern how to manage existing fisheries to protect these weak stocks.

Section 8.3 (improve harvest management). PNUCC recommended altering and greatly expanding the introductory text to Section 8.3. The proposed language emphasizes PNUCC's call for the elimination of mixed-stock fisheries and the promotion of terminal fisheries, including specific language about problems associated with the ocean troll, Columbia River gill-net, mainstem sport, and treaty mixed-stock fisheries, and recommending that treaty fisheries should be limited to terminal areas and to "Ceremonial and Subsistence platform dip-net fisheries" in the mainstem.

8.3A (harvest planning). PNUCC recommended minor changes to Section 8.3A.1 and 8.3A.2 to state clearly that BPA should fund the efforts of tribal and state fishery managers to develop and implement live-catch techniques and known-stock fisheries and to state that the Council supports the "re-programming of" enhancement activities that are geared toward stocks that contribute to "terminal fisheries" (not "adequately controlled fisheries").

Section 8.3B.1 (development of alternative capture technologies) and Section 8.3C.1 (terminal harvest fisheries). PNUCC recommended minor changes to these two sections to (1) call for “a” pilot project (not “pilot projects”) to evaluate methods for selectively harvesting abundant stocks while conserving weak stocks, and to limit participation in this effort to “tribal” harvesters (not all harvesters); and (2) to call for BPA to “[c]ontinue to fund the study” of terminal fishery sites, with a further call to “develop,” and not just “evaluate” these sites, and also adding a sentence to call for the development of a “business plan to make terminal fisheries self supporting, and identify hatchery production for re-programming.”

Public comment received by the Council included comments advocating more severe limits on harvest (Columbia County, Oregon, Commissioner Dale Heimuller); more aggressive action by the Council to oppose or eliminate all mixed-stock fisheries (Upper Columbia United Tribes or UCUTs, Douglas County PUD); support for a Council-proposed option to reduce the fall chinook exploitation rate to 35 percent, derived from a Recovery Team recommendation (UCUTs, PNGC, PNUCC); in-river commercial harvest only of marked hatchery fish (Pacific Northwest Waterways Assn.); elimination of all in-river commercial harvest which incidentally takes Snake River chinook, especially lower river gill-netting (Columbia River Alliance); the targeting of harvest on productive stocks while minimizing impacts on weak stocks (Save Our Wild Salmon); commercial and sport harvest that is restricted to what is biologically prudent to maintain a genetically diverse naturally spawning population (PNGC); no harvest of listed species until adequate escapement is established to restore populations (Corps of Engineers); an aggressive schedule to switch mixed-stock fisheries to selective live-catch and terminal fisheries, harvest measures tied to reprogrammed hatchery production “to support only natural escapement and terminal fisheries,” and an accounting for incidental salmon catch in non-salmon fisheries, (PNUCC); a reduction in harvest rates and implementation of selective fishing techniques to protect weak stocks (Direct Service Industries or DSIs); the preservation of genetic diversity and limits on mixed stocked fisheries weak stock harvest as the Council’s coordinating philosophy, including acknowledgment by the Council that the Endangered Species Act is now the major driver of harvest management (BPA). The Council also received comments in support of the continued development of terminal fisheries in general or specific terminal fishery projects (e.g., Rep. Elizabeth Furse, PNUCC, BPA).

On the other hand, the Council received comments objecting to proposals to ban lower river gillnet fishing (Salmon for All); objecting to the Council’s call for reductions in the fall chinook harvest rate and to the Council’s support for continued closures of ocean fisheries (PFMC, Washington Trollers Assn.); objecting generally to further reductions in ocean harvest and in-river gillnet harvest, coupled with information or remarks concerning how greatly reduced these fisheries already are, their minimal impact on listed populations, and a comparison of the minimal impact of present harvest rates on weak populations with the greater impact of other human activities throughout the life-cycle (Northwest Gillnetters, Pacific Coast Federation of Fishermen’s Association, Pacific States Marine Fisheries Commission, Washington Trollers Assn., ODFW). The Yakama Indian Nation emphasized that selective fisheries are not an effective tool for rebuilding populations, given the already minimal impact of fisheries. And the Council also received comments recognizing that the Council’s role, as opposed to NMFS’ specific goal under the ESA, is to rebuild healthy and numerous salmon populations over the long-term precisely so these populations can support thriving and traditional (if possible) tribal and non-tribal fisheries that contribute once again to a healthy salmon economy and culture in the region (e.g., Save Our Wild Salmon, DSIs, CBFWA). Most important, the Council received comments from nearly a consensus of the fishery managers (all but the UCUTs) objecting to Council proposals calling for further harvest restrictions, to the proposed 35 percent fall chinook exploitation rate, and to the closure of fisheries as an improper intervention by the Council that, as noted above, “contravenes the statutory management and operational responsibilities of the fishery management agencies,” interferes with treaty fishing rights, and interferes in the proper resolution of harvest issues by NMFS in its recovery plan and by the sovereign parties to the *U.S. v. Oregon* litigation. These comments emphasized that the fishery managers should make the decisions on whether further restrictions

were needed on particular fisheries and on harvest rates, including fall chinook harvest (CBFWA, CRITFC, Yakama Indian Nation, WDFW, IDFG, PFMC).

Finding: Based on this record, the Council did adopt a portion of PNUCC's recommendation. The Council continues to encourage the development of terminal fisheries wherever possible, primarily in Section 8.3C and adding a new Section 8.3C.2 calling for a joint strategy to create viable terminal fishery operations. The Council also recognized a need for and recommended more cautious and conservative harvest management to protect the weakest stocks, especially in those fisheries where the least is known about the impacts of the fishery and about how to manage to avoid impacts. The Council also supported only those production activities that contribute to adequately managed fisheries and do not aggravate mixed stock fishery problems. And, the Council called for efforts to reduce the harvest on non-targeted species. See the added language in the introduction to Section 8, in the introduction to Section 8.2, in Section 8.3A.2 and the new Sections 8.4E and 8.5B.

The Council continues to recognize that its provisions on harvest are only recommendations, however, and that the fishery managers have the full authority to determine the nature and extent of fisheries. The fisheries managers did not support PNUCC's recommendation to eliminate mixed stock fisheries. Thus the Council rejected this part of PNUCC's recommendation as not complementing the activities of the federal and state fish and wildlife agencies and Indian tribes, as those activities include managing the harvest of fish, 16 U.S.C. § 839b(h)(6)(A)(7), and as being in conflict with the legal rights of Indian tribes in the region, whose treaty harvest rights have been defined by the federal court in *U.S. v. Oregon* to include mixed-stock harvest. 16 U.S.C. § 839b(h)(6)(D). The Council continues to support the development of selective harvest methods, Section 8.3B, but rejected the recommendation to limit funding only to "a" sole project limited to tribal harvesters, as less effective than the adopted provisions for the protection, mitigation, and enhancement of fish and wildlife, 16 U.S.C. § 839b(h)(7)(C). More such projects increase the chances of increasing the protection, mitigation and enhancement of the runs.

Improvements in the techniques for estimating adult returns.

Recommendation: Section 8.4C (improve stock abundance prediction method). PNUCC recommended revising the title and content of Section 8.4C in order to "Improve Stock Abundance Prediction Methods." PNUCC recommended the deletion of the existing language in Section 8.4C.1, which called for the Fishery Managers to develop expanded marking and catch sampling programs, replacing it with a call to "[i]dentify data needs and develop research plans to provide information and develop models needed to improve predictions of adult returns to the Columbia River." The proposed text noted existing problems in predicting adult returns, especially the variables influencing ocean survival; an over-prediction for upriver spring chinook in 1994, which led to excessive commercial gill-net and mainstem sport fishery harvests; the adverse impact of this event on the treaty fisheries, which were forced to curtail harvest to compensate; and the corresponding need to improve prediction methods to "account for other factors that effect the survival of salmon." PNUCC also recommended a minor corresponding change to Section 8.4C.2 to call for BPA and the fishery managers to share the cost of expanded marking and sampling "and other" programs that are "needed" to achieve the desired level and precision of "the new prediction methodology." PNUCC also recommended an editorial change to the introduction to Section 8 to reflect these amendments.

Finding: The Council revised the introductory language of Section 8 and Section 8.2A and added provisions to former Section 8.4C (now Section 8.4D) that incorporated in modified fashion PNUCC's recommendation to develop better data and prediction methods, coupled with a call for a more conservative approach to harvest management where the uncertainties are greatest. The title of Section 8.4D was altered as PNUCC recommended. Section 8.4D.1 (former 8.4C.1) was not revised as PNUCC recommended; instead, a new Section 8.4D.3 calls on the fishery managers to "[i]dentify and implement research and model

refinements needed to improve preseason and inseason estimates of abundance and fishery impacts,” with costs to be shared between BPA and the federal government.

Improvements in the reporting of harvest data.

Recommendation: Section 8.5E (unified reporting of harvest data). PNUCC recommended an addition to Section 8.5E to make sure that harvest data is included in the Coordinated Information System (CIS) data base.

Finding: The Council revised Section 8.5E.1 to call for the PSMFC to use the CIS in the preparation of an annual unified harvest report. The Council also revised the introduction to Section 8 to recognize the need for improved data bases to estimate fishery impacts.

Reductions in the ocean harvest of Canadian fish by Washington fishers to obtain corresponding reduction in the harvest of Columbia River fish by Canadian fishers.

Recommendation: Section 8 (salmon harvest). PNUCC recommended changes to the introductory text of Section 8 that would have the Council recognize that inequities had developed in the U.S and Canadian ocean salmon fisheries and that the Washington fishers must reduce their harvest of salmon from Canadian rivers before Canada would agree to reduce the harvest by Canadian fishers of weak Columbia stocks, primarily fall chinook.

Finding: The Council’s proposed rule incorporated PNUCC’s recommendation in modified form in the introductory text to Section 8 and in a new Section 8.5F that discussed issues related to the harvest dispute between the United States and Canada and the re-negotiation of the Pacific Salmon Treaty. In the public comment, the PFMC supported reductions in Canadian fisheries “which currently have by far the highest impact on Snake River fall chinook of any ocean fisheries.” CBFWA in general agreed with the Council’s approach and language, although it recommended deletions and modifications that in its view placed too great a burden on the U.S. negotiators or that contravened the authority of the fishery agencies and tribes. The Council modified the provisions in the Section 8 introduction and in Section 8.5F to reflect in part CBFWA’s concerns, but those sections continue to incorporate PNUCC’s recommendation.

Program Section(s): **New 8.3C.2 (treaty fishing access sites)**
Source: **Bureau of Indian Affairs**
Recommendation No.: **8-2**

Recommendation: The BIA recommended a new Section 8.3C.2 to “provide for additional Treaty Fishing Access Sites along the Columbia River, in support of the goals of P.L. 100-581.” Tribal fishers encounter competition with downstream fisheries, recreational fishers, wind surfers, and others for river access as a result of dislocation from their original fishing grounds. This law directs the Corps of Engineers to acquire and construct Treaty Fishing Access Sites along the Columbia River; the Corps’ various efforts to implement the law are at various stages of progress. The BPA interpreted this recommendation as a call to the BPA to fund or provide these access sites (it does not seem that this was BIA’s intent), and objected to the recommendation as not being a measure to protect, mitigate and enhance fish.

Finding: The Council rejected this recommendation not because the Council objects to this work, but because this is not a measure for the protection, mitigation, and enhancement of fish survival, 16 U.S.C. § 839b(h)(5), and because this recommendation can and should be more appropriately addressed in other forums.

SECTION 10: RESIDENT FISH

Program Section(s): 5, 10.3A, 10.3B
Source: Montana Department of Fish, Wildlife and Parks and the Confederated Salish and Kootenai Tribes

Recommendation: In the summer of 1994, the Montana Department of Fish, Wildlife and Parks (MDFWP) and the Confederated Salish and Kootenai Tribes submitted refined integrated rule curves for the operation of Hungry Horse and Libby dams as called for by Sections 10.3A.3 and 10.3B.2. These curves were developed over the last seven years to incorporate the needs of resident fish, above and below these projects, into project operations. Because implementation of these curves has consequences for salmon and steelhead flows, as well as for the production of electricity, the Council decided to consider the integrated rule curves during the anadromous fish rulemaking and the recommending entities agreed.

In comments, MDFWP stated that it is imperative that the integrated rule curves for Libby and Hungry Horse be adopted as part of this process. The Confederated Salish and Kootenai Tribes called for the adoption and implementation of rule curves to protect resident fish in Libby and Hungry Horse reservoirs. CBFWA included the integrated rules curves in its comments and asked the Council to adopt them in this process. CBFWA also stated that the members of CBFWA would be meeting in an attempt to resolve apparent conflicts between the recommendations of upper- and lower-river members and would report to the Council in February or March 1995.

Montana Governor Racicot, Flathead Lakers, USFWS, Koocanusa International Coalition, Flathead Basin Commission, Lincoln County (Montana) Economic Development Council, Western Montana Electric G & T, Lincoln County Commissioners, Montana Board of County Commissioners, and Jim Abbott (Member of Canadian Parliament) supported the adoption of the rule curves.

The Corps of Engineers supported adopting the integrated rule curves, but noted that it will not implement the curves for Libby Dam until completion of an evaluation of the effects of drawdown restrictions on flood control and was satisfied that there was a sufficient justification for new rule curves.

The Bureau of Reclamation stated that it was not prepared to implement rule curves until completion of a number of processes, including the System Operation Review and litigation over ESA-listed stocks. The Bureau also stated that the language apparently gives the Council, MDFWP and CSKT veto over power drafts and that such a change in project control requires Congressional authorization. Also, the proposed 60-day notice requirement (for exceeding drafting limits) is too long to provide flexibility needed for emergency power and flood control operations.

BPA stated that operating Hungry Horse and Libby dams at higher levels would degrade the power system. BPA's analysis indicated that there would be reliability problems during a period of severe winter weather if these projects were operated to their upper rule curves. According to BPA, while operating headwater projects to upper rule curves on a monthly basis otherwise appears feasible, it costs an average of \$93 million in low runoff years.

James Litchfield, a consultant working for the Montana Council office, concluded that the Council and Bonneville analyses of the curves were reasonable given existing knowledge. The Montana Power Company stressed need for further refinement and analysis of these specific rule curves and other alternatives before implementation, including a "20/40/60 case" that would reduce the resident fish protection and power

impacts of the proposed curves. Ponderay Newsprint Company recommended that the Hungry Horse and Libby measures be addressed through the System Operation Review process and that further analysis was needed before any action should be taken to adopt them.

Finding: The Council adopted the integrated rule curves as recommended. Analyses by MDFWP, CSKT and the Council indicate that these curves are needed to protect, mitigate and enhance resident fish affected by the operation of Montana reservoirs. Commentors concerns about project authorizations and emergency operations can and should be addressed in implementation of the new operating rules. The Council encourages the fish managers and others to submit appropriate information as it becomes available regarding the coordination of upstream and downstream activities to ensure that program measures, including this measure, addressing anadromous fish, resident fish and wildlife are consistent. The Council analyzed and understood the power and cost impacts of the rule curves, and the Council has addressed BPA's reliability concerns. See the discussion/findings in the program Section 1.8, the Section 5 introduction and its findings, and Appendices B and C (the hydropower costs and impacts analysis and the AEERPS analysis).

Program Section(s): 5, 10.6E
Source: Idaho Department of Fish and Game

In March 1994, the Idaho Department of Fish and Game submitted a scope of work developed in consultation with the fish managers, Bonneville, the Corps, the Council and others, for a study to address key questions relating to the spawning and recruitment of kokanee in Lake Pend Oreille. The Council called for development of this statement as part of the resident fish and wildlife rulemaking in 1993. During public review and comment on the statement of work, NMFS indicated that it supported the portion of the proposal that would hold Lake Pend Oreille 5 feet higher in the winter because this would provide higher flows in the spring which would benefit the outmigration of juvenile salmon and steelhead. Because implementation of higher winter lake levels has consequences for salmon and steelhead flows, as well as for the production of electricity and kokanee production, the Council decided to consider this reservoir operation recommendation during the anadromous fish rulemaking, and the recommending IDFG agreed.

CBFWA supported the Lake Pend Oreille study, subject to the 1995 report they will provide on upstream-downstream issues. The Corps of Engineers noted that one possible consequence of the proposed measure might be an increase in warmwater fish in the Pend Oreille River and that this might increase the chances of entrainment of those fish through the dam, and hence into Washington state. The Corps pointed out that the Corps and Bonneville are considering the operation described in the measure and that the necessary NEPA documentation is undergoing public review as part of the SOR process. Baseline studies necessary to implement the measure are being carried out this winter.

The UCUTs opposed the Pend Oreille reservoir level/kokanee study and asked that it be deferred while other alternatives are studied, such as an alternative proposed by UCUTs and by Eastern Washington Council Office. The Ponderay Newsprint Company generally agreed with these comments.

Cominco, a British Columbia company that owns the Waneta hydroproject on the Pend Oreille river below Lake Pend Oreille, stated a concern about the proposed changes in operations which would change lower river flow regimes. It noted the effect of the higher winter lake level would be to decrease flows when Waneta has generating capacity and increase spring flows when Waneta is spilling excess water. This has a potential to reduce electricity production by 100 giga-watt hours at a cost of \$2.5 million. BC Hydro states that limiting drawdown at Lake Pend Oreille would adversely affect energy production at BC Hydro's Seven Mile product and its right to generation at Waneta and that the proposal should be submitted to International Joint Commission for consideration.

Finding: The Council adopted measures that address salmon flows and kokanee in Lake Pend Oreille. These measures recognize that investigation of methods to enhance kokanee can occur in tandem with changes in the operation of the lake to benefit the migration of juvenile salmon and steelhead lower in the Columbia River Basin. For this reason, the Council has called for a five-year study to investigate means for enhancing kokanee. The first three years of the study will evaluate the effects of holding Lake Pend Oreille 5 feet higher in the winter. Other aspects of the study include those proposed by Idaho Department of Fish and Game, the Upper Columbia United Tribes and the Eastern Washington Council Office, and include investigation of the effects of the higher lake level on warm water species and entrainment. The Council is encouraged that the completion of the necessary NEPA documentation and baseline studies is occurring in a manner that is timely to begin the study in fall 1995. The Council is aware of the financial consequences of this study and fully considered these consequences in reaching a decision. Finally, the Council encourages the fish managers and others to submit appropriate information as it becomes available regarding the coordination of upstream and downstream activities to ensure that program measures which address anadromous fish, resident fish and wildlife are consistent.

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Appendix A

RECOMMENDATIONS REGARDING HABITAT OBJECTIVES AND FUNDING SOURCES

The following were recommended by the fishery managers as actions that should be taken to meet the habitat objectives listed in Section 7.6D. The Council lists these recommendations here as potential means of achieving compliance with those objectives.

Sediment

- The Council recommends actions like the following to correct sediment problems: 1) no further ground disturbance or vegetation removal within the watershed until the objective is met, 2) suspend ongoing activities that generate elevated sediment delivery until the objective is met, and 3) initiate active restoration methods such as road obliteration and revegetation.

Bank Stability

- The Council recommends, where the bank stability objective is not being met, that activities that decrease bank stability or forestall bank recovery (i.e. riparian grazing, vegetation removal and road construction) be temporarily eliminated until bank stability is greater than 90 percent.

Water Quality

- Where the water quality objective is not being met, the Council recommends actions such as: 1) restoring the hydrologic regime, 2) not allowing the removal of streamside shading, and 3) restoring streamside shading.

Riparian Vegetation

- The Council recommends active riparian planting in areas with static or declining riparian vegetation trends if natural revegetation is shown to be inadequate for desired improvements. The Council also recommends monitoring trends in riparian vegetation.

Stream Morphology

- The Council recommends actions to improve stream morphology such as: 1) restoring floodplains by removing floodplain impacts (i.e. roads, riprap, and mining operations), 2) prohibiting channalization and channel armoring, and 3) meeting bank stability and sediment objectives. In addition, monitor trends in woody debris, pool frequency and pool volume.

Roads

- The Council recommends actions such as: 1) reducing roads as necessary to meet sediment and other water quality objectives, 2) using watershed-level inventories of terrestrial and aquatic conditions to determine which and how many roads should be obliterated, relocated, or otherwise treated, and 3) road closure, obliteration and revegetation where conditions do not meet the sediment objective.

Grazing

- Where current practices are not compatible with program habitat objectives, reductions or elimination of grazing until these habitat objectives are met or a peer reviewed scientific study describes the level of grazing compatible with such rapid fish habitat recovery.

Timber Harvest

- The Council recommends not harvesting timber in areas prone to landslides or erosion which could degrade the soils or release sediment to streams.

Mining

- The Council recommends that: 1) mining, and associated facilities and roads, not occur in riparian areas, 2) location and design of waste facilities use best available techniques to ensure mass stability and to prevent the release of acid or toxic materials, 3) reclamation bonds be adequate to ensure long-term chemical and physical stability of mine waste facilities, 4) waste facilities be reclaimed immediately after mining operations, 5) transport and holding of toxic materials along spawning and rearing reaches be seasonally restricted, and 6) mining operations be monitored and adjustments be made to operations as needed.

POTENTIAL SOURCES OF RESOURCES FOR HABITAT PROTECTION AND IMPROVEMENT

FEDERAL

Entity	Program	Assistance	Recipients	Purpose	Comments
Farm Home Administration	Watershed & Flood Protection	Loans	Municipalities, local non-profit organizations	Including flood control, recreation and storage	Used in conjunction with Soil Conservation Service's small watershed program
Soil Conservation Service	Small Watershed Program	Technical assistance and grants	State agencies, municipalities, districts	Planning and construction of projects which utilize resources of small watersheds	Covers up to 100% flood control and up to 50% of most other purposes
Soil Conservation Service	Conservation Reserve Program	Direct payment	Private land owners	Soil erosion control	
Soil Conservation Service	Wetlands Reserve Program	Direct payment	Private land owners	Wetlands protection	
Agricultural Stabilization Conservation Service	Rural Clean Water Program	Direct payments	Private landowners	To solve water problems resulting from agricultural nonpoint surface pollution	Cannot be used as local cost share on federal projects
Agricultural Stabilization Conservation Service	Agricultural Conservation Program	Direct payments, technical assistance	Private landowners	Land & water conservation	Up to \$3,500 per year per producer
Agricultural Stabilization Conservation Service	Water Quality Special Projects	Direct payments	Private landowners	Assist large water quality projects involving many participants	Emphasis on hot spots identified by water quality board, national competition

Agricultural Stabilization Conservation Service	Water Quality Incentive Program Wetland Reserve	Direct payments	Private landowners		Direct incentives for improvement measures, no cost share available in Washington
Agricultural Stabilization Conservation Service	Forest Incentive Program	Cost share	Private landowners	Tree planting for woodland improvement	
Agricultural Stabilization Conservation Service		Cost share	Private landowners	Capital improvements to control non-point pollution	
U.S. Bureau of Reclamation	Small Reclamation Projects Act	Loans and grants	Cities, counties, irrigation districts, water districts	Flood control, fish and wildlife, recreation, irrigation & hydropower	Cannot claim other federal funds as local cost share
Bureau of Reclamation	Rehabilitation and Betterment Act Loan Program				
Bureau of Reclamation	Federal Bureau of Reclamation Project Program				
Bureau of Reclamation	Western Watercourse			Facilitate locally sponsored and administered water education programs	
U. S. Fish and Wildlife Service	Partners for Wildlife Prog. Wetlands Restoration	Grants, technical assistance	Private landowners	Restoration and/or enhance wetlands	

US Army Corps of Engineers	Flood Control Studies				
US Army Corps of Engineers	Small Flood Control Prog.				
US Army Corps of Engineers	Beach Protection Studies				
Environmental Protection Agency	205J program	Direct payment	State and local agencies	Water quality demonstration projects	
Environmental Protection Agency	State Revolving Fund Program	Loans	State and local entities	Water quality projects	80 percent federal funds and 20 percent state funds
Environmental Protection Agency	Americorp Program	Grants	Federal, state, and tribal entities	Job training and watershed improvement	
Environmental Protection Agency	106 Grants Program				
Environmental Protection Agency	604B Grants Program				
Environmental Protection Agency	314 Grants Program				
Environmental Protection Agency	National Estuary Program				
Bonneville Power Administration	Fish and Wildlife Program	Direct payment	Various	Fish and wildlife mitigation	Funds model watersheds

U.S. Dept. of Agriculture	Urban Assistance Program	Grants and direct payment	Local and private entities	Urban watershed improvement	
U.S. Fish and Wildlife Service	Washington State Ecosystem Conservation Project	Direct payment		Wetland improvement and protection	Requires cost sharing

STATE

Entity	Program	Assistance	Recipients	Purpose	Comments
Washington of Dept. of Fish and Wildlife	Habitat Enhancement Program				
Washington State Conservation Commission	Water Quality Research Grant Program	Grants to conservation district's, water quality projects			
Washington State Conservation Commission	Nonpoint Water Quality Grants Program	Grants	Conservation districts	Water quality projects	
Washington State Conservation Commission	Dairy Waste Management Program	Loans and grants	Conservation districts and private land owners	Water quality improvement and protection	
Washington Dept. of Ecology	Clean Water Act Section 319	Grants	State or federal government entities	Improvement of natural watershed and quality of surface and ground water	
Washington Dept. of Ecology	Centennial Clean Water Fund	Grants	State or local entities	Water quality projects	
Washington Dept. of Ecology	Lake Restoration				
Washington Department of Ecology	Coastal Zone Management Grants				Environmental Protection Agency funds for coastal waters protection

Washington Department of Ecology	Flood Control Assistance Account Program				
Washington Dept. of Natural Resources	Stewardship Incentive Program	Grants	Woodland owners with 5-1,000 acres of forest land	Improve land management	Cost share is 50-75% & up to \$10,000 per owner per year, program practices include riparian, wetland & fisheries protection
Washington Dept. of Natural Resources & Washington Dept. of Fish and Wildlife	Jobs for the Environment Program	Grants	State, local, and private entities	Employing displaced workers	Works in conjunction with Watershed Restoration Partnership Program
Washington Dept. of Natural Resources & Washington Dept. of Fish and Wildlife	Watershed Restoration Partnership Program	Grants	State, local, and private entities	Watershed projects to enhance fish	Jobs for the Environment Program
Washington Dept of Community Development.	Community Development Block Grant				
Washington State Salmon Enhancement funds					
Oregon Dept. of Water Resources	Oregon Watershed Health Program	Direct payment	Local watershed councils	Watershed improvement	

Oregon Governor's Watershed Enhancement Board	Oregon Watershed Improvement Program	Grants	Various	Watershed improvement and protection	
Oregon Dept. of Agriculture				Watershed improvement	Buck Hollow 2000 Project

PRIVATE

Entity	Program	Assistance	Recipients	Purpose	Comments
Nature Conservancy		Direct payments	State and local entities	Watershed enhancement projects, land & water purchase/lease	
Isaac Walton League		Volunteer assistance		Habitat protection and improvement	
Blue Mt. Natural Resources Institute	Blue Mountain Elk Initiative	Restoration projects	varies	Restoration of elk habitat	Partnership of 22 tribal, government, and private entities
Trout Unlimited	Embrace-A-Stream Projects	Grants, volunteer assistance		Habitat and fisheries enhancement and protection	
Rocky Mountain Elk Foundation					Potential source of funding for land purch.
Key Bank	Washington Waters Program	Grants	State, local, and private entities	Watershed improvement and protection	
Mid-Columbia Public Utility Districts		Direct payments		Watershed improvement	

Phillips Petroleum Company	Phillips Environmental Partnership Awards	Schools and community organizations		Habitat and wildlife, water, public works, school grounds, recycling, environmental education	\$500-\$5000, Center for Environ. Edu, Oklahoma State U., Gunderson Hall, Stillwater, OK, 74078
Long Live the Kings				Watershed improvement	
Peace Trees				Youth group that does environmental work	
Nordstroms, Inc		Grants		Watershed improvement	
Council of International Education Exchange				Habitat improvement	Volunteers from Europe
Adopt-A-Stream Foundation	Adopt-A-Stream Program	Volunteer		Watershed improvement	
The Land Trust Alliance				Provides specialized services, publications, information, and training on land trusts	
Ducks Unlimited		Grants, volunteer		Wetlands protection and improvement	
Northwest Steelheaders				Watershed improvement	Buck Hollow 2000 Project

Oregon Wildlife Heritage Foundation					Buck Hollow 2000 Project
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OTHER

Entity	Program	Assistance	Recipients	Purpose	Comments
Northwest Power Planning Council	Fish & Wildlife Program	Direct payments	State & federal agencies, tribes, and private entities	Program to protect, mitigate and enhance fish and wildlife affected by hydropower system	Can be used as local cost share on federal projects
City and county governments, conservation districts	Stream Walk Program	Volunteer training and funding	Various	Water quality monitoring and stream/riparian enhancement	

Appendix B

SUMMARY OF HYDROPOWER COSTS AND IMPACTS OF THE MAINSTEM PASSAGE ACTIONS

This document summarizes regional hydropower costs and impacts of the mainstem passage actions in the Northwest Power Planning Council's 1994 Columbia River Basin Fish and Wildlife Program. This appendix presents a summary of the staff's hydropower and economic analysis, which provides an indication of the magnitude of the costs and impacts of these actions, as compared to the Council's 1992 Strategy for Salmon measures. In addition, a staff analysis of the biological benefits of these actions is presented in a separate appendix.

Summary

Implementation of a four-pool lower Snake River drawdown to near spillway crest would increase spring flow equivalents in the Snake River by nearly 135 percent in the lowest eight water years and by almost 110 percent in the next lowest 12 years. Summer flow equivalents under a four-pool drawdown operation increase by more than 30 percent. Equivalent spring flows with the four-pool lower Snake River drawdown are above the 140,000 cubic feet per second operational objective about 95 percent of the time. Implementation of only Lower Granite and Little Goose reservoir drawdowns to near spillway crest would increase spring flow equivalents in the Snake River by roughly 50 percent and summer flow equivalents between 10 and 20 percent in the 20 lowest water years. Equivalent spring flows under a two-pool drawdown would exceed the 140,000 objective about two-thirds of the time compared to 14 percent under the Strategy for Salmon operation.

In the lower Columbia River, operation of John Day pool at near spillway crest would increase both spring and summer flow equivalents between 55 and 65 percent in the 20 lowest water years. Equivalent spring flows with John Day drawn down to near spillway crest are above the 300,000 cubic feet per second operational objective about 95 percent of the time. Operation of John Day reservoir at minimum operating pool level would increase spring and summer flow equivalents by 10 to 15 percent in the 20 lowest water years. Equivalent spring flows under this operation would exceed the 300,000 cubic feet per second operational objective about 60 percent of the time, compared to 42 percent under the Strategy for Salmon operation.

Refill probabilities increase at Libby and Hungry Horse dams due to operation of both projects under their respective integrated rule curves. Average end-of-July refill probability at Libby increases from 90 to 92 percent and at Hungry Horse from 86 to 96 percent. At Grand Coulee, the refill probability drops from 100 percent in the Strategy for Salmon to between 40-50 percent in the 1994 measures. This is because in low water years, Grand Coulee is often drafted to an elevation of 1,280 feet in July and August to attempt to achieve the late summer flow objectives. At Dworshak, refill probability depends on whether a drawdown of the four lower Snake River dams is implemented. Without a drawdown operation, Dworshak's refill probability falls from 42 percent under the Strategy for Salmon to 10 percent. With a four-pool Snake River drawdown operation, its refill probability increases to 72 percent. In a two-pool Snake River drawdown operation, Dworshak's refill probability is 34 percent. Brownlee's July elevations are generally higher under the Council's mainstem actions, but its August refill probability falls from 100 percent in the Strategy for Salmon to about 66 percent.

In general, monthly average nutrient retention times at Grand Coulee Dam remain above or close to the suggested 30-day minimum level except in May. May retention times in the mainstem passage actions are similar to, or improved by about one day from the retention times in the Strategy for Salmon. In the months of April and June, the average retention times hover close to the 30-day value. In July and August, retention times decrease by about 6 to 16 percent, but remain above the 30-day limit. In July, average retention time ranges from about 38 days to 41 days, and in August it is about 44-45 days.

Average annual costs to the Bonneville Power Administration range from about \$90 to \$225 million.¹ The corresponding average rate impacts range from about 4 percent in the near term to 11 percent in the long term. Power system costs, which include the cost of replacement resources, energy purchases and lost revenues, amount to about one-third to one-half of the total cost. Non-power costs include the capital costs of modifying dams for drawdown,² costs of improving bypass or transportation and other related costs. Firm hydropower losses range from 400 to 850 average megawatts, depending on the package of measures implemented.

Background and Study Description

The mainstem passage actions adopted by the Council provide flow and velocity improvements in both the Snake and Columbia rivers to improve salmon survival over the next 20 years.

These actions include an evaluation strategy for smolt transportation, coupled with immediate and long-term flow improvement and/or reservoir drawdown measures. The actions are analyzed in sequence as depicted in Figure 1. They include:

1995 Actions

- A 28-foot drawdown from full pool of Lower Granite reservoir to elevation 710 for two months from mid-April to mid-June. This action will disable the existing juvenile bypass system, but adult passage can still be provided. Since navigation and juvenile fish bypass facilities are not functional during the drawdown period, smolt transportation of spring migrants cannot occur from this project, and spill provides juvenile fish bypass.
- Spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality guidelines, except at Little Goose Dam, which becomes the only smolt collecting and transport project.
- An additional 100,000 acre-feet of water (over the 427,000 called for in the Strategy for Salmon) from the upper Snake Basin, and up to 1 million acre-feet of water (over the 3 million called for in the Strategy for Salmon) stored operationally in the upper Columbia Basin reservoirs of Grand Coulee, Libby and Arrow.
- Additional drafts from Brownlee reservoir are also provided, with Brownlee passing inflow from the upper Snake Basin and not refilling until the fall.

¹Costs to Bonneville Power Administration include 71 percent of the regional power system costs, capital costs of modifying dams and other related costs. They reflect the levelized cost of implementing various measures at various future dates. Section 1 of the fish and wildlife program discusses these costs in estimated expenditures for specific years and are, therefore, different from those levelized costs reported here.

²Capital costs of drawdown-related dam modifications are based on Corps of Engineers cost estimates from its System Configuration Study, including contingency costs.

- Implementation of integrated rule curves to protect resident fish and aquatic life at Libby and Hungry Horse reservoirs in Montana. In addition, the minimum lake elevation at Albeni Falls is raised to 2,056 feet for salmon flows and resident fish.

1999 Actions - Alternative A
(same as 1995 plus)

- Maintain John Day Pool near its minimum operating pool level (elevation 257 feet) year-round, which is an 11-foot drawdown from its normal full pool level.
- Provide an additional 1,000,000 acre-feet of water from the upper Snake Basin for flow augmentation and refill of drawn down reservoirs, for a total of 1.427 million acre-feet from the upper Snake.
- Lower Granite and Little Goose reservoirs are lowered for two months to near spillway crest elevations, which are drawdowns of about 45 feet from full pool. Bypass is enhanced at Lower Granite through the addition of a surface juvenile fish bypass system with an effective fish guidance efficiency of 70 percent.
- Due to the drawdown of the two upper Snake River projects, smolt transportation is confined to Lower Monumental Dam.
- Spill at all mainstem projects for 80 percent fish passage efficiency, as constrained by state water quality standards, except at Lower Monumental Dam, which becomes the smolt collecting and transport project.

2002 Actions - Alternative B
(same as 1999 plus)

- Lower Monumental and Ice Harbor pools are drawn down to near spillway crest elevations for two months, during the spring, which represent 45 and 40-foot drawdowns from normal full pool levels, respectively.
- John Day pool is drawn down to near spillway crest elevation (elevation 220 feet) year-round, which is a drawdown of about 48 feet from full pool.
- No transportation, spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality standards.

2002 Actions - Alternative C
(same as 1999 plus)

- Lower Monumental and Ice Harbor are drawn down to near spillway crest elevations for two months in the spring.
- No transportation, spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality guidelines.

2002 Actions - Alternative D
(same as 1999 plus)

- Lower Monumental and Ice Harbor pools are held at normal minimum operating pool elevations.

- John Day is drawn down to near spillway crest elevation (elevation 220 feet) year-round.
- Spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality standards, except at Lower Monumental Dam, which becomes the smolt collector and transport project.

A decision to implement either Alternative B, C or D, or to continue implementation of Alternative A measures will be made before the year 2002.

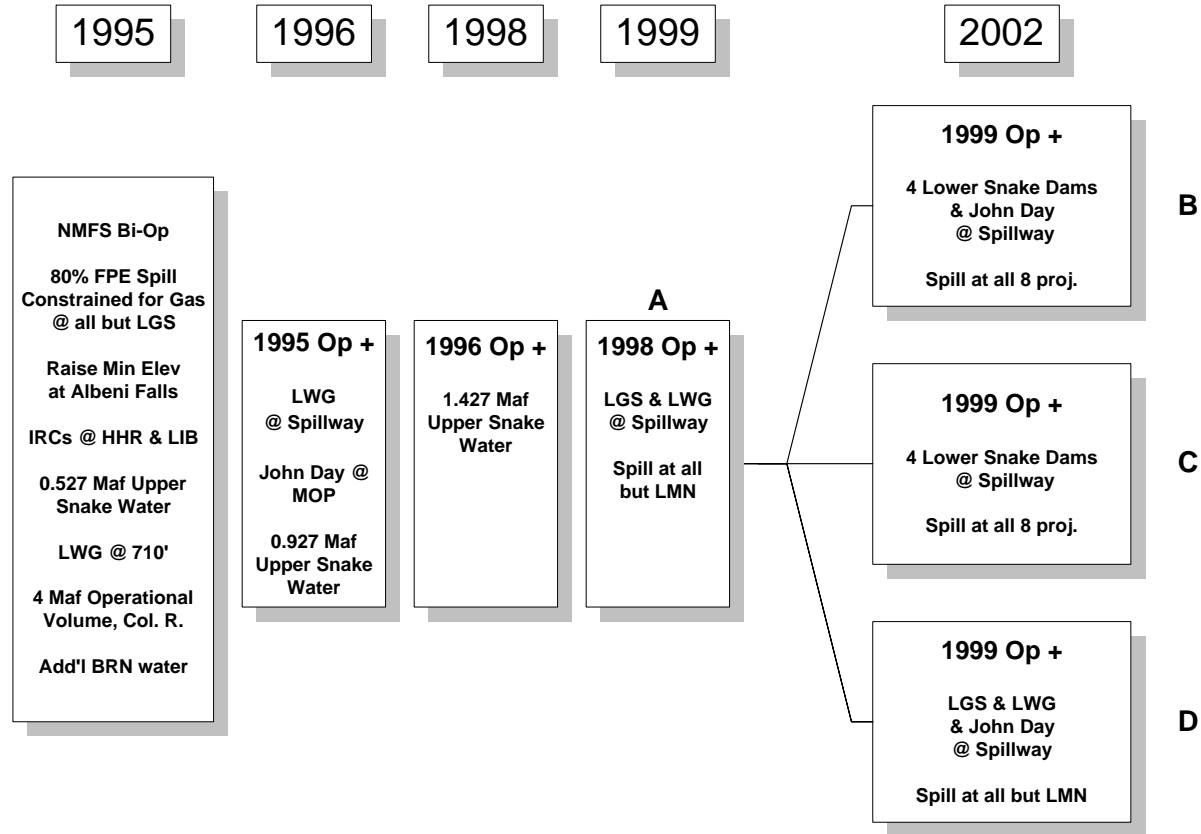


Figure 1

Assumptions

Assumptions for this analysis generally reflect information found in the Northwest Power Planning Council's 1991 Northwest Conservation and Electric Power Plan. Specific hydropower data and project operating rule curves are taken from Bonneville's System Operation Review studies. Gas price information was updated to reflect more current estimates, as were assumptions about combined-cycle combustion turbines. In addition, Southwest market assumptions were also updated based on new information from California and new gas prices.

Water for Flow Augmentation

In the Snake River, water for flow augmentation comes from the Dworshak or Brownlee reservoirs or from the upper Snake River Basin above Brownlee. Upper Snake River water is assumed to be used first, as needed, to meet the flow or water temperature objectives. It is also assumed that this water will be passed, or, in some cases, shaped through the Brownlee reservoir. Because it is presently unclear where and when upper Snake River water would be available within each year, it is assumed that certain volumes would be available for each month, on call as needed to help meet the flow objectives. For the 1995 analysis, 50,000 acre-feet are assumed to be available in the second half of April, 150,000 acre-feet in May and 90,000 acre-feet in June. In August, 137,000 acre-feet could be provided, and in September 100,000 acre-feet for temperature control operations are available. The total amount of upper Snake River water assumed to be available in 1995 is 527,000 acre-feet.

In later years, the Council's Strategy for Salmon calls for an additional 1 million acre-feet from the upper Snake River Basin. For that operation, it is assumed that 250,000 would be available in the second half of April, 550,000 in May, 390,000 in June, 137,000 in August and 100,000 in September. Upper Snake River dams are assumed to refill beginning in October and throughout the winter months, thus reducing the inflows to Brownlee reservoir.

Dworshak will provide up to 1 million acre-feet of water for spring flow augmentation, as needed, to meet the flow objective. In addition, any water stored in shifted flood control space will also be used for flow augmentation. In July, Dworshak is allowed to draft to an elevation no lower than 1,520 feet, if needed to achieve the desired summer flows.

Brownlee reservoir is drafted for flow augmentation only if volumes from the upper Snake and Dworshak are depleted. In spring (second half of April and May) Brownlee would be drafted no lower than elevation 2,069 for flow augmentation. This provides as much as 110,000 acre-feet, if drafted from full. In June, Brownlee would not refill, but simply pass water through from the upper Snake. In July, Brownlee could be drafted up to 137,000 acre-feet if needed to meet the flow objective. It would not be drafted below elevation of 2,067 feet in July. In August, normally the Brownlee reservoir would refill. Under the new measures, in the near term, Brownlee would allow 50,000 acre-feet of upper Snake River water to pass through. In the long term, it would allow a pass-through of all 137,000 acre-feet of upper Snake water.

In the Columbia River, the original 3.45 million acre-feet of water budget volume is assumed to be available for flow augmentation. The additional 3 million acre-feet of operational volume called for in the Strategy for Salmon is increased to 4 million acre-feet. The amount of additional volume to be stored is based on runoff conditions, with the full 4 million acre-feet to be stored in poor water years. It is to be stored above normal power draft elevations subject to: a) space available up to flood control elevations; and b) maintaining Vernita Bar and at-site minimum flow constraints. It is assumed that this water would be stored, as much as possible, in equal volumes beginning in January through the middle of April, and prior to the spring salmon migration season. This 4 million acre-foot operational fish volume is stored first in Grand Coulee, then Libby, and finally in the Arrow project in Canada, if necessary.

Any remaining flow augmentation volume can be held and released in the summer to achieve the summer flow objective. In addition to this water, Grand Coulee can be drafted to an elevation of 1,280 feet in July or August, if necessary to meet summer flow objectives. This represents about 800,000 acre-feet, if drafted from full pool elevation of 1,290 feet.

Flow Objectives for the Snake River

It is understood that in low runoff years there is insufficient water to achieve the mainstem passage flow objectives unless a drawdown of the four lower Snake River dams is implemented (see discussion of flow results below). Thus, for those packages of measures that include a two-pool drawdown or no drawdown operation below minimum operating pool levels, a sliding scale flow target was used in the model to distribute the release of flow augmentation water. In these low years, simply applying a 140,000 cubic feet per second objective would use up all or most of the volume in the first month, leaving little or no water for salmon flows during the latter part of the migration season. By applying a sliding scale target, starting at 85,000 cubic feet per second and ramping up to 140,000 cubic feet per second, a more even distribution of flow augmentation is achieved in these low water years. In the shoulder months, second half of April and June, the sliding scale started at 70,000 cubic feet per second to better simulate a typical spring hydrograph shape. No sliding scale flow targets are used for July, but Dworshak is allowed to draft to an elevation of 1,520 feet, if needed to achieve the summer flow objective.

Flow Objectives for the Columbia River

Various fishery agencies and lower river Indian tribes recommended specific Columbia River flow objectives, ranging from 300,000 cubic feet per second from April 15 to June 15, to 200,000 cubic feet per second in last half of June and all of July, and ramping down to 160,000 cubic feet per second in August. The spring flow objectives are decreased by 40,000 cubic feet per second in each of the second- and third-year critical periods, so that the spring flow objective under third-year critical rule curves is 220,000 cubic feet per second. These flow objectives are treated as operational flow objectives, which the system will try to achieve.

To cover the early migration, a target of 170,000 cubic feet per second is used in the modeling analysis in the second half of April. In May and June, a sliding scale target ranging from 180,000 to 300,000 cubic feet per second is used at The Dalles. As in the Snake, the flow objectives cannot be achieved in low water years without a drawdown of the John Day pool. Again, a sliding scale flow target is used to even out the distribution of flow augmentation for these low runoff conditions and more accurately simulate the natural hydrograph. In summer months, the targets remained fixed for all conditions at 200,000 cubic feet per second in July and 160,000 cubic feet per second in August.

Other Hydro-Related Assumptions

Non-treaty storage water is allowed to be used for power purposes, but is not modeled for flow augmentation. Too many complexities prevented a simulation of the use of non-Treaty water for flow augmentation.

The analysis takes into consideration the existing agreement between the United States and Canada over the lake elevations at Corra Linn Dam. This agreement affects the operation of the Libby project in Montana.

The Vernita Bar minimum flow of 70,000 cubic feet per second, as well as flood control requirements, are maintained from January through April. These requirements can sometimes limit the quantity of operational storage for salmon. This year, for example, the Vernita Bar required minimum flow was 60,000 cubic feet per second.

Estimating Firm Energy Losses

Firm energy losses were estimated using the Council's System Analysis Model. A critical period operation was simulated (operation of the hydro system over the 1929 through 1932 water conditions) in order to calculate the maximum amount of firm hydro energy, given a particular set of constraints. For a normal critical period operation (prior to water budget operations), the hydro system starts full at the beginning of the critical period and is empty by February of the 1932 water year. During the critical period no electricity service is curtailed, except interruptible contracts. All available and declared non-hydro firm resources are in operation and no imports or exports are allowed. This defines the maximum amount of firm hydro energy available in the region.

Because of the water budget and other non-power constraints, this operation must be modified somewhat. Because of efforts to store water in winter for later release for flow augmentation, out-of-region energy purchases are allowed up to 2,000 megawatts per month from January to April. Firm energy loss estimates assume the availability of up to 2,000 megawatts of energy per month from out-of-region utilities.

Southwest Market

A better and more current estimate of the Southwest market was made, taking into account current estimates of Southwest resources and demand. This produces a smaller market in the near term. Also, more current information on interregional contracts was used.

Gas Prices

Current estimates for gas prices, which are lower than those in the 1991 Power Plan, result in lower revenues from Southwest sales, but also result in lower Northwest operating costs.

Replacement Resources

Combined-cycle combustion turbines were used to replace lost firm hydro energy. This choice of replacement resource is not optimal, but it provides a good estimate of what likely costs would be. (See the section on cost uncertainty, below, for more information.) Combustion turbines are a reasonable choice for replacement resource in lieu of performing a full power plan to develop a mix of resources that would minimize the cost. Capital costs for combustion turbines are about one-third lower than the assumptions used in the 1991 Power Plan.

Spill Levels

Spill levels were increased from the Strategy for Salmon to try to achieve 80-percent fish passage efficiency. However, the spill levels at each mainstem federal dam are constrained to limit dissolved gas supersaturation below 120 percent, as determined from the actual 1994 spill levels and 1994 dissolved gas monitoring information.

Integrated Rule Curves at Libby and Hungry Horse Dams

Integrated rule curves obtained from the Montana Department of Fish, Wildlife and Parks in June of 1994 are incorporated in the analysis. These rule curves provide a set of minimum elevations for each of the 50 historic water conditions simulated. It was assumed that the State of Montana fully integrated these curves with flood control protection. Thus, these curves took precedence over the older flood control elevations at these projects.

Albeni Falls Minimum Elevation

By raising the minimum elevation at Albeni Falls to 2,056 feet, some additional water would be available for flow augmentation in the spring. Normally, this project is drafted to an elevation of 2,051 feet during the winter. Keeping the reservoir 5 feet higher in the winter represents about 440,000 acre-feet of spring water that does not have to come from natural streamflows to fill the project. In other words, water that would have filled Lake Pend Oreille from 2,051 to 2,056 feet in early spring can instead be passed through the dam. In order for this “passive” flow augmentation to work most effectively for flow augmentation, however, replacement energy (in November when it otherwise would have been drafted) must come from a non-hydro resource. Thus, this volume should be treated just as the operational volume stored in Grand Coulee, Libby and Arrow. To hold water in Albeni Falls, either: a) nonfirm hydropower sales to out-of-region utilities must be curtailed; b) non-hydropower resources must be used in the region; or c) out-of-region energy can be purchased. In this analysis, however, the minimum elevation is raised, but no active replacement strategy is used. The entire Northwest resource system is used to replace the water held at Albeni Falls. Therefore, since some of the replacement energy may have come from the hydro system, spring outflows from Albeni Falls may not be quite as high as they could be under a more desired replacement energy operation.

Methodology

System simulation models can be used to evaluate the costs and benefits of the actions called for in the Council’s program. For this analysis, as noted above, the System Analysis Model (SAM) was used. SAM is a Monte Carlo program that simulates the monthly operation of the region's hydroelectric dams and thermal resources to meet demand (load) for electricity, including regional interruptible loads and extra-regional secondary loads. Short-term demand uncertainty, hydropower uncertainty (in terms of variable runoff conditions) and thermal performance uncertainty are modeled explicitly. Exchanges with B.C. Hydro and the Pacific Southwest are also modeled. SAM will simulate the dispatch of generating resources to achieve the most economical operation for the Pacific Northwest region.

SAM provides detailed information for reservoir elevations and outflows. It can be used to estimate the magnitude of lost firm energy generating capability for a proposed change in system operations. It will also calculate the magnitude of changes in secondary energy production and the corresponding change in revenue. Costs of out-of-region energy purchases are also included.

Since SAM is a monthly model, it cannot analyze capacity losses. Capacity issues, such as the hydrosystem’s ability to meet daily peaking requirements, must be analyzed using a smaller time increment. Models exist that can simulate the hydrosystem operation on an hourly basis, but these programs are cumbersome to use and require extensive computer time. Efforts are under way to develop tools to analyze capacity issues in a more timely fashion.

The spring smolt migration period is assumed to be April 16 to June 15 in the Snake and May 1 through June 30 in the lower Columbia. During the migration periods, desired fish flows are modeled as sliding-scale target flows, which are proportional to basin runoff conditions. That is, the higher the runoff, the higher the target flow, and vice versa. Target flows can be set at Lower Granite Dam on the Snake River, Priest Rapids Dam in the mid-Columbia River and The Dalles Dam in the lower Columbia River. Target flows are set so that all of the water stored for fish flow augmentation is released by the end of the migration period.

The intent of these flow targets is to evenly distribute, as much as possible, discharge throughout the migration period. For example, if in a particular year, natural runoff is early and flows are high in May, then

most of the water reserved for flow augmentation would be saved for later release in June. In general, the sliding scale target flows are achieved provided enough water is in storage and no project limitations are violated. In some low runoff conditions, however, the target flows could not be achieved.

Two cases are usually analyzed to identify costs and impacts from a previous operation. For this analysis the base case reflects the operation of the hydrosystem under the Council's Strategy for Salmon measures. Alternate cases reflect changes adopted in the Council's amendments to its fish and wildlife program (see Figure 1).

Impacts to the power system are defined as differences in reservoir elevations, river flows and costs between the two cases. Energy costs are comprised of lost revenue from changes to secondary energy sales, replacement resource capital and operating costs, additional operating costs for existing resources and out-of-region purchase costs.

Results

The following tables summarize the impacts and costs to the hydropower system of the mainstem passage actions called for in the 1994 Fish and Wildlife Program. Tables 1 through 4 show the expected change in river flows at Lower Granite and The Dalles dams for spring and summer periods. Table 5 highlights the change in end-of-July average reservoir elevations and refill probabilities for Libby, Hungry Horse, Grand Coulee and Dworshak dams. Tables 6 and 7 summarize changes to the average nutrient retention times at Grand Coulee Dam. Table 8 identifies the range of lost firm hydro energy, the cost to Bonneville and its estimated rate increases.

River Flows

Implementation of the four-pool lower Snake River drawdown to near spillway crest (Alternatives B and C) would increase spring flow equivalents in the Snake River in the eight lowest water years by nearly 135 percent, and by almost 110 percent in the next 12 lowest water years. Summer flow equivalents would also increase by more than one-third in the 20 lowest water years. In some years, both for the Snake and Columbia rivers, normal flows would generate flow equivalent values over the flow objectives. In some of those years, some of the flow augmentation volume could be held in storage for later release in the summer, or for reservoir refill, or to minimize system cost.

Implementation of only Lower Granite and Little Goose reservoir drawdowns to near spillway crest (Alternatives A and D) would increase spring flow equivalents in the Snake River in the eight lowest water years by 57 percent, and by 50 percent in the next 12 lowest water years. Summer flow equivalents would also increase between 10 and 20 percent in the 20 lowest water years.

Table 1
Average Spring Flow Equivalents³
in the Snake River at Lower Granite Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	64.1	73.3	100.5	150.3	150.3	100.6
Next lowest 12 water yrs.	88.3	99.8	132.5	184.4	184.7	132.5
Highest 30 water years	126.4	143.4	187.7	239.8	239.8	187.7
50-Year Avg.	107.3	121.8	157.3	212.6	212.6	157.3

Table 2
Average Summer Flow Equivalents
in the Snake River at Lower Granite Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	24.1	25.9	26.7	32.1	32.1	26.7
Next lowest 12 water yrs.	28.6	31.3	34.4	39.1	39.0	34.0
Highest 30 water years	40.7	40.8	42.1	44.4	44.6	42.1
50-Year Avg.	35.1	36.1	37.9	41.1	41.2	37.8

Under a four-pool drawdown (Alternative C), the spring flow objectives can be achieved with lower absolute flows. For that alternative, flow targets at Lower Granite Dam are reduced to about 64,000 cubic feet per second (which is the 140,000 cubic feet per second equivalent flow with a four-pool drawdown operation) for the April 16 through June 15 period. The equivalent flow, averaged over the eight driest years, is about 150,000 cubic feet per second compared to about 64,000 cubic feet per second for the Strategy for Salmon. Under a two-pool drawdown (Alternative A), absolute spring flows, in the driest years, are higher than they are under a four-pool drawdown, but the equivalent flow is about 100,000 cubic feet per second.

In the lower Columbia River, operation of John Day pool at near spillway crest would increase both spring and summer flow equivalents between 55 and 65 percent in the 20 lowest water years. Operation of John Day reservoir at minimum operating pool level would increase spring and summer flow equivalents between 10 and 15 percent in the 20 lowest water years.

³An equivalent flow produces the same water particle travel time at full pool as the regulated flow under a reservoir drawdown condition.

Table 3
Average Spring Flow Equivalents
in the Columbia River at The Dalles Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	191.0	201.4	215.3	302.7	210.7	308.6
Next lowest 12 water yrs.	242.7	250.4	266.7	376.0	262.1	382.7
Highest 30 water years	334.9	345.0	366.3	515.3	360.4	524.9
50-Year Avg.	289.8	299.4	318.2	447.9	312.9	456.0

Table 4
Average Summer Flow Equivalents
in the Columbia River at The Dalles Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	125.3	130.8	142.9	203.4	141.6	205.5
Next lowest 12 water yrs.	160.7	167.6	185.3	265.4	184.9	264.2
Highest 30 water years	188.7	194.5	214.4	307.1	214.6	307.5
50-Year Avg.	171.8	177.9	196.0	280.6	195.7	280.7

Note that reservoir drawdowns play an important role in meeting the velocity equivalent flow objectives. Without drawdowns, the Strategy for Salmon flow measures fall short of achieving either the National marine Fisheries Service 1994-98 Biological Opinion flow targets or the 140,000 cubic feet per second operational flow objective. For example, in the eight lowest water years in the Snake River, the Strategy's spring flow measures fall 3 million acre-feet short of achieving the 85,000 cubic feet per second National Marine Fisheries Service spring flow target for the Snake, and 10.8 million acre-feet short of providing the 140,000 cubic feet per second operational flow objective. In the next 12 lowest water years, the Strategy is almost 7.4 million acre-feet short of the operational flow objective. Over all 50 water years, the Strategy would need more than 4.6 million acre-feet to fully achieve the 140,000 cubic feet per second operational flow objective.

Similarly, in the eight lowest water years in the Snake River, the Strategy for Salmon's summer flow measures are more than 2.1 million acre-feet short of achieving the 50,000 cubic feet per second National Marine Fisheries Service summer flow target for the Snake. In the next 12 lowest water years, the shortfall to achieve 50,000 cubic feet per second is 1.7 million acre-feet. Over all 50 water years, the summer shortfall is 1.2 million acre-feet.

For the lower Columbia River, in the eight lowest water years in the Snake River, the Strategy for Salmon's spring flow measures fall more than 700,000 acre-feet short of achieving the 200,000 cubic feet per second National Marine Fisheries Service spring flow target for the Columbia, and almost 8.9 million acre-feet short of providing a 300,000 cubic feet per second operational flow objective. In the next 12 lowest water years, the Strategy is almost 4.7 million acre-feet short of the operational flow objective. Over all 50 water years, the Strategy would need more than 800,000 acre-feet to fully achieve a 300,000 cubic feet per second operational flow objective.

In the eight lowest water years in the Columbia River, the Strategy for Salmon's summer flow measures are about 2.1 million acre-feet short of achieving the 160,000 cubic feet per second National Marine Fisheries Service summer flow target for the Columbia, and nearly 4.6 million acre-feet shy of providing a 200,000 cubic feet per second operational flow objective in July. In the next lowest 12 water years, the shortfall to achieve the 200,000 cubic feet per second flow objective is 2.4 million acre-feet. Over all 50 water years, the shortfall is more than 1.7 million acre-feet to fully meet the summer operational flow objective.

The equivalent flow levels in Tables 1-4 indicate that the 1995 salmon flow measures also fall short of providing the operational flow objectives recommended by the fishery agencies and lower river Indian tribes, except in the 30 highest water years. Implementation of a four-pool drawdown in the Snake River, and a drawdown of John Day reservoir to near spillway crest elevations would achieve the operational flow objectives, even in the lowest water years. In addition, implementation of a two-pool drawdown in the Snake River and drawdown of John Day pool to minimum operating pool level come closer to achieving the operational flow objectives than the Strategy for Salmon flow measures.

Figure 2

**Duration Curve for Spring Flows
at Lower Granite Dam - Alternative B**

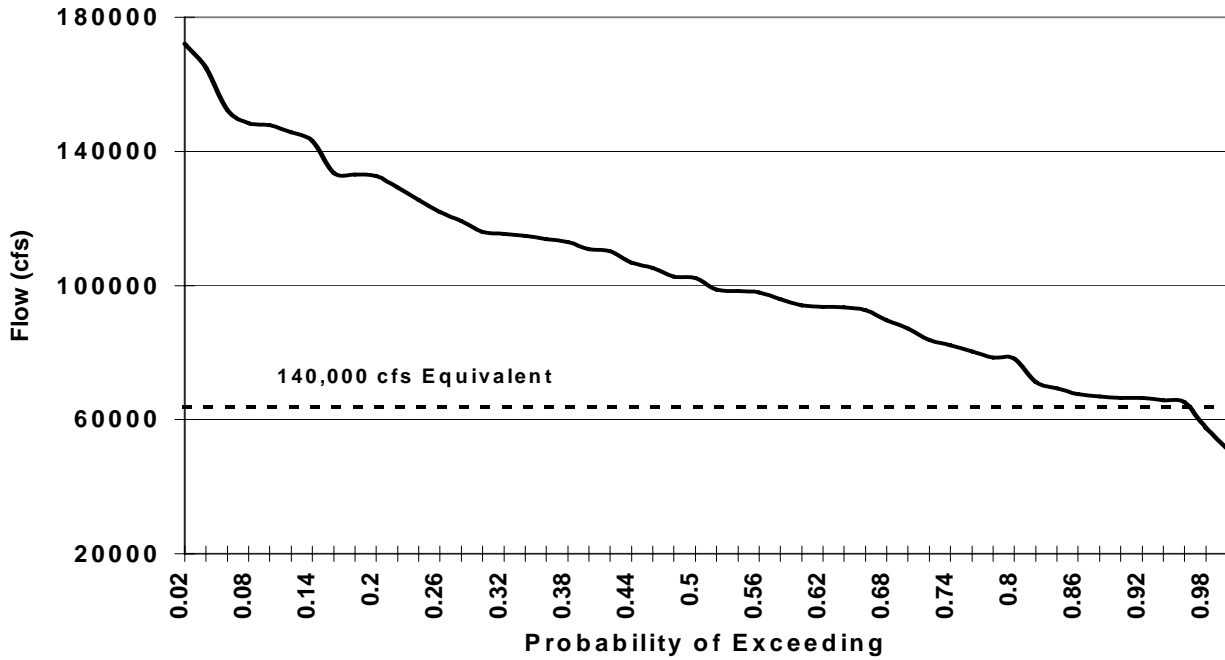


Figure 3

**Duration Curve for Spring Flows
at Lower Granite Dam - Alternative A**

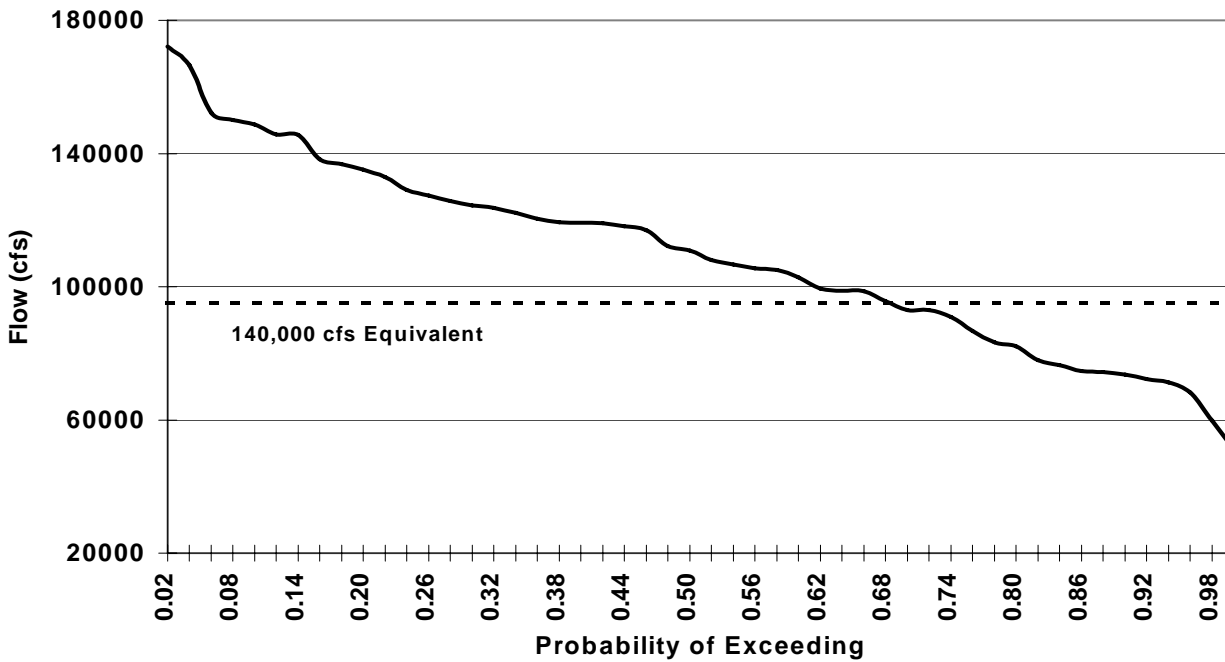


Figure 4

**Duration Curve for Spring Flows
at The Dalles Dam - Alternative B**

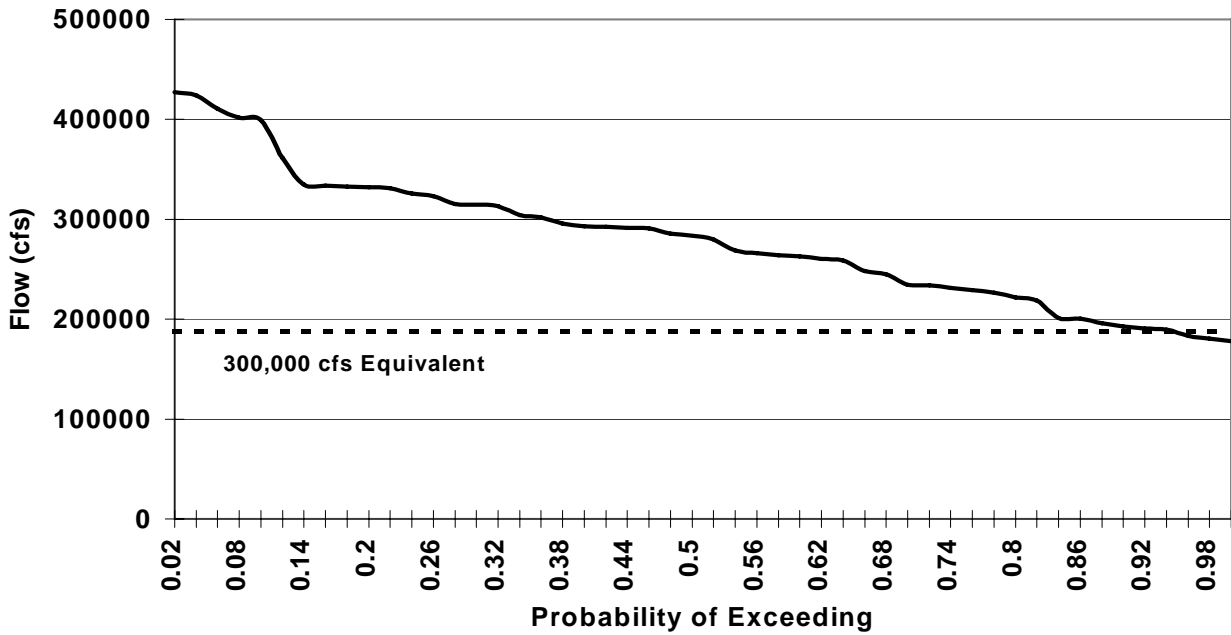
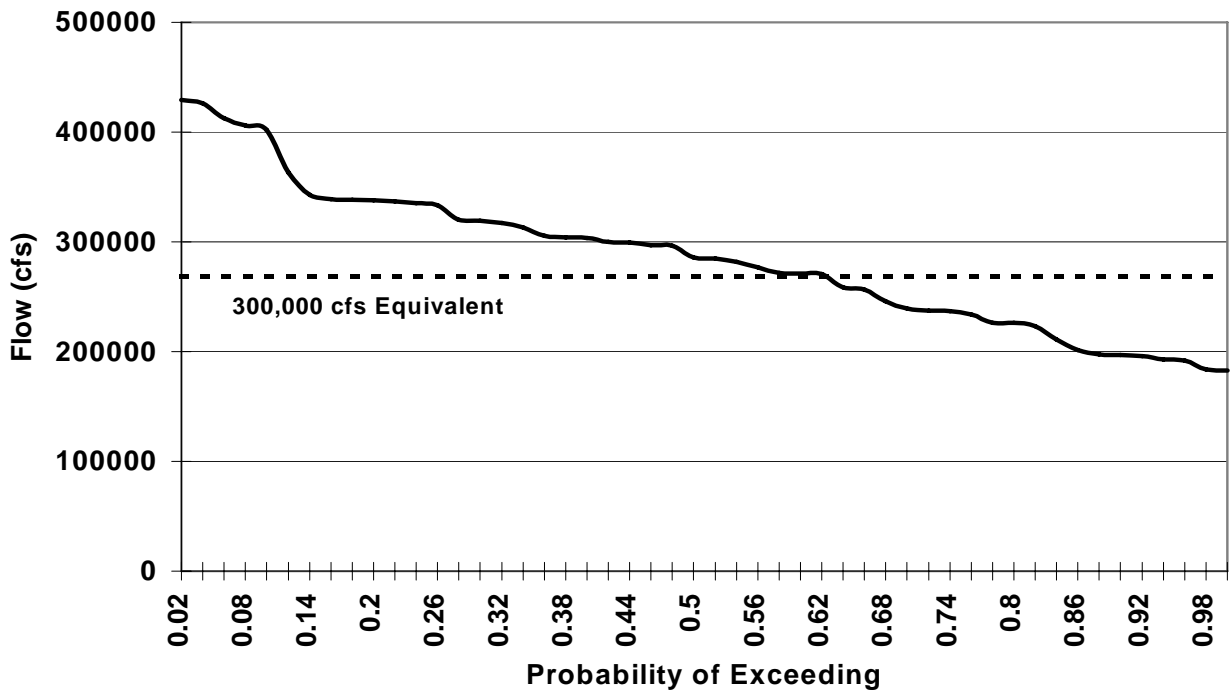


Figure 5

**Duration Curve for Spring Flows
at The Dalles Dam - Alternative A**



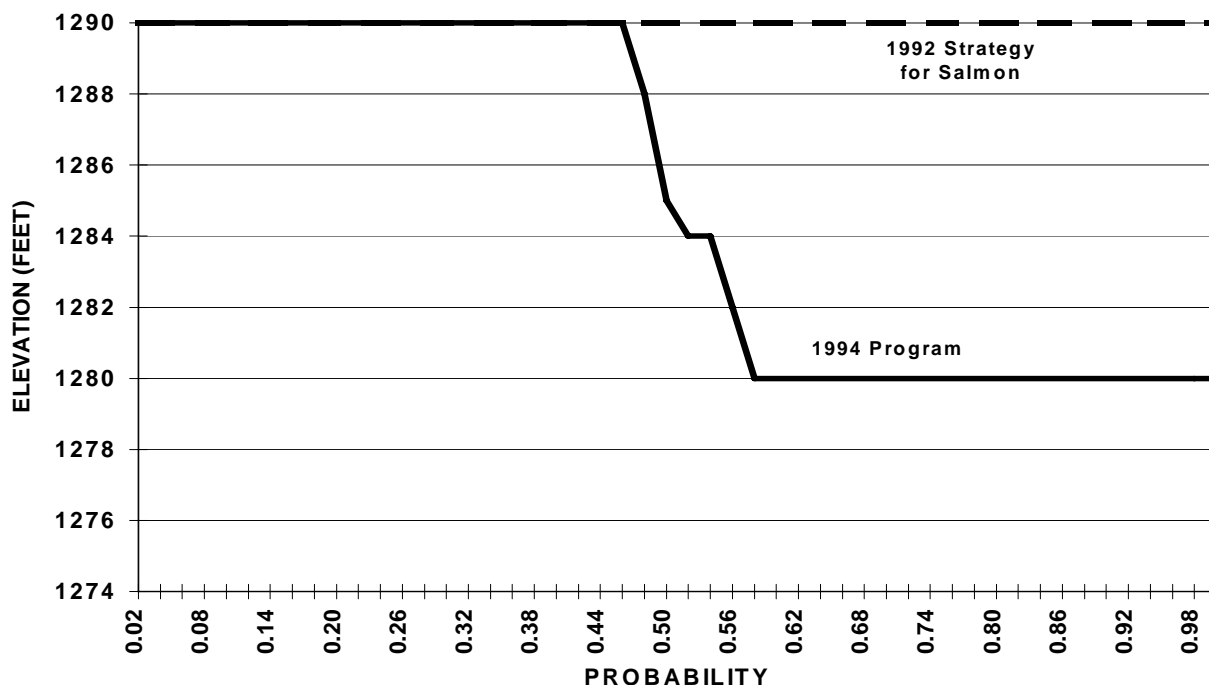
Figures 2 and 3 illustrate how often the 140,000 cubic feet per second flow equivalent is achieved under a two- and four-pool drawdown operation on the Snake River. The curve in Figure 3 (a two-pool drawdown) indicates how often a specific flow level will be achieved or exceeded. The horizontal line, at about 95,000 cubic feet per second, in that figure shows where the 140,000 cubic feet per second flow equivalent is based on a two-pool drawdown. For this operation, the flow objective is achieved about two-thirds of the time. In Figure 2 (a four-pool drawdown), it is achieved about 95 percent of the time. Under the Strategy for Salmon operation, the flow equivalent in the Snake River is achieved about 14 percent of the time.

Figures 4 and 5 illustrate the probabilities of achieving the spring flow objective of 300,000 cubic feet per second in the Columbia River. When John Day is operated at near spillway crest elevation, the flow equivalent objective is achieved about 95 percent of the time (Figure 4). Under a John Day operation to minimum operating pool, the flow equivalent objective is achieved about 60 percent of the time (Figure 5). Under the Strategy for Salmon operation, the flow equivalent in the Columbia River is achieved 42 percent of the time.

Reservoir Elevations and Refill Probabilities

Refill probabilities increase significantly at Libby and Hungry Horse dams due to implementation of the recommended integrated rule curves at both projects. Refill probability at Libby increases from 90 to 92 percent and at Hungry Horse from 86 to 96 percent. At Grand Coulee, the end-of-July refill probability drops from 100 percent in the Strategy for Salmon to under 50 percent. However, when Coulee does not refill it is generally 10 feet down from full, due to the 1,280-foot draft limit. By having August flow objectives at The Dalles, Grand Coulee cannot refill in August in dry years, and the project remains at its lower elevation of 1,280 feet. The refill probability curve for Grand Coulee is shown in Figure 6.

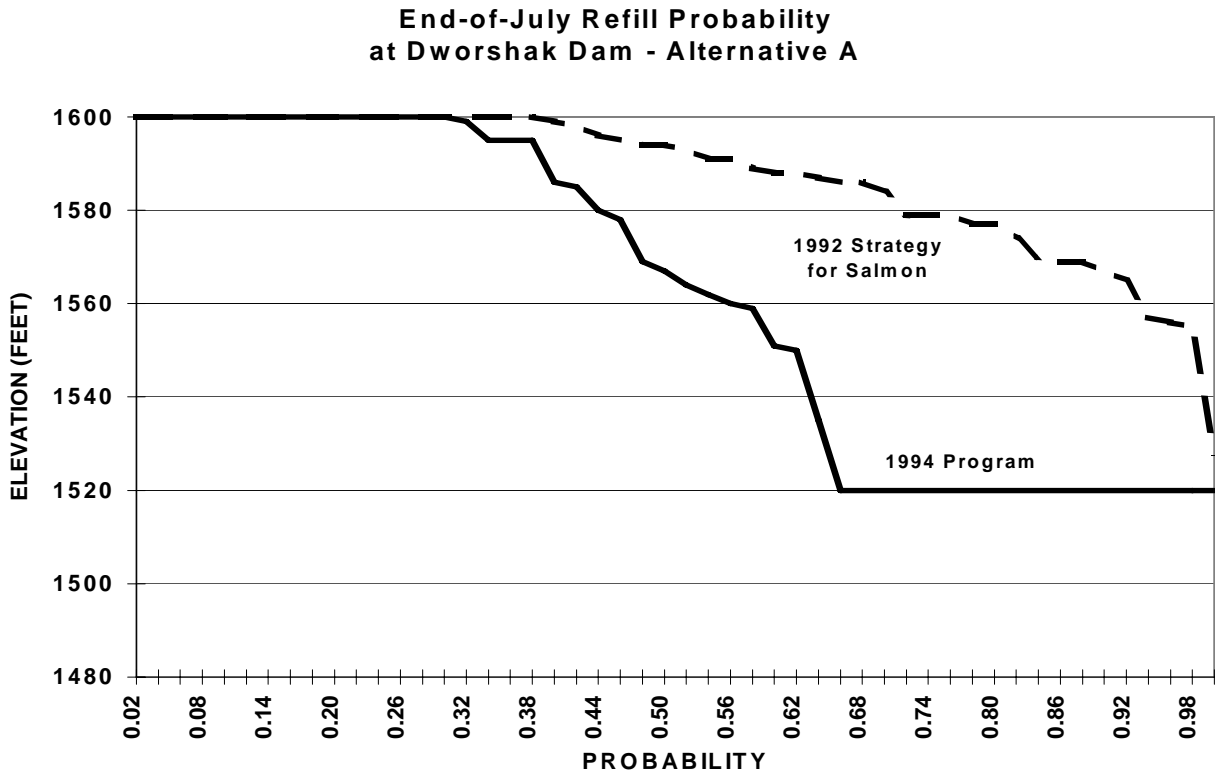
Figure 6
End-of-July Refill Probability
at Grand Coulee Dam - Alternative A



At Dworshak, refill probability depends on whether a drawdown of the four lower Snake River dams is implemented. Without a drawdown, Dworshak's refill probability falls from 42 percent under the Strategy for Salmon to 34 percent. This is due to its draft to elevation 1,520 feet, if necessary, to assist in meeting a summer flow objective of 50,000 cubic feet per second. With a four-pool Snake River drawdown operation, its refill probability increases to more than 70 percent. Figure 7 illustrates Dworshak's refill curve for the end of July. As evident in that figure, Dworshak will be drafted to an elevation of 1,520 feet in July, about one-third of the time, in the lowest water years.

The end-of-July refill probability for Brownlee Dam (Table 5) under the Strategy for Salmon operation is zero. This is because the Strategy measures call for a release of 137,000 acre-feet of water from the Brownlee Reservoir in July of every year, which is to be replaced by upper Snake River water in August. Under that operation, Brownlee refills by the end of August for all water conditions. Under the actions called for in the 1994 program, however, release of the 137,000 acre-feet of water in July is conditioned on the need for that water. Because of that, Brownlee's July elevation is higher, on average, than under the Strategy, and quite often it refills in that month. In August, the 1994 program calls for the upper Snake water, that would have refilled Brownlee, to be passed through instead. Because Brownlee is generally higher by the end of July under the 1994 program, the simulation shows that it is still able to refill by the end of August in every year. During winter months, Brownlee is used both for power and to maintain minimum flow requirements through April for salmon egg incubation.

Figure 7



**Table 5
Average End-of-July Elevations (feet)
and Refill Probabilities for Major
Columbia Basin Storage Projects**

	Strategy for Salmon	1995	A	B	C	D
Libby (full=2459 ft.)	2457.1 90%	2458.3 92%	2458.2 92%	2458.2 92%	2458.2 92%	2458.3 92%
Hungry Horse (full=3560 ft.)	3556.9 86%	3559.1 96%	3559.1 96%	3559.0 96%	3559.0 96%	3559.1 96%
Grand Coulee (full=1280 ft.)	1290.0 100%	1285.2 50%	1285.1 46%	1284.6 40%	1284.7 40%	1285.0 46%
Brownlee (full=2077 ft.)	2067.0 0%	2073.2 62%	2073.6 64%	2075.8 88%	2075.8 88%	2073.6 64%
Dworshak (full=1600 ft.)	1586.9 42%	1548.9 10%	1560.1 34%	1583.4 72%	1583.3 72%	1560.1 34%

Nutrient Retention Time at Grand Coulee Dam

In general, monthly average nutrient retention times at Grand Coulee Dam remain close to or above the suggested 30-day minimum level except during May. In April and June, average retention times are close to the 30-day value. In July and August, retention times decrease by about 6 to 16 percent from current operations, but remain above the 30-day level. In July, average retention time is between 38 and 41 days; in August it ranges from about 43 to 45 days.

Table 6
Average Nutrient Retention Time
at Grand Coulee Dam⁴
(Days)

	Current Oper.	1995	A	B	C	D
April 16-30	30.0	29.0	29.8	28.7	28.6	29.9
May	22.4	23.1	23.5	22.0	22.0	23.5
June	31.2	29.9	29.8	29.0	28.9	29.8
July	43.5	37.7	38.1	41.1	40.7	38.0
Aug 1-15	49.8	43.1	43.7	44.9	45.0	43.7
Aug 16-31	52.6	45.2	44.5	44.4	44.7	44.7

Table 7
Difference in Average Nutrient Retention Time
from Current Operations⁵
(Percent)

	1995	A	B	C	D
April 16-30	- 3	- 1	- 1	- 1	0
May	+ 3	+ 5	- 2	- 2	+ 5
June	- 4	- 5	- 7	- 5	- 5
July	-13	-12	- 6	- 6	-13
Aug 1-15	-14	-12	-10	-10	-12
Aug 16-31	-14	-15	-16	-15	-15

⁴ For nutrient retention times at Grand Coulee Dam, the current river operation was used as the base case.

⁵ For nutrient retention times at Grand Coulee Dam, the current river operation was used as the base case.

Cost and Rate Impact to Bonneville Power

Average annual costs to Bonneville Power⁶ range from about \$90 million to \$225 million. The corresponding average rate impacts range from 4 to 11 percent. The 4 percent increase would be realized if only the 1995 measures were implemented over the next 20 years. In the long-term, depending on which additional measures are implemented, the average rate increase over the next 20-year period ranges from 7 to 11 percent. Energy costs, which include the cost of replacement resources, energy purchases and lost revenues, amount to about one-third to one-half of the total cost. Non-power costs include the capital costs of modifying mainstem dams for drawdown operations,⁷ costs of improving fish bypass or transportation and other related fish and wildlife project costs. Firm hydro energy losses range from 400 to 850 average megawatts, depending on the final package of measures implemented.

Table 8
Cost and Rate Impacts
to Bonneville Power⁸

	Firm Energy Loss (MWa)	Capital Costs (millions)	Other Annual Costs (millions)	Energy Costs (millions)	Annual BPA Costs (millions)	Average Rate Increase (%)
1995	400	\$ 17	\$21	\$53	\$ 89	3.7
A	525	\$ 61	\$21	\$69	\$151	7.2
B	750	\$108	\$21	\$95	\$225	11.1
C	525	\$ 81	\$21	\$67	\$170	8.1
D	850	\$ 89	\$21	\$99	\$209	10.3

Uncertainties in Cost

A number of factors can affect regional cost estimates. Generally, cost estimates are made by comparing net revenue requirements between two different power system operations. The base case defines the operations from which changes are made. For this analysis, the base case represents the hydro operation under the Council's Strategy for Salmon measures.⁹ Even though those measures differ from current river operations,¹⁰ the Strategy for Salmon is the correct base case to use because amendments being considered by the Council reflect changes to the Strategy measures.

Cost estimates can also differ depending on the computer programs used to simulate river operations. Some programs provide very detailed simulations, while others use simplifying assumptions that yield more approximate estimates of operations. The System Analysis Model provides a very detailed simulation of river

⁶ Costs to Bonneville Power include 71 percent of the regional power system costs, capital costs of modifying dams and other related costs. They reflect the levelized cost of implementing various measures at various future dates.

⁷ Capital costs of drawdown-related dam modifications are based on Corps of Engineers' cost estimates from its System Configuration Study, including contingency costs. Edward L. McLean, a consultant, estimates the total cost of a four-pool Snake River drawdown to near spillway crest at \$610 million. This estimate is 50-percent lower than the Corps' estimate of \$1.3 billion.

⁸ The costs shown in Table 8 are levelized over the period from 1994 to 2015. In the introduction, some of these costs are discussed for specific years and thus will differ from those in this table.

⁹ For nutrient retention times at Grand Coulee Dam (Tables 6 and 7), the current river operation was used as the base case.

¹⁰ Current river operations represent the National Marine Fisheries Service 1994-98 biological opinion measures. Those measures decrease firm hydro energy generation by about 150 average megawatts and cost the region about \$40 million per year, on average, more than the Strategy.

operations. It models the operation of individual dams in the Columbia River Basin and includes specific non-power constraints at those projects.

Besides variations in estimates caused by factors mentioned above, cost can also vary due to fluctuations in other assumptions. For example, the cost of a particular set of measures can vary dramatically based on the amount of precipitation in a given year. The *average* cost of current river operations compared to the Strategy measures, for example, is about \$40 million, yet in dry years the cost could be as high as \$125 million.

What follows is a description of the variance in cost estimates due to uncertainty in four variables: gas price, capital cost of combustion turbines, water conditions and resource replacement type. Figure 8 illustrates the range in energy cost¹¹ (in percent) due to the uncertainty in these four variables.

A swing in gas price of 25-percent changes cost estimates by about 5 percent. A 25-percent reduction in the capital cost of a combustion turbine reduces the energy cost by about 8 percent, and correspondingly, a 50-percent increase in capital cost results in a 16-percent raise in energy cost.

Water conditions swing the cost more dramatically. Cost in years of poor water conditions would be nearly double the average value or more, and cost in good water conditions would be about half the average or less.

Each of the packages of measures being proposed will have some effect on the hydropower system's ability to produce firm energy. Losses to firm energy generation must be replaced if the same level of service is to be provided to Northwest customers. The choice of replacement resource makes the largest difference in the cost. In Figure 8, the change in cost due to resource type ranges almost 90 percent in either direction.

The choice of replacement resource for the average values was a combined-cycle combustion turbine. This resource has low capital costs and reasonable operating costs. When nonfirm hydro energy is available, the combustion turbines can be turned off to save operating costs. In the simulations, the replacement turbines operated about half the time. While this choice is probably not the optimum, it does represent a low cost option that continues to provide a high level of service to Northwest customers. Ideally, an optimal package of replacement resources¹² would be designed that would minimize the costs, while not harming level of service. This package would undoubtedly include conservation and renewable resources, as well as additional purchases or energy exchanges with out-of-region utilities.

On the high cost side, a "flat," non-displaceable and non-dispatchable, 35-mill per kilowatt-hour resource was chosen to replace lost firm hydro energy. This type of resource yields the greatest cost because the region must pay for it every hour of the year. It can not be turned off when surplus nonfirm hydro energy is available.

On the other end of the spectrum, only out-of-region energy purchases were used to replace lost hydro energy. Whenever there was a shortage, energy would be purchased from out-of-region utilities. If the interties (major power transmission lines) were full or if the supply was depleted, the model would simply curtail service to Northwest customers at a lost revenue rate of about 45 mills per kilowatt-hour.

¹¹ These fluctuations in cost reflect only energy costs, which represent about a third to one half of the total cost of the measures being proposed.

¹² This optimal package of resources would be developed through the Council's power planning activities in conjunction with efforts of other Northwest utilities and agencies.

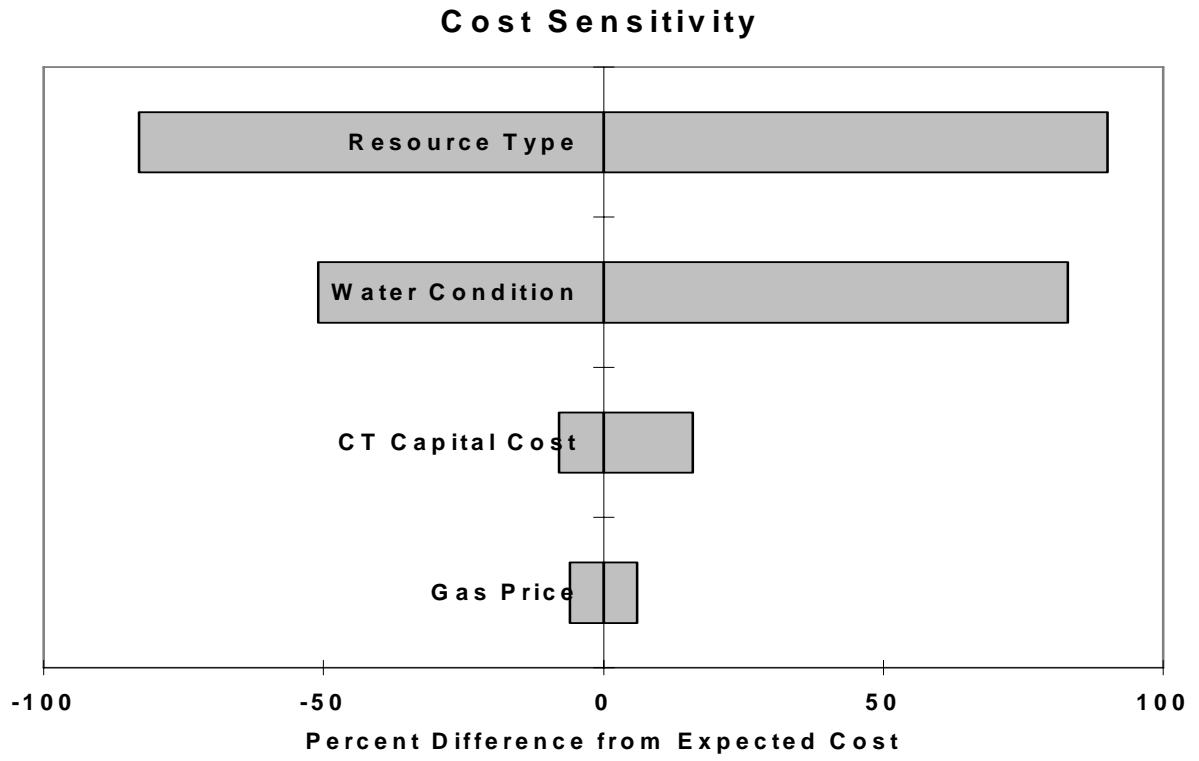


Figure 8

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- Memorandum from John Fazio to Council Members, “Uncertainty in Cost Estimates,” October 11, 1994.
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Appendix C

ASSURING AN ADEQUATE, EFFICIENT, ECONOMICAL AND RELIABLE POWER SUPPLY AND THE ABILITY TO CARRY OUT OTHER PURPOSES OF THE POWER ACT

Introduction

The U.S. Ninth Circuit Court of Appeals' recent decision in *NRIC v. Northwest Power Planning Council* characterizes the fish and wildlife provisions of the Northwest Power Act as “[a]ttempting to balance environmental and energy considerations.”¹ The Northwest Power Planning Council's Columbia River Basin Fish And Wildlife program must consist of measures to “protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of [hydropower] facilities while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.”² “Assuring” the region of such a power supply implies a reasonable degree of certainty that the objectives of adequacy, efficiency, economy and reliability will be achieved.

The Council must also determine whether the fish and wildlife program is consistent with the purposes of the Northwest Power Act.³ These purposes include encouraging conservation of electricity and timely repayment of the Bonneville Power Administration's debt to the federal treasury.⁴ An adequate, efficient, economical and reliable power supply that includes a healthy and financially viable Bonneville Power Administration is essential to carrying out those purposes.

The Council has examined the effects of fish and wildlife program measures on the ability to assure the region an adequate, efficient, economical and reliable power supply and Bonneville's ability to carry out the other purposes of the Power Act. The fish and wildlife program includes measures that would alter the operation of the hydroelectric system, affecting the amount and value of power produced. The program also includes measures that have significant capital and/or operating costs that would be borne, at least in part, by the power system.

There is a very wide spectrum of views in the region regarding the meaning of an adequate, efficient, economical and reliable power supply. Some hold that it must be considered entirely in the context of the power system that existed in 1980. In this view, an acceptable power supply is one whose characteristics are different than those of the 1980 system in only minor respects. For others, it may mean doing whatever is necessary to accommodate the needs of fish and wildlife, so long as some kind of power system can be maintained that is roughly as adequate, efficient, economical and reliable as those in other parts of the nation.

In general, it is likely that the adequacy, reliability, efficiency and economy of the region's power supply can only be fully gauged in the context of a full revision of the Council's Power Plan. Congress appears to have had this in mind. Congress anticipated that the Council would develop the fish and wildlife

¹ *NRIC v. Northwest Power Planning Council* slip opinion at p. 10879 (9th Cir. 1994)/

² 16 U.S.C. § 839b(h)(5).

³ 16 U.S.C. § 839 b(h)(7)

⁴ 16 U.S.C. § 839(1), (4).

program immediately after passage of the Act.⁵ In contrast, the Council was given up to two years to develop the power plan. Among its several purposes, the power plan is intended to:

reduce or meet the Administrator's [of the Bonneville Power Administration] obligations with due consideration by the Council for (A) environmental quality, (B) compatibility with the existing regional power system, (C) protection, mitigation and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish, and (D) other criteria which may be set forth in the plan.⁶

Thus, the fish and wildlife program is part of the power plan, and the mutual impacts of fish and power measures are intended to be examined together.⁷ It may be that the potential impacts of a particular fish and wildlife measure look different in the context of a full revision of the power plan than they do during the fish and wildlife amendment process.

This does not mean that, in adopting the fish and wildlife measures, the Council need not make a determination that the fish and wildlife program assures the region an "adequate, efficient, economical and reliable power supply." It must do so. But its determination may recognize that a fuller analysis of the issue will follow in revising the power plan.

This appendix describes the Council's analysis of the balance between fish and wildlife measures and the power system. In summary:

- The Council should adhere to utility industry standards for an adequate and reliable power supply. If fish recovery measures do not allow enough time or flexibility for the power system to adapt, those measures could violate the conditions necessary for an adequate and reliable power supply. The Council's analysis indicates that there are sufficient resources under development, available for purchase in West Coast electricity markets or that could be developed with relatively short lead time to ensure the region an adequate power supply. Although the reliance on purchased power is a departure from traditional regional planning practices, the Council believes it is becoming an increasingly common facet of the emerging competitive power market. The costs of new resources and purchased power have to be considered in the context of the economics of the power system.
- To ensure the reliability of the power supply, system operators need the ability to draft storage projects below elevations required for fish purposes in the event of circumstances that threaten firm loads. Such circumstances include severe weather, loss of major transmission links and loss of major generating units. Furthermore, the operators need some discretion to begin drafting in anticipation of severe weather events, so that the water can reach lower river projects when it is needed. Provided this sort of flexibility is allowed, the reliability of the system can be assured.
- Fish recovery measures may require actions that are not as efficient from the standpoint of the single objective of power operations as current operations. However, the Northwest Power Act clearly expected a balancing of fish and power objectives, i.e., operating the system with multiple objectives. The greatest efficiency has been and should continue to be sought in achieving both objectives. The changes in the efficiency of power operations will, however, have impacts that are considered in terms of the economics of the power system.

⁵ Remarks of Rep. Dingell, Cong. Rec. p. H10683, November 17, 1980.

⁶ 16 U.S.C. § 839b(e)(2).

⁷ 16 U.S.C. § 839b(e)(3)(F).

- From the standpoint of the region's economy and power system as a whole, it is unlikely that fish recovery measures would result in an uneconomical power supply. The total costs are small relative to regional income. Ignoring the sunk costs in the existing power system, even if Bonneville's customers were to turn to other power suppliers, the resulting power supply would still be relatively economical in relation to the rates paid by other parts of the nation. However, the advantage the Northwest currently enjoys relative to the rest of the nation would be expected to diminish dramatically both as a result of increased costs in this region and decreased costs brought on by competition elsewhere.
- The costs associated with fish recovery measures could prove to be burdensome to some individuals and industries. This is particularly true of electricity-intensive industries. However, the fact, that, on average, the costs of fish recovery are relatively modest in relation to the regional economy suggests that it is possible to redistribute costs if necessary to avoid unreasonable burdens on specific customer groups.
- The Bonneville Power Administration is an integral part of the region's power supply. It is possible for fish recovery measures to cause Bonneville's power supply to be perceived as no longer economical in relation to competing supplies. If a number of customers accounting for significant loads decided to seek other supplies of electricity, Bonneville would no longer collect sufficient revenue to fund fish and wildlife and other purposes of the Act, including repayment of its debt to the federal Treasury. The analysis presented suggests that Bonneville could absorb modest additional fish recovery costs and maintain its ability to be economical in comparison with other electricity supplies. This conclusion, however, is subject to significant uncertainty.
- The variability inherent in Bonneville's revenues also suggests that there may be some years when Bonneville's revenues are such that it could contribute "excess" revenues to support fish recovery measures. This would be contingent on Bonneville having financial reserves consistent with prudent utility practice.
- The Council has identified actions that are necessary to protect, mitigate and enhance fish and wildlife affected by the development, operation and management of hydropower facilities. To successfully implement these actions *and* assure an adequate, efficient, economical and reliable power supply and not subvert the other power purposes of the Act, the region will need to work with the federal government on the allocation of costs. There is a need to implement the fish recovery measures and maintain the Bonneville Power Administration as an economical power supply.
- The Council has identified three possible means of mitigating the impact of fish and wildlife costs on Bonneville. One is to seek federal appropriations or other sources of funding for fish recovery measures. A second is to share as much of the cost of fish and wildlife costs as are attributable to the non-power uses of the Columbia River system as allowed under Section 4(h)(10)(c) of the Power Act. The third recognizes the parallel between fish recovery measures and utility investment that is made uneconomic and therefore no longer recoverable as a result of competitive pressures. Much of the policy debate surrounding the ongoing restructuring of the electricity industry nationwide is focused on the question of unrecoverable or "stranded" investment. A charge for use of transmission and/or distribution systems is the mechanism that is most frequently proposed. The potential for recovering part of the fish recovery costs and/or costs of uneconomic investment in the unfinished Washington Public Power Supply System nuclear projects through a transmission charge should be investigated.
- Finally, while the Council has done considerable analysis in connection with these findings, it is important to recognize that the adequacy, reliability, efficiency and economy of the region's power supply, and the impact of these measures on Bonneville's ability to carry out the purposes of the Act, can be more fully gauged in revising the power plan. Some recommendations submitted in the fish and

wildlife amendment process, for example, the Columbia River Inter-Tribal Fish Commission's proposal to establish ramping rates for flow fluctuations at mainstem dams, raise issues of adequacy and reliability that could not be addressed in the fish and wildlife process. The potential impacts of these and other fish and wildlife measures deserve further consideration in the context of a full revision of the power plan.

Adequate Power Supply

The term "adequate" has a generally accepted meaning in power planning. An adequate power supply is one where power resources are either currently available or can be developed in time to meet forecast demands with an adequate reserve margin. "Adequate" is distinguished from "reliable" by the time dimension. "Reliable" relates to the short term, when resources cannot be added (except for spot market or other short-term purchases), while "adequate" relates to the longer term, when resources can be added. Adequacy might also be thought of as forecast reliability.

Fish recovery measures would result in a power supply that was *not* adequate if they reduced the capability of the Northwest power system to such an extent that, on a planning basis:

- existing supplies and/or transmission capability in the West Coast market were insufficient to meet forecast demand; and
- the timing were such that sufficient additional new resources and/or transmission capability could not be developed in time to meet forecast demand.

Given sufficient time, it would be possible to develop sufficient resources to assure an adequate power supply, albeit at some cost. Then the question becomes whether the resulting power system is economical. Nonetheless, the power system cannot be judged to be adequate if existing resources or constraints on the development of new resources were such that it was not possible to acquire sufficient resources to meet forecast firm loads.

Analysis

The analysis of adequacy focuses on the period 1996 through 2000. Fish recovery actions taken during 1995 may be of concern because of their possible effect on system reliability. Beyond 2000, the typical five-year lead time for the development of combustion turbine power plants (Table 1) should allow these plants to be developed "from scratch," providing that the need for new resources is identified and acted upon during 1995.

Table 1

Representative Combustion Turbine Power Plant Development Schedule

Project and site selection, agreement to proceed	12 months
Permitting, preliminary engineering, contracting	24 months
Final engineering, procurement, construction and testing	24 months

Fish recovery measures could affect both the capacity and energy capabilities of the hydropower system, possibly requiring both replacement capacity and energy resources. However, with the exception of the Detailed Fish Operations Plan, the options considered, while reducing hydropower capacity, are expected

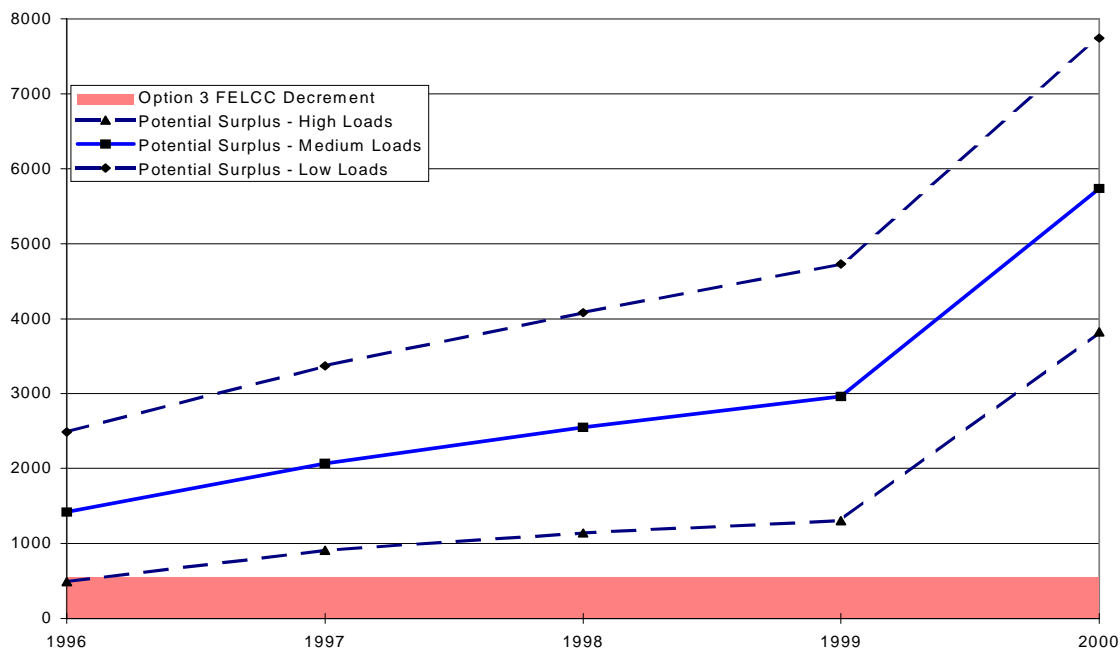
to maintain sufficient hydropower system flexibility to preserve current capacity during the regional winter peak period. Adequacy concerns therefore focus on the ability to compensate for the energy impacts of fish recovery programs.

The ability to secure additional resources to meet needs in excess of forecast loads during the period 1996 through 2000 is depicted in Figure 1. Figure 1 shows the firm regional energy load/resource balance. Each line on the figure is the difference between the sum of existing firm resource capability, new resource development potential and additional potential for imports, and the forecast regional loads for low, medium and high growth. The existing capability of the hydropower system is held constant, reflecting hydropower operation under current fish recovery programs. Positive numbers denote a potential supply surplus.

Also plotted in Figure 1 are the estimated decrements to hydropower system firm energy load carrying capability that would result from implementation of Recovery Option 3.⁸ Of the recovery options considered (other than the Detailed Fish Operations Plan), Option 3 would produce the greatest reduction in firm hydropower energy during the period of interest. (The 4,700 megawatt firm energy load carrying capability reduction resulting from the Detailed Fish Operations Plan could likely not be fully replaced under medium, or greater, load growth conditions until 2000.) Option 3 firm energy load carrying capability reductions are estimated to be 525 megawatts beginning in 1995, increasing to 550 megawatts in 1999. Though in year 2002, other recovery options might result in greater firm energy load carrying capability reductions, ample time would be available to secure sufficient replacement resources.

⁸In amending the Columbia River Basin Fish and Wildlife Program, the Council analyzed several alternative packages of mainstem measures. These were called "Options". The Council adopted what was called "Option 7," whose energy impacts would be less than those analyzed.

Figure 1
Availability of New Resources Compared to Option 3*
Firm Energy Load Carrying Capability Decrement



* see footnote

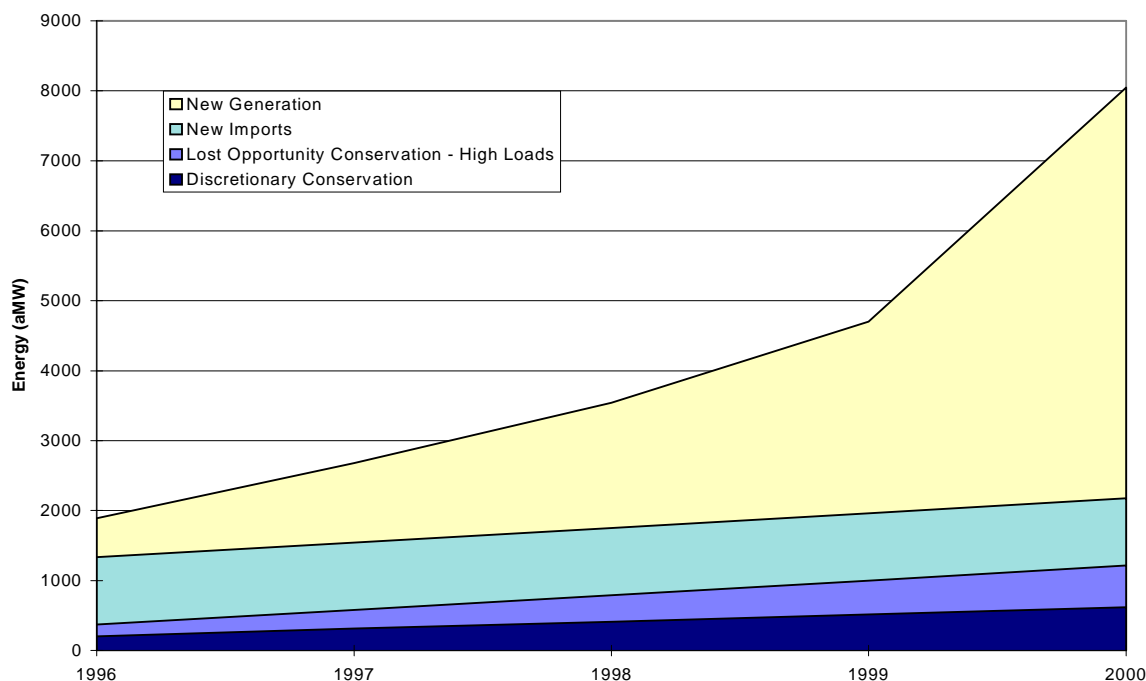
As depicted in Figure 1, it appears to be possible to accommodate the hydropower energy decrements resulting from Option 3 for all load growth cases. In the worst case situation -- high load growth -- sufficient energy could be secured by 1996 to maintain load/resource balance. With continuation of medium load growth, nearly 1,000 megawatts of potential surplus energy could be secured. The potential resource surplus steadily increases through 1999, when it reaches nearly 2,500 average megawatts with medium load growth and 800 megawatts with continued high load growth.

By 2000, sufficient time is available to bring new combustion turbine plants through the full development process, and the amount of potentially available new resources increases rapidly. Beyond 2000, new resource development would be constrained primarily by the availability of suitable sites, resource diversity concerns and environmental constraints. This would probably have the effect of increasing the cost of new resources, as more stringent environmental controls and more extensive site facilities are required. However, it is likely that resources adequate to compensate for the hydropower firm energy load carrying capability reductions of all options save for the Detailed Fish Operations Plan could be secured by 2002.

The new resources that could be secured to offset reductions in hydropower system output include conservation, generating resources developed within the Northwest and increased imports of existing surpluses from British Columbia and the Southwest. Most of the new resources available during the early years of the period are from increased imports from California and British Columbia (Figure 2). Later in the period, an increasing amount of energy could come from steadily increasing new conservation and generating projects (mostly gas combined-cycle plants) under construction, committed for development or in the process of permitting.

Figure 2

Potentially Available New Resources



Conservation resources include all discretionary resources plus lost-opportunity resources corresponding to the respective load growth rates.

Generating resources are based on actual projects under construction or proposed for development, plus a 500 megawatt (capacity) block of new wind resources. The short lead time for wind projects and the competitiveness of wind with combustion turbines under current tax laws suggest that if needed, this amount of new wind resource in excess of currently proposed new projects could be developed by the year 2000.

The potential energy contribution of each new and proposed generating project is estimated as the product of the project capacity, the estimated project availability, the estimated probability of successful project development (permitting, contracting and financing) and the estimated probability of successful project construction. Probabilities are estimated by resource type, based on recent project development experience. For example, the energy contribution of a proposed 240 megawatt gas-fired combined-cycle combustion turbine is estimated to be 164 megawatts, as follows:

Net capacity	240 megawatts
Availability	90 percent
Probability of successful development	80 percent
Probability of successful completion	95 percent
Expected energy contribution	164 average megawatts

The estimated timing of each new generating resource was based on its current stage of development and the expected time to complete project selection, development and construction, as applicable. For example, a combined-cycle project, currently licensed on speculation, but not holding a power purchase agreement, would be estimated to be available for the 1999 operating year, as follows:

Need for power identified	July 1995
Project selection	12 months
Project development	0 months
Project construction	24 months
Initial service date	July 1998
First operating year	1999

Additional imports from California or British Columbia could be limited by the availability of generating resources within these regions to supply power in excess of local needs, by transmission bottlenecks between these regions and the Northwest and by the ability of the Northwest to accept energy during certain periods. The estimates of potential new imports used in this analysis while based on limited information, are thought to be relatively conservative. Both British Columbia and California have resource surpluses available for the period considered, and there is surplus intertie capacity over and above that needed for current long-term contracts. This is true even for the reduced intertie capacity available this winter. The assumptions used in this analysis are shown in Table 2. These figures include the approximately 6,000 megawatt-months needed to store water for fish flows, which are not available to provide firm energy. Those 6,000 megawatt-months have not been included in Figure 2.

Table 2
Estimated Availability of New Energy Imports
(Megawatt-months)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CA	2680	2287	1893	1500	0	0	0	0	1500	1500	1500	1500
BC	0	0	800	800	0	0	0	0	800	800	0	0

Conclusions on Adequacy

The Council finds that the resources either under development or proposed for development in conjunction with reasonable amounts of imported energy are sufficient to assure an adequate power supply under the full range of probable loads and fish recovery measures, with the exception of the Detailed Fish Operations Plan. It would be difficult to accommodate recovery options resulting in very large decrements (thousands of megawatts) of hydropower capability, early within the period examined and maintain power supply adequacy.

The reliance on imports to meet firm power needs is a departure from traditional planning practices in the Northwest. The Council believes, however, that the emerging competitive West Coast power market will encourage a much greater level of sales and exchanges among the regions of the Western system. This will occur regardless of fish and wildlife requirements because it is a more economically efficient use of the power system.

Reliable Power Supply

A non-technical approach to reliability would ask the question: If all the emergency purchases that could have been made have been made, then under all but the most extreme possible circumstances, can all firm loads be met without interruption to the bulk power supply system? In a reliable system the answer is “yes.”

As in the analysis above, for the purposes of this analysis, “reliable” means the short-term ability to meet load. It is distinguished from “adequate” by the time dimension. “Reliable” relates to a condition in the short term when resources cannot be added (except for spot market or other short-term purchases), while “adequate” relates to the long term, when new firm resources can be added. Adequacy might also be thought of as forecast reliability.

This analysis proposes to deal only with reliability at the bulk power supply level, since that is generally the level at which the criterion could be applied to fish issues. It does not deal with questions of unreliability at the distribution system level, for example, outages caused by downed distribution wires.

“Load” refers to all firm load. In the case of the direct service industries (DSIs), restriction rights are specified in the contracts, and firm load is the load that is not restrictable. Load can also be distinguished between energy load, which is the total amount of a resource used over some time period and capacity load, which is the amount of resource required at any one time.

Generally, capacity unreliability is a different and more serious kind of problem than energy unreliability, because it is less easily remedied and the consequences (area blackouts) are more severe. Energy unreliability can usually be solved completely with purchases (thus becoming mostly an economic problem), while capacity reliability often cannot be solved merely with purchases, especially in the shortest term of a few hours to several weeks. However, because the Northwest is a hydro-based system, it is possible under certain circumstances, such as the long-term (multimonth) loss of a large resource, like Washington Nuclear Project Two (WNP2), or of an intertie, on top of poor reservoir conditions due to drought, to have energy shortages that would make the system unreliable.

On a forward looking basis, reliability is usually defined probabilistically. Capacity reliability is defined by a certain level of probability that load can be met after taking into account the distribution of forced outages of generating plants and the simultaneous distribution of possible loads, the latter usually based on random weather variations. Because of the interrelationship of water availability and capability to meet instantaneous loads in the Northwest’s hydropower system, this measure is not as easily defined as in conventional thermal systems. Work is continuing on this problem, though current results typically address specific contingencies rather than defining them probabilistically.

Energy reliability in the Northwest has historically been based on meeting regional loads with regional resources under critical water conditions. The expansion of the Western regional bulk power market in recent years has allowed utilities to relax their reliance on regional resources, but reservoir status and water conditions still dominate the region’s ability to meet its energy loads.

“Reliability” raises the question of voluntary limits on loads. Generally, the definition of “firm load” can be qualified in two different ways, load without curtailments or load after voluntary curtailments. The utilities and the Northwest states have in place a mechanism for calling for voluntary firm load curtailments. This mechanism will be used before any involuntary curtailments are imposed in a last ditch effort to prevent a widespread blackout of the system. Whatever that level of reliability may be, normal industry usage does

not assume the ability to voluntarily curtail load when calculating whether that level can be met. This paper recommends that voluntary curtailments not be part of the definition of a reliable power system.

Increasing reliance on purchased power to meet monthly and annual energy loads has tended to mean that we also increasingly rely on purchased power for energy during periods of peak capacity demand, for instance, during cold snaps. Reliability for this purpose is a much more rigorous test than reliability for annual energy demand. Failure of key intertie transmission lines during a cold snap would have more serious consequences than during other times. For capacity reliability purposes, transmission availability (and the size of the supply market that lies behind it) can be as important as the reliability of a generating plant and needs to be addressed analytically with the same rigor.

The question has been raised whether a system that relies on out-of-region purchases for a significant part of its power supply has the same reliability as one that meets all its needs internally. The implication is that there may be both less reliability from an out-of-region supplier and less reliability as a result of dependence on transmission. This is not necessarily true, though it may be, depending on the facts of the specific situation. In-region plants can go down, as can in-region transmission lines. The Council believes that reliance on a West Coast power market will be a fixture of the emerging competitive market for electricity. The reliability of that market is an issue that can be addressed analytically in the future.

In any case, the Northwest has been relying on out-of-region supplies for some time. Moreover, Bonneville has decided that, over the next few years, it would rely on purchases rather than new resource development because of the economically attractive supply purchase opportunities on the West Coast market and the long-term risk management benefits such purchases can provide.⁹ The Council believes that reliance on out-of-region supplies should not be considered, in and of itself, a reason for finding the power supply to be unreliable.

Bonneville reported that there are significant effects on the reliability of the system if certain restrictions on the operation of reservoirs are maintained. Bonneville provided the results of a set of studies evaluating the ability of the federal system to meet monthly energy loads and to meet hourly loads in the event of a severe cold snap this winter. Different levels of restriction on the storage reservoirs¹⁰ as well as the effects of contingencies in large thermal plant operation and intertie availability were examined. The studies concluded that monthly energy loads could be met this winter even if the three U.S. headwater projects (Libby, Hungry Horse and Dworshak dams) were operated at their flood control levels, as long as there were no major problems with the intertie. If there were extended problems, or if Grand Coulee or Arrow dams were required to operate to flood control levels, the system could be unable to meet its firm energy load and could be unreliable.

In addition, hourly capacity studies showed that, during a cold snap, constraining draft on the three headwater projects, even in the absence of contingencies, could lead to firm load curtailments. Libby and Dworshak were more crucial than Hungry Horse in these cases, because their water passed through all the downstream plants during the simulated cold week, while the water from Hungry Horse was trapped in Flathead Lake by other constraints.

Bonneville's comments noted that operation of fish-constrained projects would be a last resort among the tools available to deal with both capacity and energy reliability problems.

⁹ Bonneville Power Administration, "Resource Additions to Optimize the Power System -- Developed for the General System Management and Expansion Component of the Power and Resources Strategic Plan," March 8, 1994.

¹⁰ Libby, Hungry Horse, Dworshak, Albeni Falls, Grand Coulee and Canadian projects to the extent available under the Canadian Treaty and other agreements.

Conclusions on Reliability

One way to address reliability concerns in connection with fish recovery measures would be to put conditions on the use of stored fish water for emergency non-fish reasons. The current fish and wildlife program contains similar flexibility for operation of Dworshak.

A situation testing these issues could come up this winter. A cold, dry winter on top of current low reservoir levels could leave the region exposed to the effects of a cold snap like that of February 1989 or December 1990. In such a circumstance, the ability to meet loads on an hour-to-hour basis (capacity reliability) would depend in part on the ability to release enough water over a short period of time (likely one to two weeks) to support the full generating capability of the system.

Another example of the operation of such a criterion could be support for the Corps and Bonneville's desire to maintain two to three weeks of storage in Dworshak for emergency operating reasons, rather than drafting completely to support fish migration.

To ensure the reliability of the power supply, the system operators need the ability to draft storage projects below elevations required for fish reasons in the event of circumstances that threaten firm loads. Furthermore, the operators need some discretion to begin drafting in anticipation of severe weather events, in order that the water can reach the lower river projects at the time it is needed. The travel time can be as long as three days from some projects to the lower river.

In response to the clarification request by the Power Planning Council to address actions the federal system would take to maintain reliability, Bonneville and the Council developed the following paragraphs:

To ensure the reliability of the power supply, power system operators need the ability to draft storage projects notwithstanding fish needs in emergency circumstances that threaten firm loads (e.g., major temperature drops like those experienced in 1989 and 1990; loss of a major resource like WNP 2 or a large Grand Coulee unit; or loss of the Northern or Southern inertia). System operators need some discretion to begin drafting in anticipation of severe weather events, so that the water can reach the lower river projects when it is needed. BPA also has the responsibility under the Pacific Northwest Coordination Agreement, the Northwest Power Pool and the Western Systems Coordinating Council to maintain reliability standards for voltage and transmission stability. Instability could result in local or regional blackouts.

Accordingly, during the time of year that water is being stored for fish at the federal projects (Hungry Horse, Libby, Dworshak, Albeni Falls and Grand Coulee), such storage may be temporarily drafted to avoid: 1) threatened inability to meet firm loads due to emergency circumstances (see above); or 2) voltage and transmission instability. Such drafts should be only temporary and should strike an equitable balance between impacts to resident and anadromous species. System operators are expected to make purchases to minimize the risk that there will be less water stored for resident and anadromous fish than would otherwise have been stored. The role of financial considerations in Bonneville's purchase decisions is discussed later in this appendix.

Efficient Power Supply

The term "efficient" is more ambiguous than either adequate or reliable. It could have several meanings in the context of "assuring an adequate, efficient, economical and reliable power supply". Because

one of the purposes of the Act is to “encourage development of energy conservation and efficiency resources”, one view of an efficient power supply might be one in which electricity is used efficiently. There are conceivably two ways in which fish measures might preclude some efficiency measures. One would be if the performance characteristics of some conservation measures conflicted with the requirements of fish measures. For example, the provision of fish flows in the spring and summer reduce the value of conservation measures that reduce summer loads. On the other hand, irrigation conservation measures that reduce water withdrawals and measures that reduce fall and winter loads and peak demands would have greater value. Taken altogether, this does not seem to be a particularly significant line of reasoning. In developing the power plan, the Council should interpret the cost-effectiveness of all resources in light of their value to the power system, taking fish and wildlife and other objectives into account.

Another way in which fish measures might preclude improvements in the efficiency of the use of electricity would be if the cost of fish measures made investment in efficiency resources impossible. The implication of this is that it would no longer be economically feasible to make such investments. This should be considered in the context of raising a conflict with one of the purposes of the Act.

“Efficient” could also be interpreted in an engineering sense. For example, requirements for spill result in “wasting” water that would otherwise be used for power production. From a power production standpoint, that is inefficient operation of the power system. Similarly, not using “efficient” hydroelectric generation because of fish objectives and running less efficient thermal generation instead results in a less efficient power supply from the standpoint of the average amount of energy used to produce a kilowatt-hour of electricity.¹¹ In that sense, however, the power system has already become less efficient as more thermal or other generation has been added to the system merely to meet load growth. This trend can be expected to continue. Loss of hydro energy capability will hasten this decline in efficiency, but it is not clear that in the long run, the overall efficiency would be significantly different.

The inability to run the hydro system as a multiyear system with the flexibility to transfer energy from one time period to another suggests a system that is possibly less efficient than it once was. More likely, it means a system which is less flexible. Because the Power Act expressly contemplates electric power losses associated with fish measures, this view of “efficiency” seems too restrictive. Moreover, from a practical standpoint, the consequences of this operation, apart from biological, are subsumed in the economics of the power system. The real question is whether this operation results in a power system that is no longer economical.

It is also worth noting that less efficient power operation will have some associated environmental issues. For example, less reliance on the hydro system will probably result in greater reliance on gas-fired generation that may contribute to global climate change. To the extent those effects are internalized in the future through a carbon tax or some other mechanism, they will show up in the economics of the power system.

¹¹ From the standpoint of the fuel conversion efficiency of the individual generating units in the system, the system is more efficient than it was in 1980.

Conclusions on Efficiency

The objective of the planners and operators of the power system is a power system that is as efficient as possible given the multiple objectives for the use of system. From the single objective perspective of power operations, the power system is less efficient than it was at the time of the passage of the Act. This is the result of many factors, some of which are just related to characteristics of new resources available to meet growth and some related to the effects of fish recovery measures. It is still, however, a very efficient system relative to systems elsewhere. The Council does not believe that the framers of the Power Act meant the term "efficient" to establish an absolute standard. The Northwest Power Act clearly expected a balancing of fish and power objectives, i.e., operating the system with multiple objectives. The greatest efficiency has been and should continue to be sought in achieving both objectives. Ultimately, the consequences of reductions in the efficiency of the power system are economic -- additional costs to supply a given amount of power. These effects will be evaluated in the context of whether the power system is economical and whether the costs impair Bonneville's ability to fulfill the purposes of the Power Act.

Economical Power Supply and the Ability to Carry Out Other Purposes of the Power Act

As the discussion of adequate, efficient and reliable suggests, except for a few relatively well-defined circumstances, the overriding consideration is whether the power system is economical. The legislative history suggests that the Council must search for ways to accommodate the needs of fish and the needs of the power system, and if there are trade-offs, must strike a balance. Congress did not intend, however, that fish and wildlife needs should be sacrificed just to save money.¹² The legislative history also suggests that in striking the balance, the Council should consider potential power and revenue losses and costs imposed on consumers. Having done so, the Council should judge whether the power and revenue losses are "unreasonable", whether the costs "burden" consumers, and whether these losses and costs "subvert the power objectives" of the Act -- in addition to ensuring a stable and affordable power supply, the Act is intended to encourage energy conservation and efficiency; and ensure that Bonneville customers and consumers pay the full cost of power, including repayment of federal Treasury investments.

Burden on Consumers

At what point would additional fish recovery costs unduly burden consumers of the Northwest? This question suggests two possible frames of reference. Because of the national politics of this issue, it may be necessary to look at it from the standpoint of the costs of electricity in this region in relation to the rest of the country. Another frame of reference is the costs in relation to the size of Northwest economy.

Analysis

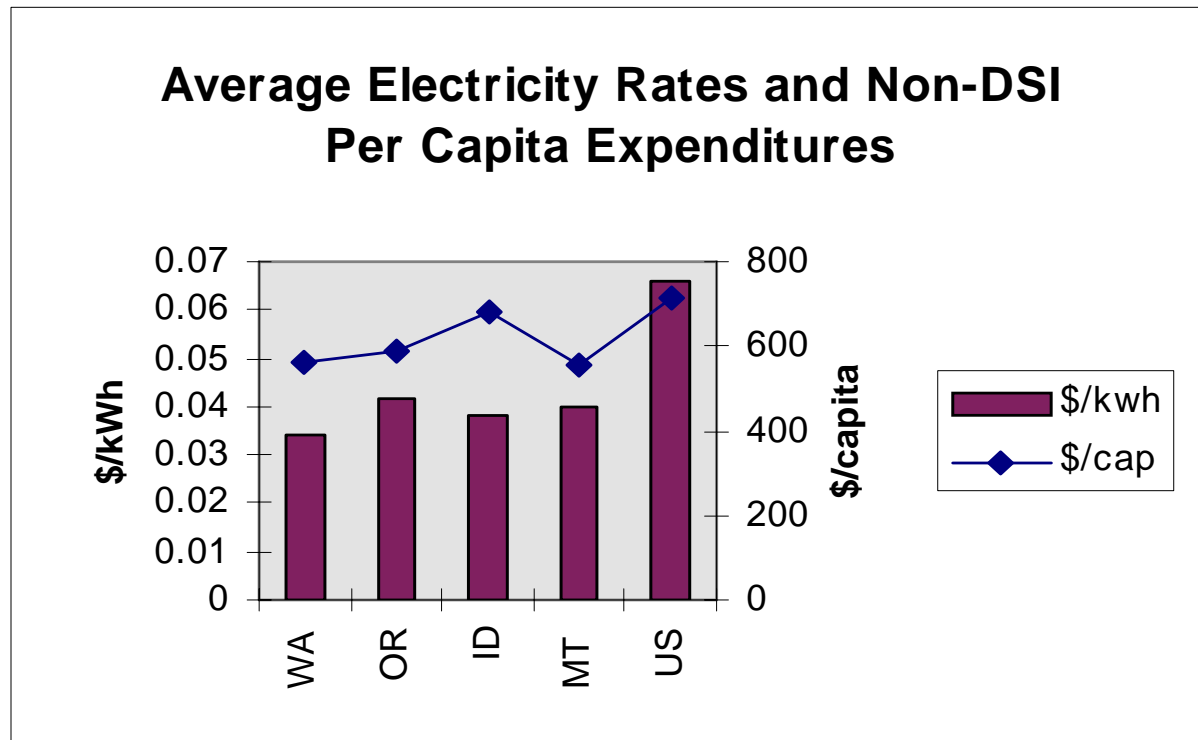
On average, it is unlikely that the magnitudes of the fish recovery costs considered by the Council could be considered a burden for Northwest consumers by others outside the region. Figure 3 shows average electricity rates and non-direct service industry per capita expenditures for electricity for the Northwest states and the United States as a whole.¹³

¹² For a more complete discussion of the legislative history, see Volkman, John, "Adequate, economical, etc. power supply," memorandum to Council members, October 6, 1994.

¹³ *State Energy Price and Expenditure Report -- 1990*, Energy Information Administration, U.S. Department of Energy, Sept. 1992, pp. 11-16, and *Bonneville Power Administration Annual Report -- 1990*, p.38.

The reason Idaho's per capita expenditures are out of line with the rest of the region is unexplained. It may be the consequence of irrigation pumping loads. This figure implies that electricity rates could increase somewhat before average cost for electricity per customer in the Northwest equaled the national average. Increased prices would stimulate conservation and substitution that would moderate the effects of increased rates.

Figure 3



Looking at the issue in relation to the size of the Northwest economy, annual personal income in this region is approximately \$200 billion and is forecast to increase at approximately 2.8 percent for the period 1993 - 2005 in real terms and 2.3 percent per year for the period 1993 to 2015. The maximum average additional annual cost of most of the fish recovery measures considered during the program amendment process amounts to less than 0.2 percent of regional personal income. The most expensive, the Detailed Fish Operations Plan, amounts to about 0.4 percent. That option has not been analyzed further. It seems unlikely that, *on average*, this increase over the long term would amount to an unbearable burden to consumers in the Northwest.

From the standpoint of rates, as will be shown later, the increase in Bonneville wholesale rates associated with the costs of the fish recovery measures considered range from almost 2 percent to almost 25 percent. By the time this is passed through to retail consumers, the impact would generally be significantly less. Retail rates in the region would still be significantly less than the rest of the country. Utilities other than Bonneville and its customers would also be affected by fish recovery measures, but not to the same extent.

It should be noted, however, that the historical advantage that the Northwest has had in electricity rates is likely to erode. This is the effect of both the upward pressures on power costs in this region and the anticipated reduction in power costs elsewhere in the nation in response to competitive pressures. Whereas average electricity rates here are typically less than the cost of new resources, the average rates elsewhere are

typically greater than the cost of new resources. Competition from new resources can be expected to force rates down in the rest of the United States.

The problem with thinking in terms of the average burden from the standpoint of either rates or overall cost to the economy is the problem with averages -- they frequently do not represent the situation of many individuals and industries. In this instance, there are two problems. First, the costs of fish recovery measures are not spread uniformly around the region. The costs which are the result of derating of the hydropower system or capital additions to that system are recovered through the rates of the Bonneville Power Administration and other utilities with hydroelectric facilities on the Columbia and Snake River systems. Other costs of the fish and wildlife program are recovered through Bonneville rates. How closely this distribution of costs corresponds to the historical distribution of benefits from the Columbia and Snake river hydroelectric facilities is unclear. If the costs of fish recovery and the benefits derived from the hydro system do not coincide, the fact that the costs of fish recovery appear bearable on average may suggest that recovering some of the costs of fish recovery efforts other than through Bonneville power rates is appropriate.

Second, not everyone is an average consumer. Consumers in some parts of the region must cope with a more severe climate than others; consumers in some areas historically have been more heavily reliant on electricity than others; some consumers have lower income than others. Each of these groups and others are more likely to find an increase in electricity costs more burdensome than the "average consumer."

One obvious example is the direct service industries, most of which are aluminum smelters. The cost of electricity is about 20 to 30 percent of the cost of a pound of aluminum, depending on the efficiency of individual plants and the world price of aluminum. Several of the plants in the region are relatively old and inefficient. Absent adjustments in their power rates, which are tied to the world price of aluminum (the Variable Industrial Rate), they might not operate when world aluminum prices are low. Increases in their cost of power would increase the amount of time that they would not operate. If their rates go up sufficiently, the owners of these plants might cease operations in the Northwest, shifting production to lower cost plants elsewhere in the world. Over the long run, this would reduce the need for new resources and reduce power system costs as a consequence. In the short term, however, it would raise rates, unless the power could be sold elsewhere at comparable rates. Public and regional preference requirements could hamper the ability of Bonneville to make such sales.

To assess the relative impacts on particular industries, the data in Table 3 were developed. The first column shows electricity costs as a percent of value of shipments. The others were based on Council estimates of electricity use and average industrial retail rates, and value of shipments from the Annual Survey of Manufacturers. The estimates were for 1990.

The second column shows an estimate of electricity-employment elasticities developed by Bonneville. These were used in the System Operation Review (SOR) to analyze the impact of rate increases on regional industries. For example, a 1 percent increase in retail electricity rates would lead to a -0.1 percent change in employment in the pulp and paper industry, all other things being equal. The assumption used in the System Operation Review was that output changes would be proportional to employment changes, which is reasonable, given the uncertainty of these estimates. There is not a number for the aluminum industry because Bonneville utilizes a detailed aluminum sector model that evaluates impacts on a plant by plant basis. Changes in output are heavily dependent on the forecast price of aluminum. It is important to note that the System Operation Review Draft Environmental Impact Statement concludes that aluminum output would not be affected under any of the rate impacts associated with System Operation Review alternative system operations. The most extreme rate impact was an increase in direct service industry rates of roughly 20

percent over what would have occurred in the no-action alternative. However, this analysis assumes that two plants in the region have already ceased operation.

The last column shows industry percent of total regional employment. These numbers are quite small even for the major manufacturing industries because manufacturing employment is only 15 percent of total employment. The Council used 1993, the most recent historical year.

Table 3

Industry	Electricity Costs as a % of Value of Shipments	Employment-Electricity Elasticity	Percent of Total Regional Employment
Aluminum	20-30	n.a.	0.2
Pulp and Paper	5	-0.100	0.7
Chemicals	6	-0.025	0.3
Lumber and Wood	1	-0.020	2.6
Food Processing	0.5	-0.010	1.9

While the data in the table are of interest, it is important to recognize that each of the industry categories is not entirely homogeneous. For example, within the category of pulp and paper, a plant that uses electro-mechanical pulping technology may have a higher sensitivity to electricity costs than the sector as a whole. Data was also not available for irrigated agriculture. It is clear, however, that for some irrigated agriculture, power costs are a significant factor.

It is impossible to know with any certainty how much of an increase in power rates would result in any of these industries no longer being competitive. There may also be other consumers who could be similarly affected -- low-income consumers, for example. However the fact that, *on average*, the costs of fish recovery would not appear to be an unbearable burden for consumers in the region might argue for exploring other means of recovering the costs of fish recovery efforts or redistributing the costs of recovery to avoid inordinate burdens on particular consumers. Bonneville and retail utilities, for example, have some ability to establish special rates that are designed to mitigate impacts on specific customer classes if there is an overall benefit to doing so. The effect, of course, is to pass the additional costs on to other, less price-sensitive customers. In Bonneville's case, however, that ability is limited by the competitive alternatives available to its customers.

Repayment of the Treasury and Other Purposes of the Act

The Act requires the Council to assure an adequate, efficient, economical and reliable power system. However, as noted in the introduction, the Council must also determine whether the fish and wildlife program is consistent with the purposes of the Northwest Power Act. Those purposes include encouraging conservation and ensuring that Bonneville customers and consumers pay the full cost of power, including repayment of federal Treasury investments. Bonneville can fulfill neither of these purposes if it cannot recover sufficient revenues to cover its costs. It cannot do so if Bonneville is no longer an economical part of the power supply. The cost of power from the region's hydroelectric system is very low indeed. By itself, it could easily compete with any alternative source of electricity available today. However, Bonneville is faced with recovering all of its costs, including fish recovery costs and repaying debt on the Washington Public

Power Supply System nuclear plants. The latter accounts for roughly a fifth of Bonneville's revenue requirements on a net exchange cost basis.¹⁴ In a competitive market, the degree to which costs can be covered through power sales depends on the difference between a utility's rates the cost of alternative marginal resources. Much of Bonneville's ability to cover non-power costs has been "used up" by the Supply System debt.

Given the resources available, past investments in both power resources and fish recovery measures, the evolving competitive wholesale power market, and the possibility of additional fish recovery costs, it is conceivable that there could be an adequate, efficient, relatively economical and reliable regional power system in which Bonneville could not charge enough for its power to recover its costs. If that were to occur, Bonneville would be unable to make full repayment of its debt to the federal Treasury or carry out its other purposes under the Act. If so, the Council could judge that the fish and wildlife program was not consistent with the purposes of the Act. At the time the Northwest Power Act was passed, this possibility was probably inconceivable.

To evaluate the question of Bonneville's competitiveness, it is important to understand the rapidly evolving nature of the electricity industry. The industry is approaching the point of being fully competitive at the wholesale level. This is the consequence of a number of developments and trends in technology, fuels and electricity policy. The primary technology facilitating wholesale competition is the natural gas-fired combined-cycle combustion turbine. The relatively low capital cost, small scale, efficiency and low pollution aspects of the modern combined cycle combustion turbine have lowered barriers to entry into the generation business. Second, current low gas prices and the generally accepted expectation of continued low prices for some time to come have combined with the characteristics of the gas turbine to make it possible for power from new generation to be produced at rates that are significantly lower than those of the best generating technologies of ten or even five years ago.

For more than 15 years, national, regional and state policy has been to promote competition in the generation of power. The Public Utility Regulatory Policies Act of 1978 contained provisions expressly designed to encourage the entry of non-utility generators into the power supply business.¹⁵ State regulatory policies and the Council's plan have encouraged the use of competitive bidding.¹⁶ Finally, the National Energy Policy Act of 1992 further encouraged competition in generation. It created a class of "exempt wholesale generators" that are not subject to the requirements of the Public Utility Holding Company Act and it allows the Federal Energy Regulatory Commission (FERC) to require that the owners of transmission provide open access to their transmission to other power suppliers.¹⁷ The transmission provisions of the National Energy Policy Act apply to Bonneville with some special conditions. The effect is to make it easier for non-utility entities to participate in the generation business and to prevent the owners of transmission, like Bonneville, from denying market access to potential wholesale competitors.

Bonneville's customers are, with the exception of the direct service industries, utility wholesale customers. In the new utility environment, those customers now have choices. Utility solicitations for bids for new power supply typically elicit responses that total many times the bid amount.¹⁸ These bids come from independent power producers, brokers, power marketers and other utilities. The resulting competition typically drives the costs of the bids down. Even the direct service industries, although not wholesale

¹⁴ Net of the effects of the residential exchange provisions of the Act.

¹⁵ Public Utility Regulatory Policies Act of 1978, Pub. L. 95-617, Nov. 9, 1978, 16 U.S.C. 2601.

¹⁶ See, for example, *1991 Northwest Conservation and Electric Power Plan, Vol. II, Part II*, pp. 893-900.

¹⁷ National Energy Policy Act of 1992, Pub. L. 102-486, Oct. 24, 1992, 42 U.S.C. 13201.

¹⁸ See, for example, "Snohomish RFP Elicits 47 Proposals Totalling 7943 MW, Mostly CTs," *Clearing Up*, No. 623, May 23, 1994, p. 2; "Regional Utilities Select 1300 aMW through Bidding Solicitation," *Clearing Up*, No. 622, May 16, 1994, p.4; and "Clark Public Utilities Selects Cogentrix to Build 248 MW CT," *Clearing Up*, No. 644, Oct 17, 1994, p.2.

customers of Bonneville, have choices. If Bonneville were to deny the direct service industries access to its transmission system, these industries can, if necessary, be served by power from combustion turbines located on the industries' sites.

As a consequence of the choices available to Bonneville's customers, Bonneville is limited in the cost it can recover in its rates. If those costs become too high or if there is the perception that those costs are going to become too high, customers can choose other suppliers. The recent decision of the Clark County Public Utilities to go forward with a large combustion turbine project is evidence of that. Even though Bonneville's current and projected rates are probably less than the cost of power from a combustion turbine, Clark's perception of Bonneville's possible future rates and the risks of total reliance on Bonneville was such that it chose to go ahead with the project.

If customers, like Clark, take load off of Bonneville, Bonneville's costs must either be recovered from a smaller base of customers, causing their rates to rise and encouraging them to seek alternative suppliers, or the costs must be recovered from the sale of the surplus to other customers, either in the Northwest or elsewhere. Bonneville's ability to make such sales on a long term basis is somewhat restricted by the call-back provisions protecting public and regional preference established in federal law. But even without such restrictions, Bonneville would be selling into a competitive market. Just as its ability to sell to its existing customers is limited by the customers' competitive choices, Bonneville's ability to sell to others would be limited by the same choices. Bonneville cannot charge more than market prices for its products. If those prices are not sufficient to recover all its costs, its only recourse is the U.S. Treasury -- in effect, Bonneville's stock holder. Sustained failure to make timely payment of Bonneville's treasury debt would clearly violate one of the purposes of the Act.

Analysis

To assess the likelihood that Bonneville's rates could become uncompetitive, the Council analyzed Bonneville's future revenue requirements with alternative fish recovery actions compared to the cost of alternative power supplies. For this analysis it was assumed that fish recovery costs could be recovered through Bonneville rates. The analysis was done on the basis of Bonneville's current electricity sales. If Bonneville successfully implements tiered rates, tier two sales will compete directly in the marginal power markets. Tier one, however, will serve existing demands and will not grow over time. It is these tier one sales that will be expected to recover the costs of Bonneville's current debts and resources, as well as the costs of additional fish and wildlife mitigation for the hydroelectric system. The central question of the analysis is whether Bonneville's tier one costs can be recovered through power sales revenues.

The costs of Bonneville supplied power are estimated in a simple revenue requirements model. Bonneville's current revenue requirements serve as the starting point. Over time the cost of Bonneville's existing revenue requirements are assumed to decline in real terms by 1.5 percent per year. This reflects an assumption that about 50 percent of Bonneville's revenue requirements are fixed debt repayments that are relatively constant in nominal terms and therefore could decline in real terms at the rate of inflation. At 3.5 percent inflation, this would imply a 1.8 percent nominal increase per year in total existing Bonneville revenue requirements. Assuming 1.5 percent allows for some real cost increases in Bonneville's system aside from fish and wildlife costs, which are examined separately in the analysis.

Total revenue requirements are calculated by adding to the base system costs annual fish and wildlife costs in addition to the Council's Strategy for Salmon for each of the various options being considered. In addition, when existing tier one resources need to be replaced, the cost of new generating and conservation resources are added to the revenue requirements. It is assumed that Bonneville would pay half of the conservation costs, the rest being paid by conservation participants. It is assumed that Bonneville will

succeed in building up a financial reserve of about \$500 million by the year 2003, with about 60 percent of these reserves rebuilt during 1996 and 1997.

The average rate for Bonneville power sales to both utilities and direct service customers is calculated by first crediting other types of revenues, such as from non-firm sales and transmission charges, and then spreading the remaining revenue requirement over firm power sales. In the base case, with no additional fish and wildlife costs, Bonneville rates are predicted to decrease, in real terms, at about 1.9 percent a year between 1993 and 2015. With 3.5 percent inflation, this would be consistent with a nominal escalation rate of about 1.5 percent a year. This is similar to the average nominal escalation experienced in Bonneville priority firm rates over the last 10 years. Bonneville is in the process of unbundling its products and services. It may be that Bonneville can recover somewhat greater revenues in the sale of unbundled products (e.g., shaping, load following, reserves) than it can from the currently bundled product. This analysis assumes that is not the case. As such, it may somewhat underestimate Bonneville's ability to absorb additional costs.

Additional fish and wildlife costs were estimated based on specific actions included in a selection of the Council's options as presented in Section 5 of the draft fish and wildlife program amendments (Council Document 94-48). The selected scenarios under options 1, 2, and 3 include a variety of actions such as lower Snake reservoir drawdowns to spillway and natural river, and new storage dams on the upper Snake. Costs are estimated separately for capital expenditures, lost hydropower replacement costs and other annual costs. With the exception of the Detailed Fish Operations Plan, these options span the full range of fish and wildlife costs.

Capital costs are generally based on Corps of Engineers' estimates contained in the System Configuration Study. However, the Corps' construction schedules have not been strictly adhered to in the Council's options. Capital costs are allocated to years, and each year's expenditures are assumed to be financed at an interest rate of 7 percent over a 50-year period.

Hydro system firm energy losses and the cost of replacement were estimated using the System Analysis Model (SAM). Critical period analysis is used to estimate loss of firm hydro energy. SAM simulates the operation of the hydro-electric system over the historic critical water conditions between 1929 and 1932. The model attempts to shape water throughout each year to minimize the need for non-hydro generation, while maintaining non-power requirements (such as fish flows, flood control, etc.). The analysis assumed that purchases from the Southwest or Canada could be made in amounts up to 1,500 megawatts for the months of January through April. Estimated losses of annual firm hydro energy are replaced with gas-fired combined-cycle combustion turbines. Under the simulated operation, the replacement combustion turbines operate only about half the time, being displaced by non-firm hydro energy the other half.

Other annual costs for fish and wildlife actions were gathered by Council staff from various sources. These costs include such items as Bonneville fish and wildlife staff and project management, annual operations costs for expanded transportation operations, cost of evaluations, and water leasing and marketing costs.

The initial rate impacts of fish recovery actions are moderated by an assumed demand response to the electricity rate increases. It is assumed that a 10-percent rate increase will decrease electricity demand by 2.8 percent. This demand response is a weighted average of a 5-percent reduction by the direct service industries and a 2-percent reduction by other customers. The demand reductions create a surplus of tier one electricity, which is assumed to be sold for 25 mills per kilowatt-hour. Both of these assumptions are highly uncertain. If the demand response were smaller or the resale rate lower, the rate impacts of fish recovery actions would increase. These demand responses are not intended to predict Bonneville customer decisions to

seek alternative sources of power. They are only meant to represent traditional end-user response to price increases.

The rates implied for Bonneville customers as a result of the factors discussed above are compared to the cost of power from a combined-cycle combustion turbine assumed to be built in 1997. The levelized cost of the combustion turbine, in real 1993 dollars, is estimated to be 29 mills per kilowatt-hour under medium gas price escalation assumptions. However, the levelized cost of the combustion turbine is very sensitive to the assumed escalation of gas prices, varying from 21 to 37 mills. Table 4 shows gas price escalation assumptions and the resulting levelized costs for the combustion turbine.

**Table 4
Natural Gas and Stand-Alone CCCT Costs**

Gas Scenario	Real Wellhead Price Escalation percent/year	Real Variable Fuel Cost Escalation percent/year	Levelized Cost of CCCT (1993 mills/Kwh)	Real Escalation of CCCT Costs percent/year
Low	-0.9	-1.1	20.7	-1.3
Medium Low	0.7	1.3	25.1	0.0
Medium	1.9	2.7	28.9	1.0
Medium High	2.7	3.7	32.3	1.7
High	3.6	4.7	36.9	2.6

The costs of the power from combustion turbines needs to be adjusted to make it comparable to power purchased from Bonneville. This is because the Bonneville rate estimates include implicitly the cost of integration services such as shaping, load following, reserves and transmission. It is difficult to estimate the value of these additional products, but the Council has assumed in this analysis that such costs may range from 3 to 7 mills per kilowatt-hour. The lower end of this range is based on staff estimates of the cost of a recent utility contract for integration services. The upper end is based on an analysis of Bonneville’s system cost adjustments included in its billing credits program.

Table 5 shows the cost of a combustion turbine integrated into the power system at various gas prices and system integration cost assumptions. The cost of power from a combustion turbine in 1998 varies from 27 to 34 mills, but the lower system integration costs may be more realistic in the near term.

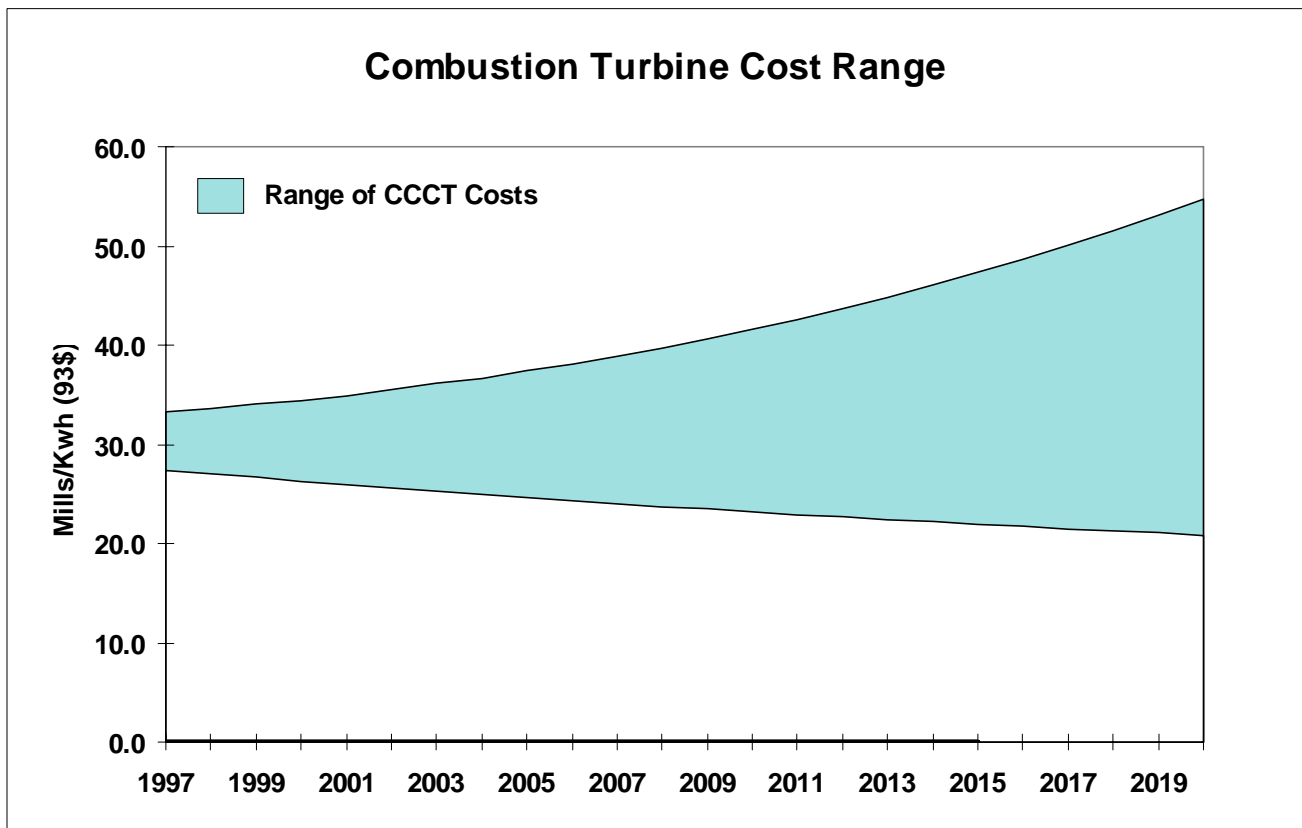
The cost estimates in Table 5 compare well with recent bids received by utilities. Bonneville staff compiled a list of such potential competitors and found average costs in 1998 of 28 mills. The projects costs varied from 22 to 33 mills in 1993 dollars. Bonneville’s study also showed that utilities are being offered system sales, which typically include system integration services, at costs averaging 31 mills for 1998 delivery. The system sales and combustion turbine costs are typically either tied to gas prices or escalated in various patterns that average about 4 percent a year in nominal terms, or about 0.5 percent a year in real terms with 3.5 percent general inflation expectations.

Table 5
Integrated CCCT Costs
 (Mills per Kilowatt-Hour in 1993 Dollars)

Gas Scenario	System Integration Cost	1998 CCCT Cost	2015 CCCT Cost	1998-15 Escalation Rate	Levelized Cost of CCCT
Low	3	27	22	-1.2	24
Medium Low	4	29	29	0.0	29
Medium	5	31	35	0.7	33
Medium High	6	33	40	1.1	37
High	7	34	46	1.8	40

The resulting range of costs for power over time from the combustion turbine are shown in Figure 4.

Figure 4



In Figure 5, the price of Bonneville electricity has been overlaid on the range of combustion turbine power costs. Instead of a shaded area, as shown on Figure 4, the combustion turbine costs are shown as solid lines for each of the five gas price assumptions. The price of Bonneville electricity is shown for a Strategy for Salmon base case and for a range of options. The options include those called Option 1 through 3 in the draft amendments. The reader is referred to the appendix of the draft amendments for a description of the

options. However, the cost estimates for the options have been revised in response to public comment and additional information solicited since the draft amendment analysis was done.

The net effect on electricity rates relative to the base case varies from a 2.8 percent increase in *average rates* over the 1994 to 2015 period for option 1b to a 16.7 percent increase for option 2b. The effects on rates in 2015 range from a 3.8 per cent increase over the base case to a 25.3 percent increase. This analysis assumes that Bonneville could successfully recover the fish program cost through rates. As subsequent discussion will illustrate, this may not be the case.

Figure 5

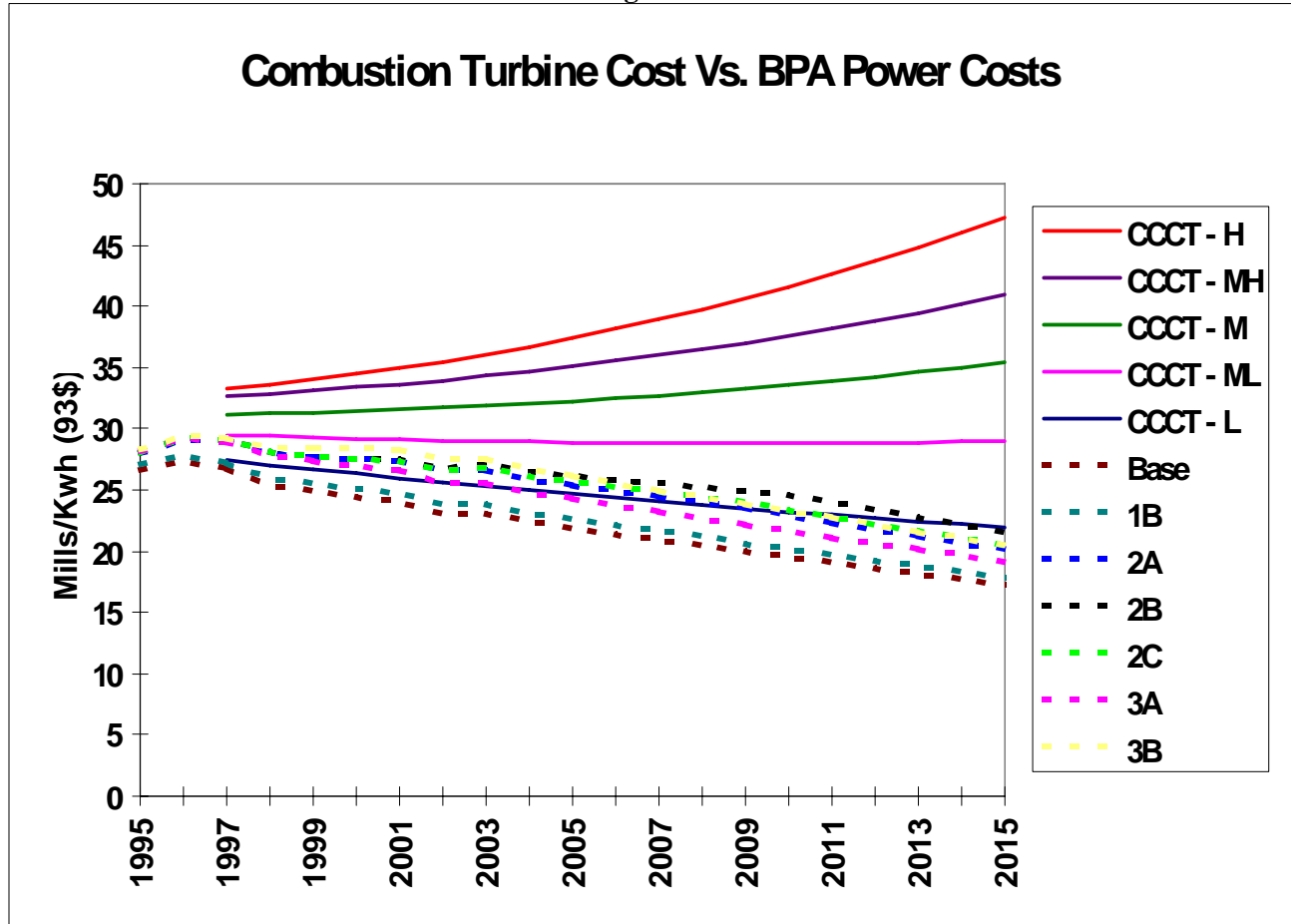


Table 6 shows the levelized costs of the options in three components and in total. Clearly, for all of the scenarios under options 2 and 3, capital costs are the largest component of fish and wildlife costs. The capital costs are dominated by requirements for dam modifications to accomplish drawdowns, or in the case of 3c, to add additional storage reservoirs in the upper Snake. The capital and “other” costs have been allocated to Bonneville. Seventy percent of the energy replacement costs have been allocated to Bonneville. The remaining 30 percent of the energy replacement costs would be incurred by the owners of non-federal projects, primarily those on the mid-Columbia. Most of the cost variation among the scenarios is due to variations in the capital costs.

Table 6

Levelized Cost of Fish and Wildlife Options
(Millions of 1993 Dollars)

Option	Capital Costs	Energy Replacement Costs	Other Annual Costs	Total Costs
1b	5	18	36	58
2a	148	67	52	266
2b	197	73	52	322
2c	168	68	49	285
3a	80	69	50	199
3b	178	87	50	315

Based on analysis and consultation on several alternative options, including those in Figure 5 and Table 6, the Council has focused on a modified set of mainstem actions. These actions are named Alternative A through D. Which of the alternatives are ultimately pursued depends on decisions made in the future after evaluating additional research and testing. The costs and rate effects of Alternatives A through D are presented below. In addition, the costs of only those actions pursued immediately in 1995 are evaluated over time. This case is referred to as 1995.

Table 7 shows the levelized cost components in millions of 1993 dollars. The increased annual revenue requirements would range from \$89 million in the 1995-actions-only case to \$225 million for Alternative B. Table 7 also shows various wholesale and retail rate impacts and effects on public utility residential customer bills.

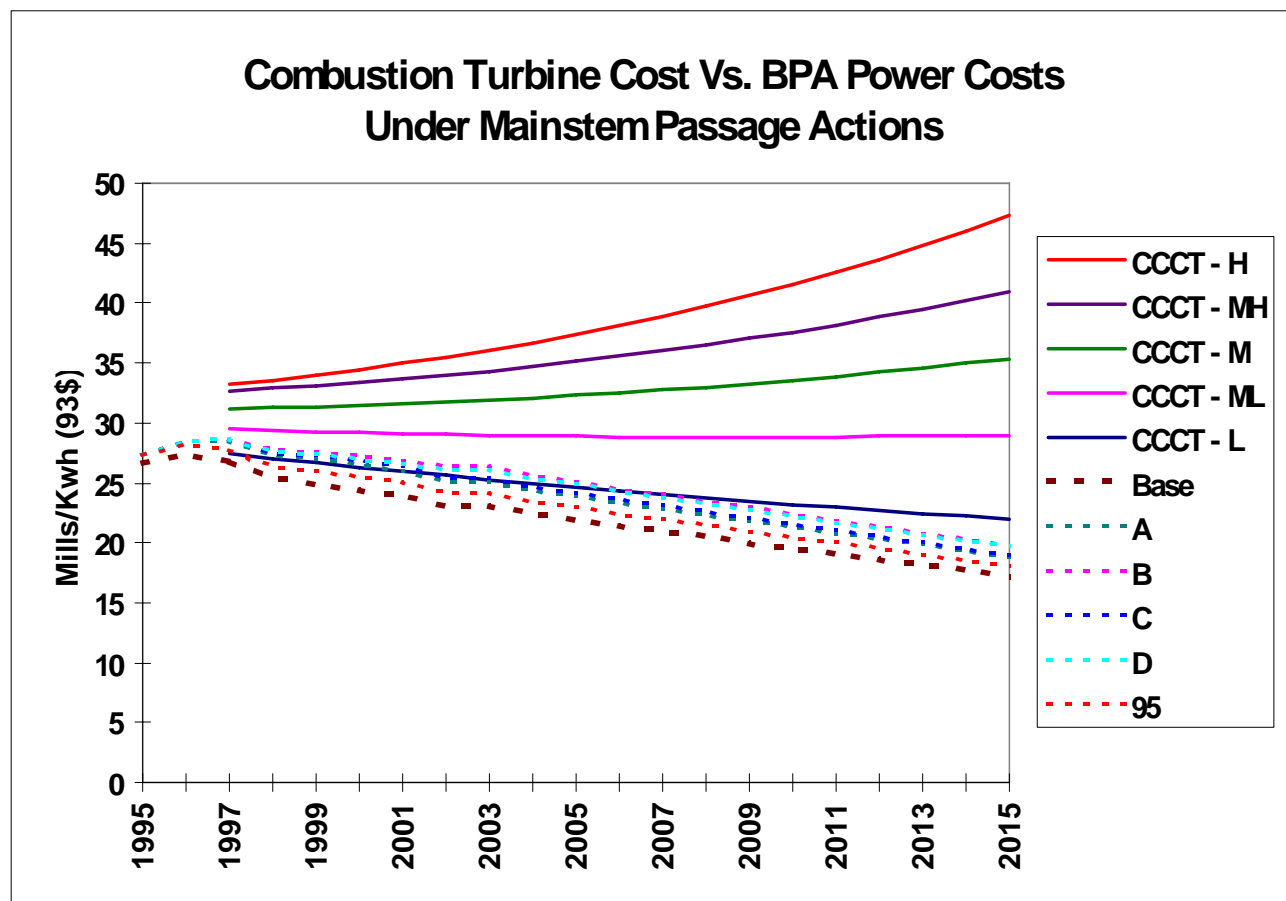
Table 7
Cost and Rate Impact Summary For Mainstem Passage Actions

	1995	A	<u>Alternative</u> B	C	D
Levelized Costs (Million 93\$)					
Total	89	151	225	170	209
Capital	17	61	108	81	89
Energy	53	69	95	67	99
Other	21	21	21	21	21
Wholesale BPA Rate Impacts					
Average % Impact	3.7	7.2	11.1	8.1	10.3
1997 % Impact	3.3	5.9	6.6	6.2	6.3
2015 % Impact	4.7	9.0	14.6	10.0	13.8
Retail Public Utility Rate Impacts					
Average % Impact	2.5	4.8	7.4	5.4	6.9
Increase in Typical Annual Bill	\$15	\$29	\$45	\$33	\$41
1997 % Impact	2.2	4.0	4.4	4.2	4.2
Increase in Typical 1997 Bill	\$13	\$24	\$27	\$25	\$25
2015 % Impact	3.1	6.0	9.8	6.7	9.2
Increase in Typical 2015 Bill	\$19	\$36	\$59	\$40	\$55

The average increase in rates for the mainstem passage alternatives compared to the Strategy for Salmon base case vary from 3.7 percent in 1995 to 11.1 percent in Alternative B. These percent increases over the base case should not be confused with average annual growth rates. Their meaning is that in a typical future year, Bonneville tier one costs would be, in the case of B for example, 11.1 percent higher than they would have been under the Strategy for Salmon. The near-term rate impacts for 1997 are about 6 to 7 percent in Alternatives A through D. By 2015, these impacts vary from 9 to 15 percent. Retail rate impacts for residential customers of public utilities that rely on Bonneville power would be about two-thirds of the wholesale rate impacts. The increases would imply annual electric bills that are between \$30 and \$45 higher than those expected under the Strategy for Salmon.

Figure 6 illustrates Bonneville tier one costs under the mainstem passage alternatives compared to combined-cycle combustion turbine costs under different gas price escalation assumptions.

Figure 6



Figures 5 and 6, on the surface, indicate that there is a good chance that Bonneville could cover the expected range of possible fish recovery costs and still compete well with alternative sources of electricity supply. However, such an interpretation may be too complacent. There is uncertainty in the Council’s analysis. For example, the rate model used here is relatively simple and may not fully capture all the factors affecting Bonneville’s costs and rates.

In addition, there is a great deal of uncertainty surrounding gas prices. Over the past several months, Council staff have repeatedly reduced their gas price forecast in the face of evidence and opinion that gas prices were low and were likely to stay low. If natural gas prices escalate at a rate near the low end of the forecast range, Bonneville tier one power will not be a clear winner. Not included in the above analysis, is the fact that Bonneville power costs will also be increased by low gas prices due to reduced secondary power sales revenues.

Most significantly, the change to competitive power markets needs to be the frame of reference for decisions about the ability of Bonneville to recover costs and support fish recovery measures. Because of the nature of customer’s expectations, the flexibility of competitors’ actions, and the unknown future cost of competing supplies, Bonneville, more than ever, will need to develop the flexibility to compete in a market.

Currently, Bonneville’s customers perceive that there are alternative supplies available at competitive prices. Their expectations are, as evidenced in the offers they are receiving, that natural gas prices can

maintained at low levels. For many, the expectations for Bonneville costs are for ever-increasing and uncontrollable fish recovery costs as well as other risks -- repayment "reform" that could alter the terms of Bonneville's treasury repayments and risks associated with the operation of the Washington Public Power Supply System nuclear plant. In the face of these expectations, some of Bonneville's customers are already seeking to diversify their sources of power. At least one, Clark County Public Utilities, has acted to significantly reduce its dependency on Bonneville. In a world where uncertainty is large, some diversification may make sense even when simple calculations seem reassuring.

Bonneville has approached the question of how much additional cost it could take on and remain competitive from a slightly different direction.¹⁹ Bonneville gathered the available information (quantity, cost, characteristics) about specific competitive offers to their customers and others. This information was gleaned from contacts with the customers, public information on responses to solicitations, suppliers and others. Based on this information and their knowledge of their customers, Bonneville estimated the customer response to increases in their rates. These estimates were not based on any explicit analytical model, but on the collective judgments of their account executives, segment managers, marketing staff and others. The results suggest that for a rate increase of 10 percent now, they would realize significantly less than a 10-percent increase in revenues as a few customers chose to put some of their loads on competitors. An additional 10-percent increase in rates (20 percent total) resulted in no increase in revenues, as more customers chose alternative supplies. Any further increase in rates resulted in loss of revenue. As with Council staff's analysis, there was a wide band of uncertainty.

Some might argue that Bonneville's perspective on this question is biased toward a limited capability to absorb additional fish and wildlife costs. Council staff's analysis indicates that in the early years, an immediate 10-percent increase in Bonneville's rates would put it in competition with combined-cycle combustion turbines with gas prices at the medium-low forecast. An immediate 20-percent increase would correspond to the medium gas price forecast. On a long-term basis, Bonneville's rates would look much better. Still, the Council believes it is reasonable to expect some of Bonneville's customers to diversify their power supply away from Bonneville if confronted with those kinds of competitive choices.

Bonneville's ability to recover the costs of fish recovery is almost certain to vary depending on the uncertainties discussed above. In addition, it is likely to vary with seasons of the year and time of day, as the value of electricity changes. The addition of more fixed cost on Bonneville's system will seriously reduce its ability to compete flexibly in the electricity market.

There are likely to be conditions under which Bonneville can generate significant revenues to contribute toward non-power costs, e.g., years with good water conditions and high export demands or perhaps years in which higher than anticipated gas prices allow Bonneville to capture a higher margin on its sales. There may also be conditions in which, if burdened by large fixed costs, Bonneville cannot compete successfully enough to even cover its current fixed costs. The new electricity market calls for new approaches to recovering costs of non-power objectives such as the fish recovery efforts.

Conclusion on Economical Power Supply and Other Purposes of the Act

It is unlikely that additional fish recovery costs in the range being considered would result in a Northwest power system that is un-economical in relation to the power systems in other parts of the country. It is, however, entirely possible that the kinds of cost increases involved could constitute a burden for specific consumers and relatively electricity-intensive industries. It is not possible for the Council to identify a particular level at which the burden becomes too great. A likely response to increased power costs for at

¹⁹ *Competition and BPA's Sustainable Revenues*, Bonneville Power Administration, Market Research, Nov.21, 1994.

least some major industrial consumers would be to turn to alternative sources of supply not subject to fish recovery costs.

The more immediate concern is that fish recovery costs might seriously reduce Bonneville's ability to compete in the increasingly competitive wholesale power market. Because Bonneville's customers now have competitive choices, they can abandon Bonneville if Bonneville's costs become too high. The effect would be to preclude Bonneville from making timely payment of its debt to the federal treasury -- one of the purposes of the Power Act. The Council's analysis indicates some limited ability to absorb additional fish recovery costs. That ability probably improves with time as Bonneville's existing fixed costs decline in real dollar terms. How great that ability is, however, is subject to considerable uncertainty. To ensure Bonneville's ability to carry out the purposes of the Power Act, the Council should encourage cost-sharing to minimize the additional fish recovery costs that are placed on Bonneville, particularly in the near term. The variability inherent in Bonneville's revenues also suggests that there may be some years when Bonneville's revenues are such that it could contribute "excess" revenues to support fish recovery measures. This would be contingent on Bonneville having reserves sufficient for prudent utility operations.

Although the analysis in this section has focused on long-term costs, Bonneville's ability to repay the federal Treasury can be threatened by short-term and long-term decisions. If Bonneville encountered a reliability problem due to emergency circumstances described earlier in this paper, it might have to make additional short-term purchases to maintain service to firm loads. Prices in such a market would be expected to rise above normal levels, and purchases could strain Bonneville's financial reserves. The Council understands that in making such purchase decisions, Bonneville will consider its financial situation (e.g., financial reserves and its ability to make Treasury repayments), and its obligations under the Endangered Species Act, the Northwest Power Act and other laws.

Mitigating the Impact on the Economics of Bonneville's Power Supply

If the Bonneville Power Administration were a private utility facing the degree of competition Bonneville now faces, it would take several steps to improve its competitive position. One of the more important of these is that it would write down its investment in uneconomic resources. This would cause significant short-term problems for the utility's shareholders, but would ensure the competitiveness of the utility in the long run. Much of Bonneville's investments in the Washington Public Power Supply System are such investments. Supply System debt constitutes about 45 percent of Bonneville's debt and interest costs and roughly a fifth of its net revenue requirement. If part of these costs could be written down, the cost of the fish recovery measures would still be a significant issue, but there would be no question whether those costs could be accommodated while maintaining an economical power supply. However, because Bonneville has no stockholders other than the federal taxpayer, writing down this investment does not appear to be an option.

Although writing down existing uneconomic debt does not seem an option, the fact that the projects that make up the federal Columbia River Power System are multiple purpose projects suggests other means of recovering some of the costs of fish recovery measures. One is to seek federal appropriations or other sources of funding for fish recovery measures. A second is to share as much of the cost of fish and wildlife costs as are attributable to the non-power uses of the Columbia River system as allowed under Section 4(h)(10)(c) of the Act.

A third approach would recognize the parallel between Bonneville's situation with fish recovery costs and uneconomic investment in generation and so-called "stranded investment" and consider the recovery of fish recovery costs through a charge for the use of Bonneville's transmission system.²⁰

Federal Appropriations

The recovery of salmon in the Columbia River System is an effort at environmental restoration of unprecedented proportions. The Council should explore with Congress the possibility of federal appropriations or other funding mechanisms for part of the costs.

Section 4(h)(10)(C)

Section 4(h)(10)(C) of the Act provides:

The amounts expended by the Administrator for each activity pursuant to this subsection shall be allocated as appropriate by the Administrator, in consultation with the Corps of Engineers and the Water and Power Resources Service, 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 of the Federal Columbia River Power System.

Earlier this year, on a one-time basis, the federal government concluded that Bonneville could recoup replacement power costs and other costs of carrying out the Council's fish and wildlife program, but could not recoup the value of lost power revenues. The method of recoupment was to reduce Bonneville's repayment to the U. S. Treasury. Under this approach, Bonneville's ability to repay the Treasury would be determined after the Treasury repayment obligation is reduced to account for a portion of fish and wildlife program implementation costs.

Recovering Costs through a Transmission Charge

In jurisdictions where retail competition is being considered, a transmission or "wires charge" is being considered to allow utilities to recover at least part of the costs of otherwise stranded investments through a charge for the use of the utilities' transmission and distribution systems.²¹ Much of the policy discussion surrounding electric utility deregulation has to do with stranded investment.²² The Federal Energy Regulatory Commission recently issued a notice of proposed rulemaking on stranded investment involving wholesale as well as retail transactions.²³ A recent decision by the Circuit Court for the District of Columbia appears to restrict the treatment of stranded investment.²⁴ The issue, however, is far from resolved.

Fish recovery costs and/or supply system debt can be thought of as analogous to stranded investment. Fish recovery costs, in effect, represent the internalization of environmental damages caused by the past investment in the hydroelectric system. As a result of the competitive environment that exists today, the beneficiaries of those past investments, Bonneville's customers, may be able to strand the fish recovery

²⁰ "Stranded investment" refers to past utility investment that can not be recovered in power rates because of competitive pressures.

²¹ California Public Utilities Commission Order Instituting Rulemaking and Order Instituting Investigation: On the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry, Docket No. R.94-04-031, April 20, 1994.

²² For example, see Pierce, Richard, "The Advantages of De-Integrating the Electricity Industry," *The Electricity Journal*, November, 1994, p. 20; and *Public Utilities Fortnightly*, Nov 15, 1994, pp. 6 - 7 and pp. 16 - 18; for just a few recent examples of the debate on stranded investment.

²³ Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 59 Fed. Reg. 35274, July 11, 1994.

²⁴ *Cajun Electric Power Coop. v. FERC*, 28 F. 3d 173, D.C. Cir. 1994

costs by leaving the system. Similarly, the Supply System costs were incurred by Bonneville for the benefit of a large number of utilities. Today's competitive market may enable these utilities to strand this investment.

Bonneville controls about 80 percent of the transmission in the region as well as large parts of the intertie. If fish recovery and/or Supply System costs were allocated to transmission, it would lessen, but not eliminate, the ability of customers to avoid fish recovery costs by turning to alternative suppliers.

This would be a very difficult and contentious issue. It could result in costs falling heavily on particular utilities that currently participate in the transmission market. It would also not preclude avoidance of fish recovery or Supply System costs by using other transmission providers and by siting alternative supplies to avoid use of Bonneville's transmission system. The extent to which this kind of cost allocation to transmission would be consistent with Federal Energy Regulatory Commission regulation is unclear.

Conclusion

The Council should actively pursue all means for paying for fish recovery measures in addition to using Bonneville power rates.

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Appendix D

STAFF ANALYSIS OF BIOLOGICAL BENEFITS OF MAINSTEM PASSAGE ACTIONS

During the course of this amendment proceeding, the Northwest Power Planning Council has examined the biological, economic and hydroelectric impacts of a wide range of options to enhance the biological status of Snake River salmon populations specifically and all Columbia Basin salmonid populations in general. Each of the options was analyzed extensively by Council staff. These deliberations culminated with the Council adopting a set of amendments to its Fish and Wildlife Program at its meeting in Portland, Oregon on December 13-15, 1994.

This report provides the results of the biological analysis of the adopted actions. The package was termed Option 7 during the amendment process. Option 7 is very similar to the Council's previous Alternative 6. The Council received the results of the analysis of Alternative 6 prior to its December 6, 1994 meeting and the analysis of Option 7 was provided prior to the Council's meeting on December 13, 1994.

The analysis has been confined to the biological impacts of the actions on Snake River spring chinook. Because of their close biological similarities, the results would also be applicable to Snake River summer chinook as well. For this analysis, Snake River spring chinook were treated as a single population above Lower Granite Dam

Description of the action

The Council's adopted rule calls for shorter and longer-term flow, velocity and bypass measures coupled with an evaluation comparing transportation and in-river passage. The evaluation is intended to guide future decisions by the Council regarding the different alternatives. The sequence of actions analyzed is shown in Figure 1. Briefly, however, the analysis consists of the following actions:

1. 1995 Actions

- a. Lower Granite drawdown to elevation 710. This action will disable the existing juvenile bypass, but adult passage can be provided with minor modifications. Transportation is eliminated from this project and spill is provided as bypass.
- b. Transportation is reduced to a single project, in this case, Little Goose. Collection from Lower Monumental and McNary is eliminated. Transportation is assumed to be in an evaluation mode and would only operate from a single collector project.
- c. Spill except at the collector project for up to 80-percent fish passage efficiency constrained by state water quality guidelines.
- d. Additional flow as described in Figure 1.

2. 1996 and 1997 Actions

- a. John Day Pool at minimum operating level.
- b. Lower Granite to near spillway (1996)
- c. Additional flow as in Figure 1.

3. 1999 (Alternative A) Actions

- a. Little Goose lowered to near spillway. Bypass is enhanced at Lower Granite through the addition of a surface bypass system with an effective fish guidance efficiency of 70 percent.
- b. Transportation is confined to Lower Monumental Dam.

4. 2002 Actions

a. Alternative B

- i. Lower Monumental and Ice Harbor drawn down to spillway.
- ii. John Day drawn down to spillway. Surface bypass system installed with effective fish guidance efficiency of 70 percent.
- iii. No transportation; spill at all projects.

b. Alternative C

- i. Lower Monumental and Ice Harbor drawn down to spillway.
- ii. No transportation; spill at all projects.

c. Alternative D

- i. Lower Monumental and Ice Harbor at minimum operating pool.
- ii. John Day drawn down to spillway. Surface bypass system installed with effective fish guidance efficiency of 70 percent.
- iii. Transportation from Lower Monumental.
- iv. Spill at all projects except Lower Monumental.

Management for the evaluation of transportation benefits is to be determined by the National Marine Fisheries Service, with management of additional transportation in any year to be determined by the fishery management agencies. The above specifications assume a certain configuration of transportation for the purposes of the analysis, but should not be regarded as necessarily reflecting how the management agencies might elect to manage transportation.

Alternatives A through D are the end points that depend on Council decisions to be made in 2002 (Figure 1). These decisions should benefit from additional evaluations called for by the Council, especially an evaluation of the relative benefits of transportation and inriver passage. The Council's action included all four alternatives with the final path to be determined in the future.

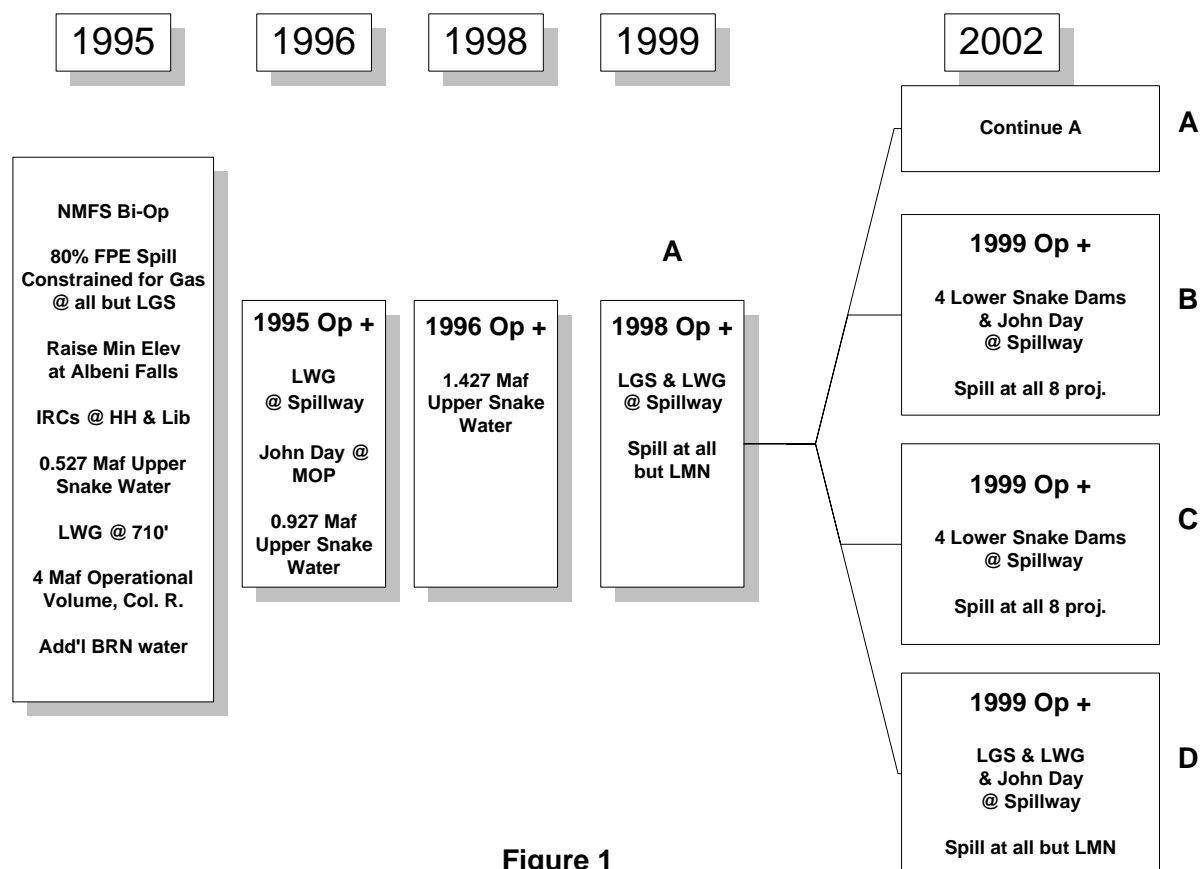


Figure 1

Description of the analysis

Three different analytical tools were used for this analysis. The System Analysis Model was used to examine the hydrological impacts of the option. This analysis was based on the historical runoff in the Columbia River basin for the years 1929-1978. The result was an array of 50 flows in the Snake and Columbia that reflect the different boxes in Figure 1. These were analyzed using the Passage Analysis Model to estimate the resulting downstream passage survival for each box in Figure 1. The System Planning Model was then used to combine these passage survival rates with other assumptions concerning the salmonid life cycle to produce a simulation of the run into the future reflecting the different paths in Figure 1.

The four possible alternatives, A, B, C, or D, were examined using three different sets of assumptions related to juvenile mainstem passage. These are:

- a. A Sims/Ossiander-based model assuming a moderate level of transportation benefits. The transportation benefits are based on the point estimates of benefits from the National Marine Fisheries Service transportation evaluation studies in 1986 and 1989 (Transportation Benefit Ratio equals 1.6:1 and 2.4:1 respectively).
- b. A similar Sims/Ossiander model using the lower end of the confidence limits for transportation in 1986 of 1.01:1.

These two passage options are similar to those used by the Council staff in the past and are consistent with the analytical work being done by the fishery managers. The result of these assumptions is that juvenile mainstem passage survival rate is a major factor limiting upriver spring chinook populations.

- c. A model that assumes that mortality caused by the hydroelectric system is relatively low (HiSurv). This model is similar to that advocated by the Columbia River Alliance and some utility groups. Survival in Lower Granite and Little Goose pools reflects preliminary estimates of survival in Lower Granite and Little Goose reservoirs made by the National Marine Fisheries Service (Skalski and Iwamoto) in 1993 and 1994. Survival in the other pools is derived from the assumption of an 80-percent transportation survival rate (Darryll Olsen, Columbia River Alliance, personal communication) and the transport benefit ratios observed by the National Marine Fisheries Service in 1986 and 1989. The result of this assumption is that juvenile mainstem passage survival rate is not a major factor limiting upriver spring chinook populations. This assumption set is termed HiSurv in the charts.

These options have been used by the Council staff in recent analyses and are documented in the attachment. The intent is to bracket the range of uncertainty in key passage assumptions and to illustrate the implications of different assumptions.

To properly interpret the results of this analysis, it is important to understand that these different passage assumption sets were assumed in the base period and in the simulations of future conditions. For example, if the HiSurv assumption was used, it was assumed to be operating during the base period as well as into the future. Thus, these assumption sets are not different alternatives but are different underlying models of how the system works. The different alternatives to modify the system in the future are overlain on these assumptions.

This analysis did not explicitly treat any potential negative impacts of spill in the sense that there is no explicit mechanism in the analysis linking a level of spill to a level of survival. However, this is not to say that negative spill impacts were not considered. The spill levels used were termed "constrained spill" and are based on empirical observation of dissolved gas levels that occurred in the Columbia and Snake rivers in 1994 during periods of high spill. These observations were used to arrive at an approximation of spill conditions that maintained dissolved gas below a threshold of 120-percent gas saturation level. This provided a relatively high level of fish passage effectiveness, but usually less than the 80-percent level advocated by some fishery management agencies.

In addition to the juvenile passage alternatives, we have included potential impacts of other actions in the program. These include changes in adult passage, pre-spawning survival and tributary survival (egg-smolt stage). Unfortunately, it is not possible to quantitatively link actions to survival in these areas as we do for juvenile passage. In addition, many of these actions affect particular subbasins and populations and not necessarily the population above Lower Granite as a whole. As a result, plausible estimates were used to illustrate the impacts of changes in these survival areas, but they do not represent quantitative estimates of the impacts of specific measures.

The assumption about adult passage is based on observed change in between-dam survival rates that have occurred over the last several years. Relative to the 1975 - 1993 time period, the average adult survival rates provided by the fishery managers for the last ten years (84-93) have shown appreciable improvement (see table below). Without speculating as to the cause of these improvements, we chose adult survival rates into the future from this array of recent passage rates rather than from the 20-year record. This represents an average increase in adult passage survival for survival from below Bonneville to above Lower Granite of 13.6 percent relative to the entire period (1975-1993).

Adult Passage Survival Rates

Period	BON-MCN	IHR-LRG	Total
1975-1993 Average	0.693	0.826	0.572
1984-1993 Average	0.772	0.842	0.650
Percentage improvement	11.5 percent	1.9 percent	13.6 percent

Pre-spawning survival (survival of adults from Lower Granite to the spawning grounds) and tributary (egg-smolt) survival improvements were based on changes suggested by the National Marine Fisheries Service as part of the 1994 biological opinion analysis. Changes in pre-spawning survival were made relative to the estimated adult survival of radio-tagged fish from Lower Granite Dam to spawning areas in 1992 of 69 percent.¹ The medium level changes suggested by the National Marine Fisheries Service increased pre-spawning survival by 13 percent and egg-smolt survival by 8 percent. These changes are intended to reflect improvements in hatchery practices (reduction in the take of wild fish into hatcheries) and improvement to habitat. Because these changes are presumed to result from future actions, they were not fully realized in the analysis until 2002.

Presentation of Results

Two different ways of comparing the biological impacts of the alternatives are provided. The first is the long-term trend in fish returns as a result of the strategy. These charts present the median value of 500 runs of the System Planning Model. While these graphs are visually appealing, they exclude some of the information from the analysis. For example, it must be kept in mind that half the time, the System Planning Model results were below the median line and half the time they were above the line. If a significant number of times the results showed a decline in the run, this might not be evident from looking only at the median.

Because of this, we also are providing probability charts. These show the probability of the System Planning Model result relative to certain run sizes. For example, the charts show the proportion of the 500 System Planning Model simulations that were fewer than 1,000 fish at Lower Granite after 24 years. Because the recent spring chinook returns are on the order of 1,000 fish, this is the probability that the System Planning Model results show a continued decline in the run after 24 years as a result of the alternative. We analyzed the probability that the System Planning Model results at Lower Granite Dam after 24 years would be:

- a. Fewer than 1,000 fish;
- b. Greater than 1,000 fish;
- c. Greater than 5,000 fish;
- d. Greater than 10,000 fish.

Because the run size varies from year to year, it is necessary to average the results when calculating the probabilities. For this, we used the eight-year geometric mean. This is similar to using the eight-year running average. The eight-year period was chosen to encompass two salmon generations and is similar to the statistic used by the fishery managers in the federal court settlement negotiations currently underway.

The first numeric category is based on the level of recent returns of about 1,000 wild spring chinook at Lower Granite Dam. One way to look at these results is that the probability of an average System Planning Model result for a scenario being fewer than 1,000 fish after 24 years provides an indication of how likely it is that the run would continue to decline as a result of the alternative and under the particular assumption set. The second category speaks to the likelihood that the alternative would provide rebuilding above the existing

¹Bjornn, T.C. et al. 1994. Migration of adult chinook salmon and steelhead past dams and through reservoirs in the lower Snake River and into tributaries-1992. Technical report 94-1 to U.S. Army Corps of Engineers and Bonneville Power Administration.

population size. Finally, the other two categories provide an indication of the probability of rebuilding to higher levels. The use of the word *indication* is important. There are a number of unknowns that will affect the future and many scientific uncertainties. This is highlighted by the use of three alternative passage assumption sets in the analysis. Hence, these are not *predictions* of results so much as indicators of the relative effectiveness of the alternatives under different sets of underlying assumptions.

Results

Prior to discussing the results, one important caveat is in order. This analysis treated all Snake River spring chinook above Lower Granite Dam as a single population. However, the Council has acknowledged that there could be a number of important individual populations that are included in this larger designation. The number of spring chinook counted at Lower Granite Dam must be distributed to all of these populations. There is every reason to suspect that when populations are as low as they have been recently (around 1,000 fish) that some of these populations will be composed of very few spawning fish. This could result in genetic drift or other problems that affect survival and reproductive success. These factors are not built into this analysis. In this respect, the results should be considered optimistic.

Baseline

The System Planning Model median baseline for Snake River spring chinook (i.e. no actions beyond the *Strategy for Salmon*) shows the population leveling off at around 1,500 fish (Figure 2a, NoActionBase). The other three lines in Figure 2a suggest that, without improvement in juvenile passage survival, but with improvements in tributary survival, pre-spawning survival and adult passage, the runs would show a slight rebuilding. Over 90 percent of the System Planning Model simulations showed average runs in excess of 1,000 fish after 24 years; 20-40 percent of the time, the results were greater than 5,000 fish at the end of 24 years (Figure 2b). However, none of the baseline situations indicated a reasonable likelihood of rebuilding even to levels that prevailed during the 1980s, and certainly not to levels that would achieve the Council's goals for Snake River spring chinook.

The results of the alternatives will be discussed in the order that reflects the addition of actions. Alternative A and D for example, differ only in regard to John Day pool drawdown to spillway. Similarly, B and C differ in this regard and add the drawdown of all four Snake River projects. The nomenclature of the alternatives reflects previous discussions and is continued to avoid confusion.

Alternative A

Much of the discussion in this section applies generally to all of the alternatives. The impact of the differing underlying assumptions regarding transportation and flow are evident in the results from Alternative A. If transportation is assumed to have a low level of effectiveness, then drawdown of Lower Granite and Little Goose pools could be expected to have a positive impact on rebuilding (Figure 3a). Similarly, if transportation currently has a moderate level of effectiveness (consistent with the point estimates of benefits by the National Marine Fisheries Service), then the results point to a positive, but more modest, level of rebuilding. Under both transportation assumptions, there was a 50-percent or greater expectation of a System Planning Model result in excess of 5,000 fish after 24 years with this scenario (Figure 3b).

In the case of the first model (low transportation effectiveness) it is necessary to assume that transportation has a negative impact on survival relative to inriver passage under most conditions (see documentation appendix). In this case, ceasing transportation itself has a positive impact and accounts for some of the rebuilding for A_Low in Figure 3a and for other alternatives as well. It should be stressed, however, that the low transportation effectiveness assumption is based on the lower confidence limit of a point estimate from a single year (1986). Statistically there is reason to place greater confidence in the point estimates from both 1986 and 1989, which are the basis for the mid-transportation effectiveness assumption;

there is less evidence to indicate that transportation is as negative as indicated by the low transportation effectiveness assumption. For this reason, the results using the low transportation assumption are likely to be optimistic regarding rebuilding potential and the moderate effectiveness assumption may be the most realistic.

However, if transportation is assumed to have a high level of effectiveness and overall juvenile passage survival is generally high (A_HiSurv), then the drawdown actions in Alternative A have a slightly negative impact on rebuilding relative to the baseline (3a). With this assumption, Alternative A had a 20-percent chance of a result fewer than 1,000 fish after 24 years (Figure 3b) compared to a less than 10-percent chance in the baseline (Figure 2b). In other words, if juvenile river passage survival currently is relatively high, and much higher than assumed in the other two models, then actions aimed at improving conditions in the river will have little impact on rebuilding. Further, because with these assumptions transportation survival is very high (80 percent), then actions that decrease transportation, such as drawdown, will have a negative impact on survival.

If transportation were as effective as the HiSurv assumption supposes, then one would have to come to the unlikely conclusion that the development and operation of the hydroelectric system and the resulting modification of the ecosystem have had little effect on downstream migrant survival and are not an important factor limiting spring chinook abundance in the Snake River. In this case, it would be necessary to attribute the present decline in production to some as yet unidentified factor that affects Snake River spring chinook in particular.²

Alternative D

This alternative adds the drawdown of John Day to spillway to the drawdown of the upper two Snake River pools in Alternative A. Under the assumptions of moderate and low transportation effectiveness, this action added about 3,000 fish to the results of Alternative A (Figure 4a). A similar change was seen in the System Planning Model probabilities with an increase in the probability of results greater than 5,000 and 10,000 fish (Figure 4b). These increases result from the assumption of a relatively high benefit from changes in water velocity and a relatively low benefit from transport, as discussed above.

This alternative did not result in rebuilding under the HiSurv assumptions because it reduced, but did not eliminate, transportation relative to the base period (transportation continued at Lower Monumental Dam). However, there was a small improvement over Alternative A because of the drawdown of John Day pool. The probability of a declining run (fewer than 1,000 fish) for Alternative D was about 17 percent for the HiSurv assumption, compared to about 20 percent for Alternative A. This is because under these assumptions, velocity augmentation still had a beneficial effect, and augmentation of water velocity in John Day pool had an overall positive, albeit small, impact.

Alternative C

Under Alternative C, the four Snake River projects were drawn down to spillway in 2002, but John Day pool was maintained at its minimum operating level. Reflecting the previous reasoning, this action had a dramatic positive benefit if it was assumed that transportation currently has a low level of effectiveness (Figure 5a). Rebuilding, in fact, approached levels that occurred in the early 1970s. Positive, although more moderate, rebuilding was seen under the assumption of medium transport effectiveness as well. With this alternative, there were almost no System Planning Model runs that were fewer than 1,000 fish using the low and medium levels of transport effectiveness, and high probabilities of average runs in excess of 5,000 fish

² This does not ignore the profound impact of natural environmental conditions on fish survival and production. Ocean conditions in particular have been poor for several years and have affected populations throughout the Northwest. However, Snake River spring chinook have been particularly hard hit and are now at a level of abundance that threaten the continuation of some populations. Thus there is reason to believe that Snake River spring chinook are limited by some additional factor unique to these populations. Development and operation of the Columbia and Snake river hydroelectric systems must stand out as a likely candidate.

for both assumptions (Figure 5b). Even assuming low effectiveness for transportation, there was a probability of almost 70 percent of a result greater than 10,000 fish after 24 years.

Because this alternative eliminated transportation, it increased the negative impacts of the alternative if the HiSurv assumptions were used (again, under this assumption, transported fish had a survival of 80 percent. Eliminating it, therefore, had a negative effect). For example, the proportion of System Planning Model runs after 24 years that were fewer than 1,000 fish was about 27 percent for Alternative C (Figure 5b), compared to about 10 percent in the baseline (Figure 2b).

Alternative B

Adding the further action of drawing down John Day pool to spillway contributed several thousand fish to the median run sizes of Alternative C under the low and moderate levels of transport effectiveness (Figure 6A). For low transportation effectiveness, this alternative produced median run sizes in excess of 25,000 spring chinook at Lower Granite (still substantially below the Council's goal of 50,000 wild spring chinook at Lower Granite Dam). The probability of a System Planning Model result greater than 10,000 fish after 24 years was almost 90 percent for this assumption (Figure 6b). Using the medium level of transport effectiveness, the median return approached 10,000 fish. Overall, the probability of a System Planning Model run greater than 5,000 fish after 24 years was over 60 percent, but the probability of a result greater than 10,000 was only about 25 percent (Figure 6b).

The results under the assumption of high transport and juvenile passage survival (HiSurv) were similar to those seen in the other alternatives. The drawdown of John Day pool had a positive impact compared to the action without John Day drawdown (Alternative C). The probability of a System Planning Model result after 24 years of fewer than 1,000 fish was about 18 percent for Alternative B compared to about 27 percent for Alternative C, this difference being the effect of the John Day drawdown to spillway.

Conclusions

The Council's adopted actions offer the possibility of substantial increases in Snake River spring chinook. However, like all options for salmon recovery in the Columbia River, the outcome is very dependent on a few key assumptions. In particular, these include the relationship between water velocity and in-river survival and the benefits associated with fish transportation. Under some assumptions, the adopted actions could result in either little change or even a decrease in survival. This sensitivity of any recovery action to these assumptions highlights the need for the evaluation features that are central to the Council's approach.

The result assumes continuation of existing environmental conditions. Improvement in ocean survival conditions or the current drought in Idaho could add to the results reported here. However, because of the depleted state of many upriver chinook populations, of greater concern is that further degradation of environmental or habitat conditions would worsen the situation and delay benefits of any rebuilding actions.

Figure 2a.

Snake River Spring Chinook Baseline Simulations

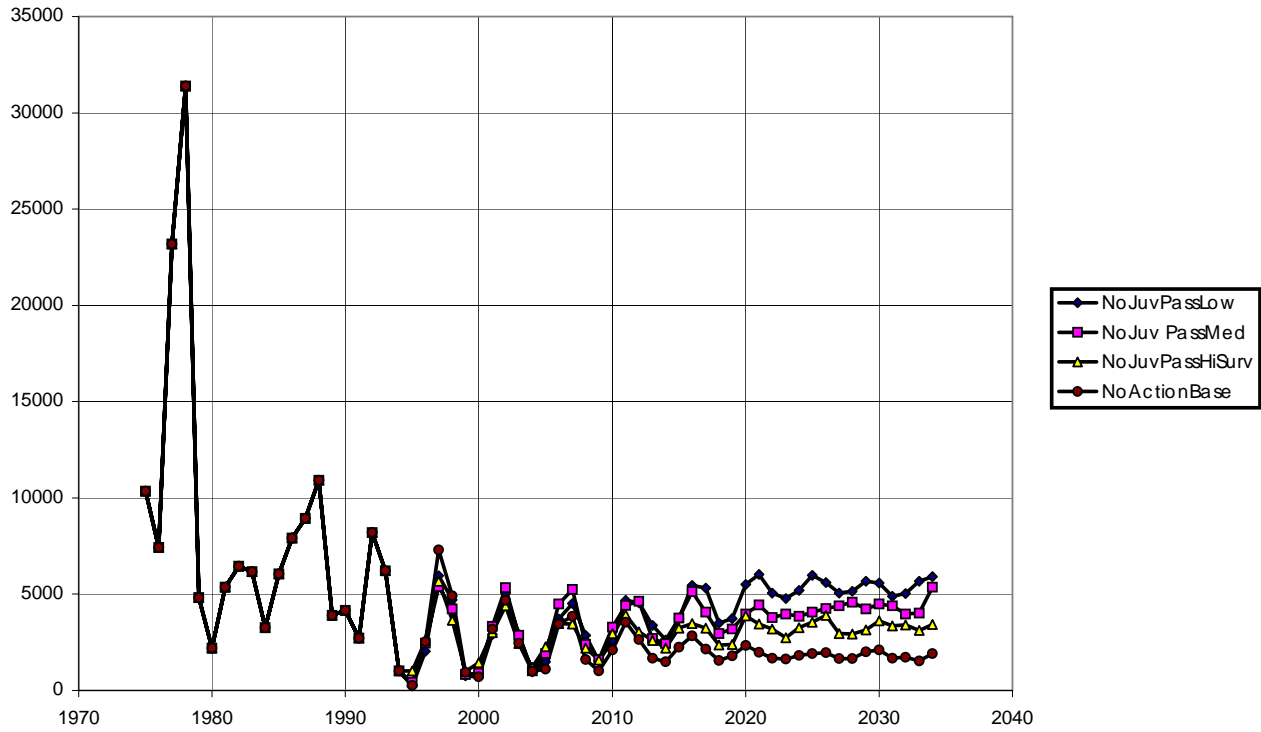


Figure 2b.

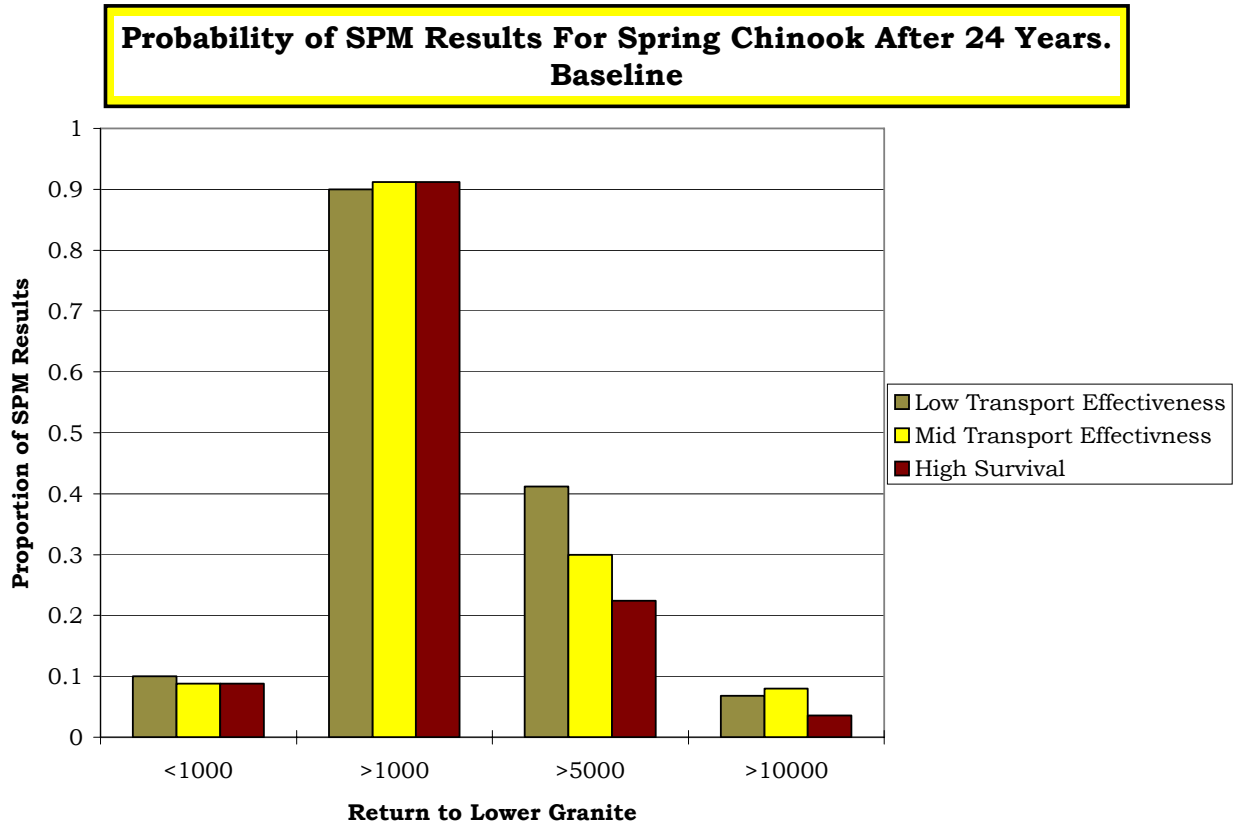


Figure 3a.

Snake River Spring Chinook Alternative A

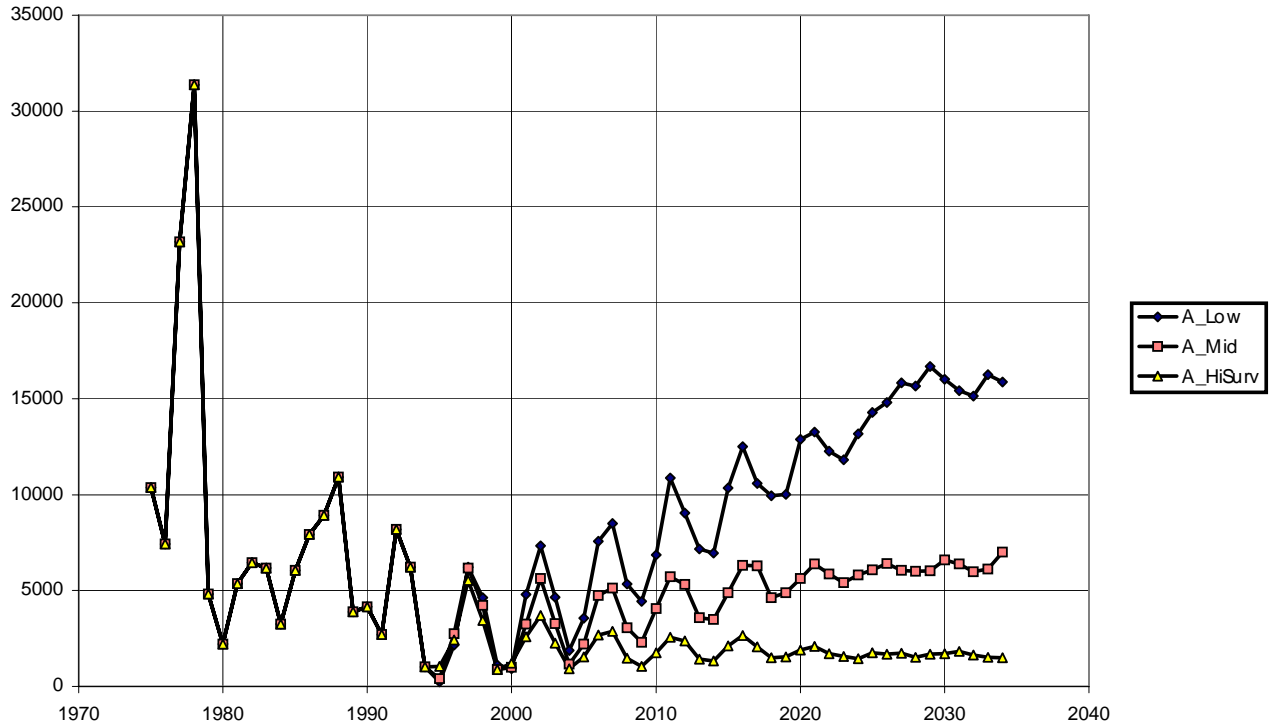


Figure 3b.

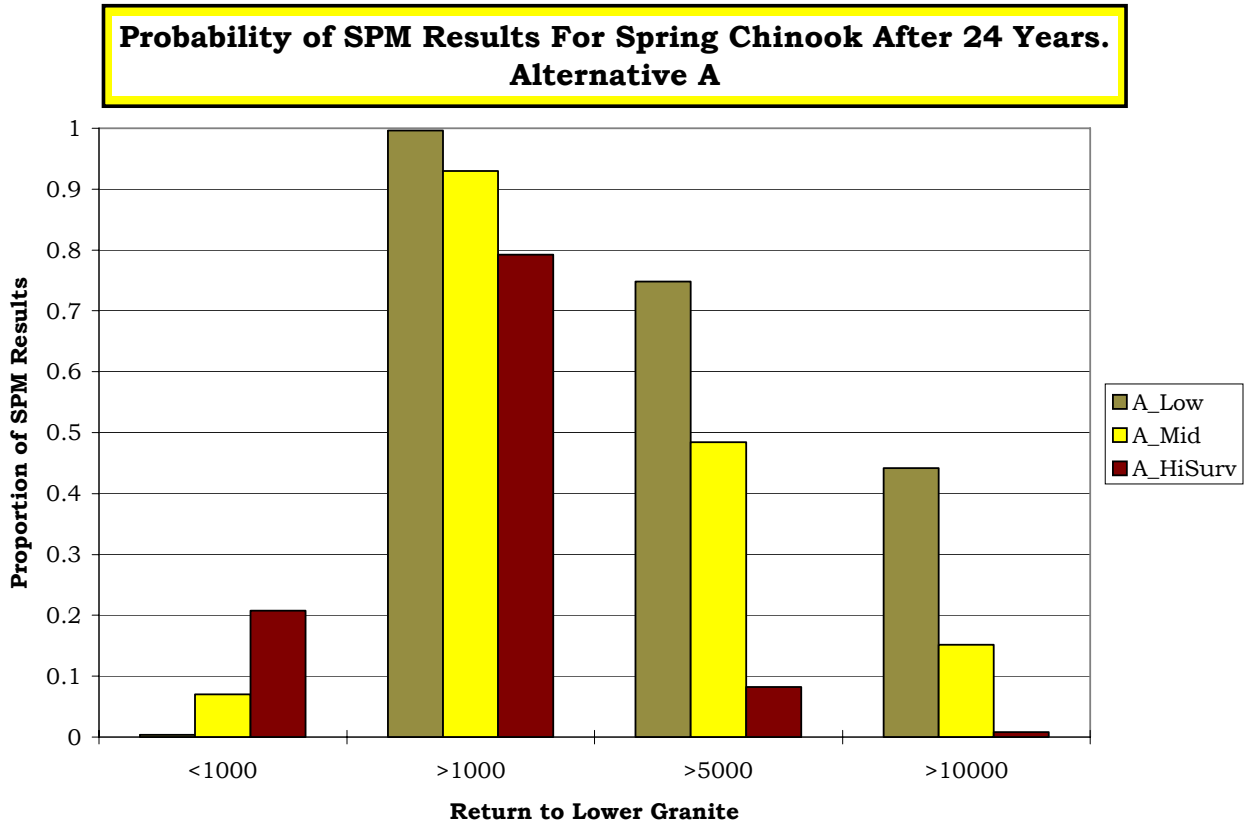


Figure 4a

Snake River Spring Chinook Alternative D

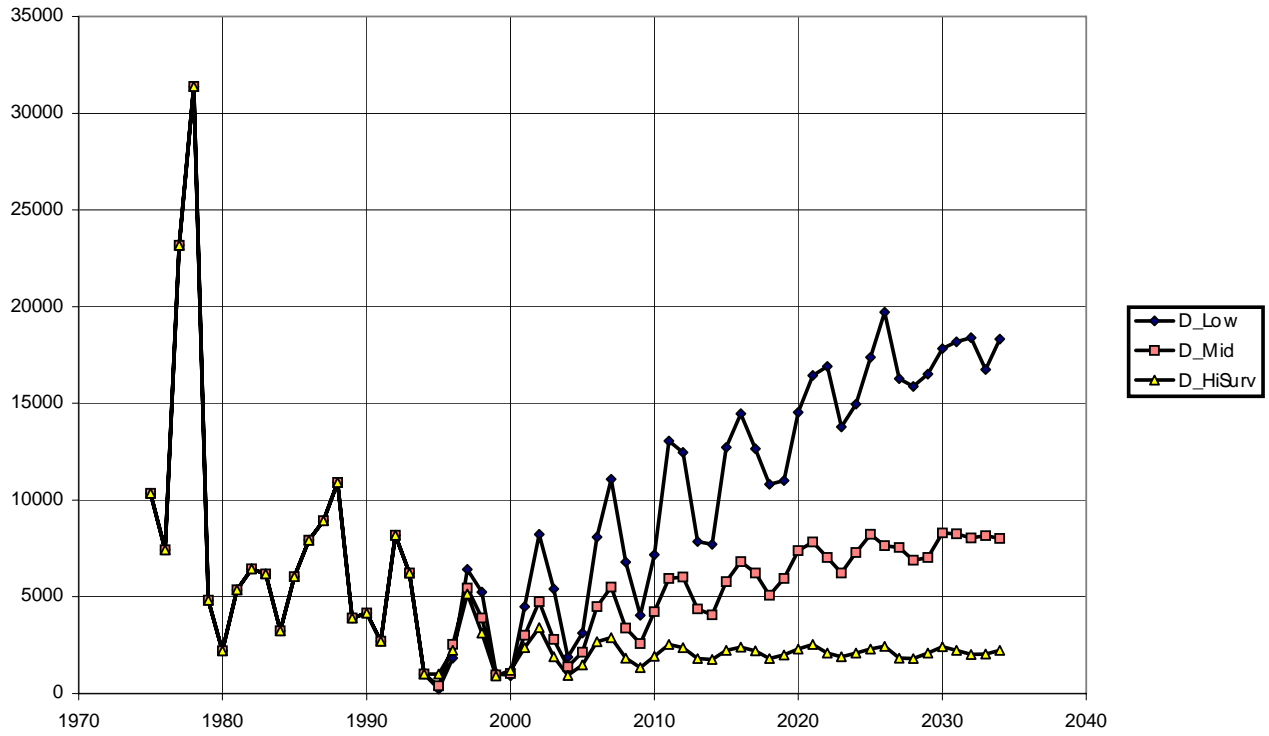


Figure 4b.

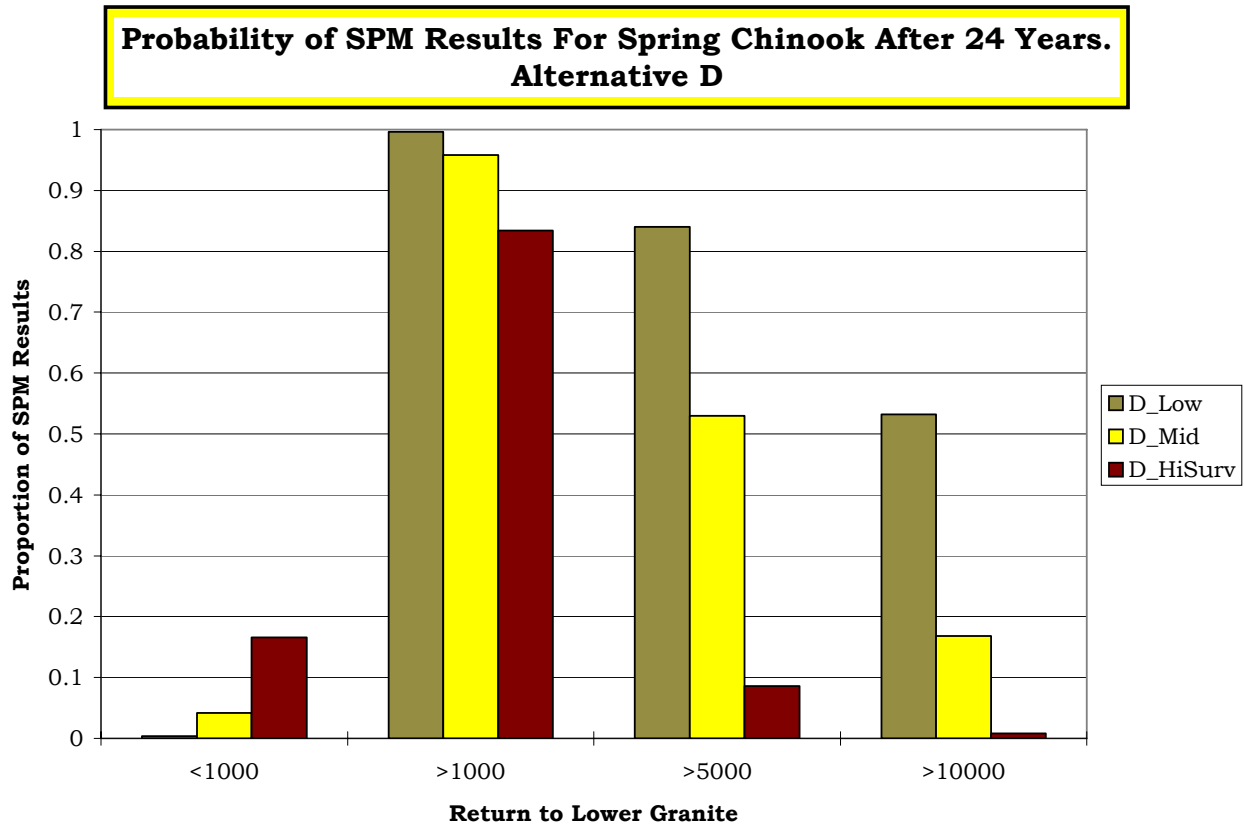


Figure 5a.

Snake River Spring Chinook Alternative C

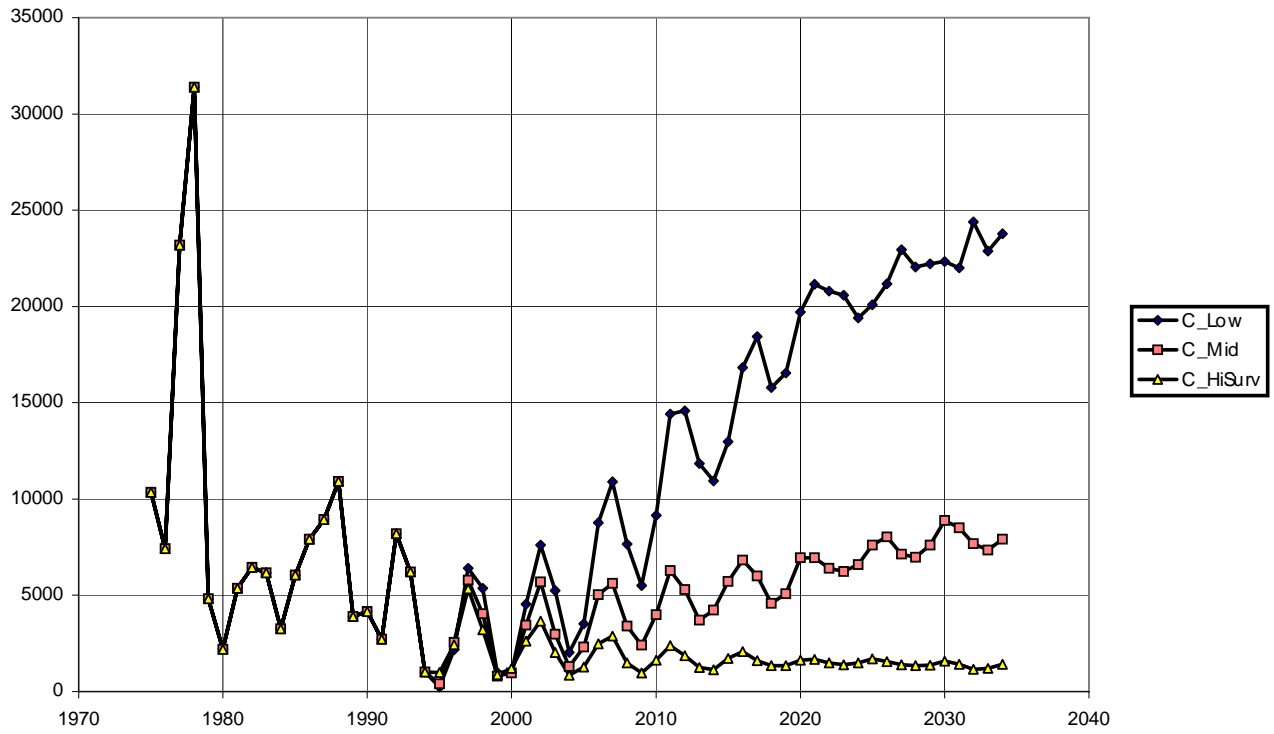


Figure 5b.

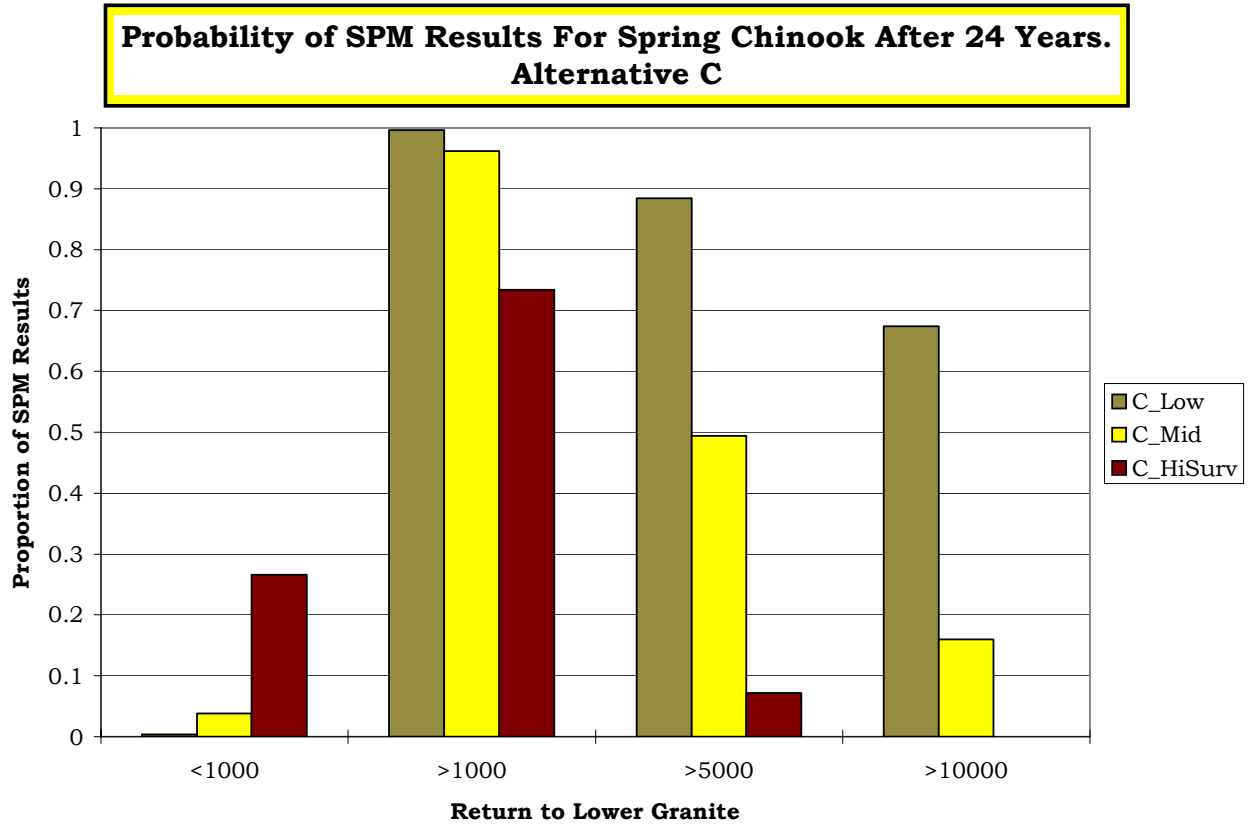


Figure 6a.

Snake River Spring Chinook Alternative B

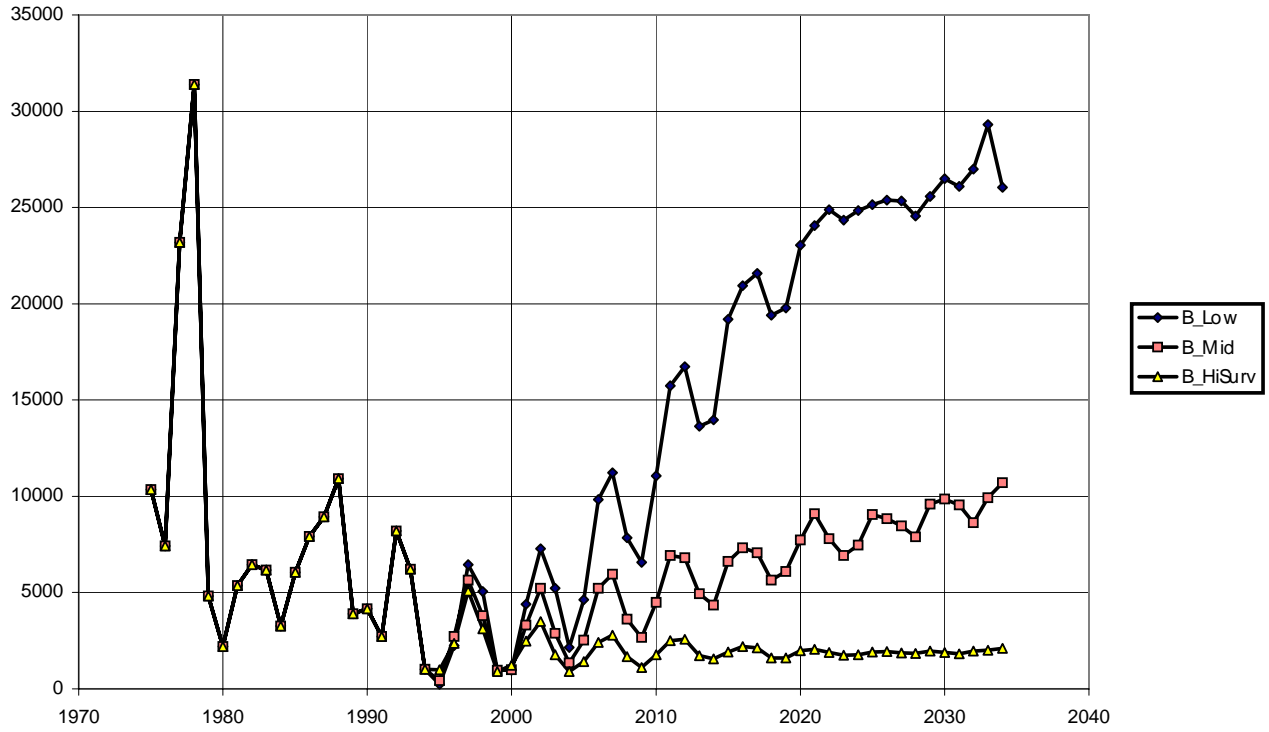
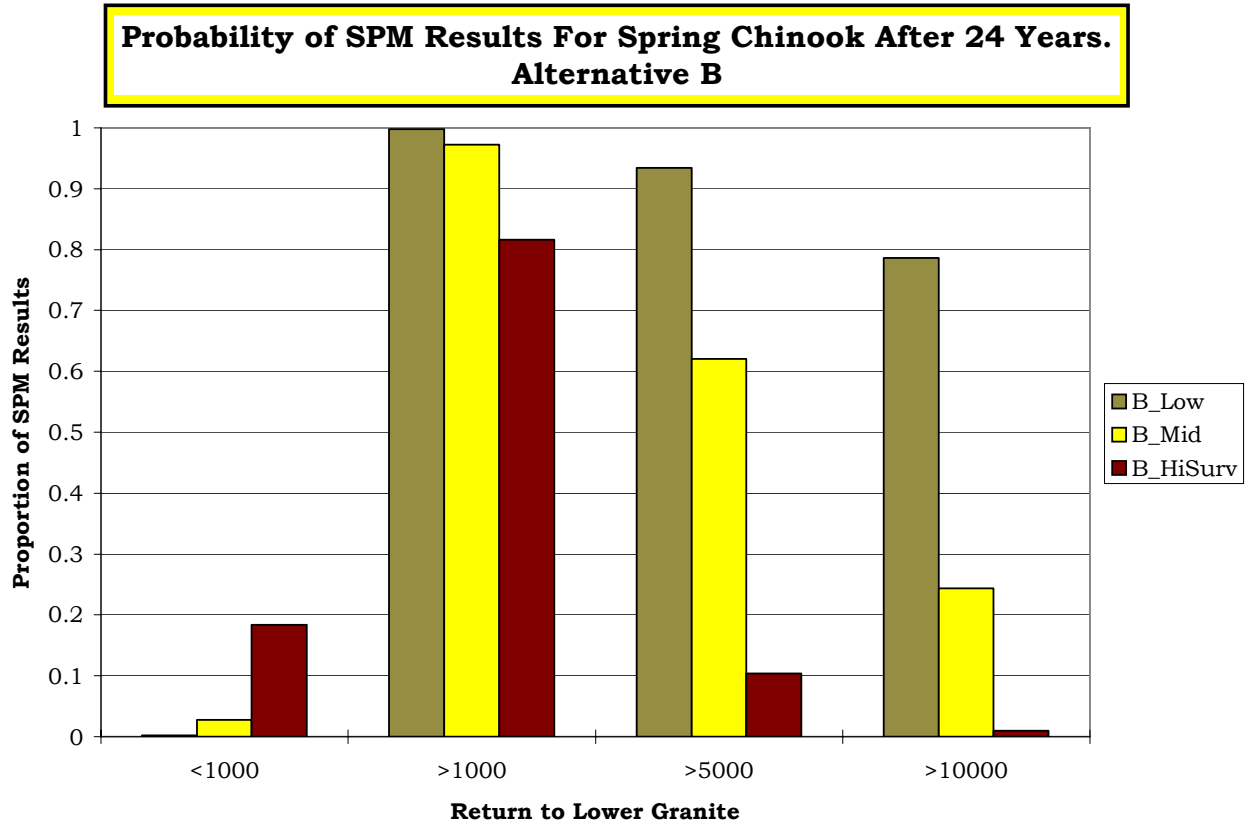


Figure 6b.



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Appendix E

MINORITY OPINION

**By John Etchart and Stan Grace
Montana Members, Northwest Power Planning Council**

On December 14, 1994, the Northwest Power Planning Council amended its Columbia River Basin Fish and Wildlife Program to improve salmon and steelhead survival. While we support the fish and wildlife restoration goals of the Northwest Power Act, the law that created the Power Planning Council, we voted against the recent fish and wildlife program amendments for several reasons.

First, we voted against the amendments because some of the major actions -- such as the river velocity measures in Section 5 -- rely on a scientific foundation that we find unconvincing. These amendments are unlikely, in our opinion, to help fish.

Second, we believe the amendments, as a whole, will impose huge costs on the region's ratepayers. These ratepayers finance most of the salmon recovery work. The amendments also will be costly for others who use the Snake and Columbia rivers.

Third, we voted against the amendments because they were rushed to adoption in a process motivated more by politics than by biology.

This is not to say we opposed all of the amendments. We supported many. For example, we supported the amendments establishing new operating rules for Hungry Horse and Libby dams that will protect reservoir biology from deep drawdowns in all but the most extraordinary conditions. Other features such as accelerated diversion screening, hatchery reforms, harvest restrictions and surface collectors are entirely appropriate.

Our concern with the amendments as a whole, however, has to do with the underlying assumption that salmon and steelhead survival can be increased by further manipulations of the Snake and Columbia rivers. The theory is that higher river velocities during the spring and early summer, when juvenile fish are migrating to the Pacific Ocean, will increase their chances of survival to adulthood by moving them more quickly to the ocean. This increased velocity will result from higher flows or the "drawdown" of reservoirs.

There have been two recent major analyses of drawdown: one done by the U. S. Army Corps of Engineers and the other by a highly reputable engineering firm hired by the Council. Neither found any significant benefit to drawdown except under the most extreme conditions -- that is, all the way to natural river configuration. The drawdowns called for in the Council's recent amendments are less extreme. We couldn't support those drawdowns because they provide such minimal and speculative gain, and without knowing a lot more, we certainly would not support drawdowns to natural river conditions -- tantamount to removing the dams.

Central to this skepticism about the merits of drawdown is the following:

Last year the Scientific Review Group, independent scientists impaneled by the Bonneville Power Administration and the Columbia Basin Fish and Wildlife Authority, told us they question whether salmon survival would necessarily be increased by further focusing of recovery actions on management of the river system. These scientists concluded that while it is important to improve river conditions, further improvements may make very little difference until conditions improve in the ocean. That contention is reinforced by the work of other scientists, who also believe poor ocean conditions may override any mitigative work undertaken in the river environment.

This doesn't mean we believe the hydropower system hasn't damaged salmon runs. Certainly, dams have hurt the Columbia Basin's salmon. But the ongoing debate over river flows, velocity and salmon survival is just that -- a debate, and it hasn't been resolved. It must be kept in mind that the region has been

experimenting with “increasing velocity” since the early 1980s, to the extent that we now dedicate 70 percent of our reservoir capacity to fish flows. By our conservative estimate, the region has spent in excess of \$2 billion in the last 14 years on a fish and wildlife program whose centerpiece is the higher-velocity hypothesis. Even with all this money spent, our fish runs are poor and we really are no closer to resolving the flow/survival debate. Just last May, the Council amended the fish and wildlife program with language that calls for concentrated scientific research to investigate this puzzle. That was six months ago. We don’t know anything today that we didn’t know then, but the Council has now ordered up more of the same in a plan that could cost the ratepayers of this region in excess of \$2 billion more over 20 years. So, in our view, too much of the very expensive new plan is based on the same old uncertainty.

Now, about cost. With the recent amendments, the Council program is going to cost nearly half a billion dollars a year -- \$177 million in addition to the \$250 million our program already costs. Incidentally, these costs are underestimated because they refer only to Bonneville Power Administration costs, ignore utilities’ costs and all indirect impacts and are premised on water conditions much better than we have had in recent years.

Even if we could be sure of benefits, the Council must be very careful with measures that affect the region’s power system, and we simply aren’t comfortable committing to another huge sum of money based on the available flow/survival evidence. About two-thirds of the electricity we use in the Northwest comes from the Columbia Basin’s dams, and this system is already pushed to the ragged edge. This plan imposes more costs, further reduces the system’s capacity and throws system reliability into question -- all of this without a good understanding of the consequences.

Additionally, the Council rushed its deliberations and its decision. As a result, it did not do the best job of engaging the public, of evaluating the science, of studying the costs, of debating the choices, of considering the alternatives, and so on. But for our headlong rush, the Council could have heard information which could have been useful in our deliberations. For example, the National Marine Fisheries Service plans to release its draft recovery plan for Snake River salmon in January 1995, and it would have been useful to review that plan before finalizing the amendments. In addition, the Columbia Basin Fish and Wildlife Authority, which represents Indian tribes and state fish and wildlife agencies in the Northwest, plans to offer the Council its recommendations on river flows in March.

In the Council’s deliberations in this rulemaking, a number of arguments were advanced in support of going ahead with a decision in December 1994. None was persuasive, in our opinion. For example:

- Some thought the Council needed to vote in December because the salmon -- particularly the endangered species in the Snake River -- couldn’t wait for us to impose additional protections. We believe those salmon will be protected by the National Marine Fisheries Service, and, in any event, most elements in our plan offer little for Snake River salmon in the near term.
- Some believe that the Council had to amend its program before the Fisheries Service releases its recovery plan. Unless we were trying to set the stage for the Fisheries Service by including measures such as drawdowns, we were rushing for the sake of rushing. This is not a competition. The issues are too critical -- to the fish, to the region’s economy and to the power system. We believe that if the Council and the Fisheries Service both use the best science to fulfill their legal mandates -- ours under the Northwest Power Act, theirs under the Endangered Species Act -- our separate paths ultimately will reach the same conclusion.
- We were told that our amendments must be finalized before new Council members are appointed in January because collectively the learning curve of new members would hinder our progress. That is a convenient assertion. In truth, the new Council members will be every bit as likely to accomplish things for fish as the old Council, and this action was taken in the face of two Governors and seven of eight U.S. Senators asking for a more deliberate pace. For any plan to be successful, it must be embraced more widely than this one will be.

We sought to persuade the rest of the Council that the amendments needed more scrutiny and additional public comment. In particular, we believe there should be a better analysis of the potential costs, impacts and implications for system reliability. But the majority chose to go ahead, and while we respected

their right to make that decision, we disagreed with their conclusions. It is our belief that these particular fish and wildlife program amendments were developed too quickly. They will cause the region to spend money it doesn't have and use water that isn't available. They ignore such science as there is, and they are unlikely to be implemented. Even if they are implemented, we are not sure many of them would help fish -- or that we ever would know if they did.

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Appendix F

RESPONSE TO COMMENTS

In addition to receiving recommendations, for which the Council has made findings, the Council received many comments in the fish and wildlife program amendment process. In instances where the comments related to recommendations, the Council has summarized and responded to them in the findings. There were a number of comments that did not specifically address findings, however, and the Council responds to them here. These responses to comments together with the findings, satisfy the federal Administrative Procedure Act's requirement of a statement of "basis and purpose" of the amendments.

The Council wishes to take this opportunity to thank all commentors. The comments were most useful in helping to assure that the Council's fish and wildlife program is responsive to the needs and interests of the region, as well as to the requirements of the Northwest Power Act.

I. AMENDMENT PROCESS

A. Adequacy of the amendment process

Comments: Several commentors said the Council's rulemaking had procedural flaws. The Pacific Northwest Utilities Conference Committee (Pacific Northwest Utilities Conference Committee, 732, 733, 734), the Direct Service Industries (Direct Service Industries, 749) and Idaho Power (724) objected that the Council failed to inform the public of the action it proposed to take because it did not propose a single set of specific amendments. The range of options, in Pacific Northwest Utilities Conference Committee's view, is "so immense as to make meaningful comment impossible." It also said that making a finding on the adequacy, efficiency, economy and reliability of the power supply "in this rulemaking, without sufficient time and the full participation of the region's utilities, is unacceptable." Idaho Power objected that the draft rule contains alternatives that are inconsistent with one another and in some instances, mutually exclusive. The Council has further frustrated meaningful comment by announcing it will consider all the recommendations it received on August 15, 1994 and in the Strategy for Salmon process along with the proposed amendments, Idaho Power said. In short, the Council's notice suffers from over-breadth: the Council has only begun to describe the vast universe of possible actions it might take to address concerns about salmon, in Idaho Power's view. Given the breath and complexity of the rule, Pacific Northwest Utilities Conference Committee and Idaho Power said, the Council did not allowed sufficient time for comment.

Idaho Power also objected to the Council's notice on the ground that it fails to give the Council's reasons for its proposal. The notice has no legal, factual or scientific explanation of why any of the options or recommendations under consideration would be authorized, appropriate or desirable. None of the proposed actions, in Idaho Power's view, would comply with the standard set out in the Act that requires the Council to adopt measures to "protect, mitigate and enhance fish and wildlife affected by the development, operation and management of (hydroelectric) facilities while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply." Trying to define an adequate, efficient, economical and reliable power supply in the course of this rulemaking is an insurmountable task, Pacific Northwest Utilities Conference Committee said. Idaho Power objected that the notice fails to show how any of the proposed amendments meet the criteria of Section 4(h)(6), which require the program, among other things, to complement the existing and future activities of the federal and the region's state fish and wildlife agencies and appropriate Indian tribes.

Idaho Senator Larry Craig (716) said he would like a second review of a Council preferred option, especially so the new Idaho governor can review it. Western Montana Electric Generating and Transmission Cooperative, Inc. (700) asked the Council to slow down; wait for new governors and new Council members, and not to push toward an "artificial time limit." Columbia River Alliance (587) said that the Council's rulemaking process appears too open-ended, lacking direction based on technical merit. The five mainstem options are simply too broad, encompassing alternatives that are not practical, economically realistic, feasible or even structurally sound. The Council should have stated a preferred option to present to the region for further review and consideration, based on Recovery Team report and the Harza drawdown report. Boise Cascade (594) requested an extension in the public comment period, so there could be more time for review and regional debate over what Boise Cascade saw as proposed habitat policies and standards that raise legal and scientific concerns. Public Utility District No. 1 of Douglas County (600) said it was overwhelmed by volume of material, lack of time and lack of supporting information. The Council should put out for public review a preferred option; Act requires the Council to reject recommendations without supporting information on biological basis. Industrial Customers of Northwest Utilities (698) said that the Council should develop its biological objectives, work with Bonneville Power Administration and the utilities and industry on potential power system implications, and settle on one proposed salmon plan and put them out for public comment, with an eye on a February 15 decision. Lincoln County (Montana) Economic Development Council (0710) said it would prefer one alternative to comment on, not many. Others also urged delay: Regional Services,

Inc. (726); Grand Ronde Model Watershed Program (907); Union Soil and Water Conservation District (0832); Mark Reller (787).

The U.S. Army Corps of Engineers (728) said that the amendment document was confusing, contained numerous unnumbered pages and was disorganized. The use of multiple options was confusing and did not reflect a prudent, reasonable and scientifically based decision-making scenario for salmon recovery. The Council should reformulate the proposed amendments, based on the public comment, into a single, comprehensive proposed alternative.

Bonneville Power Administration (750) said that the Council seeks comments on alternatives, not a draft program. Alternatives should not be the basis for decision; the Council should choose a preferred alternative, including clear proposals on specific objectives, and submit it to the region for comment.

Other commentors urged the Council to make a prompt decision, before the end of 1994. Shortly after receiving the court's opinion in *Northwest Resource Information Center v. Northwest Power Planning Council*, 35 F.3d 1371 (U.S. Ninth Circuit Court of Appeals 1994), the Council consulted with the Columbia Basin Fish and Wildlife Authority, which strongly urged the Council not to delay. A joint comment from American Rivers, the Natural Resources Defense Council, and Trout Unlimited made the same point: "Further delay in selecting a long term alternative for mainstem passage is not legally or biologically acceptable." Michael Blumm (707) urged the Council to conclude the rulemaking before the end of the calendar year, as did others (Sierra Club (0735)).

The Idaho Department of Fish and Game and the Idaho Department of Water Resources said that delay would jeopardize the very subject of the rulemaking, survival of the salmon: "Not only is there no more time to study the reasons for salmon declines, salmon survival is currently so precarious that there are literally not enough fish left to study." The National Marine Fisheries Service (National Marine Fisheries Service) spoke on behalf of the Administration and strongly urged that the Council "proceed without additional postponements." National Marine Fisheries Service urged prompt action for several reasons, including: postponement would not change the basic biological facts nor produce new solutions; and delay would make it harder for the federal effort to mesh its plans with those of the Council and thereby defeat the goal of a "single, unified blueprint for salmon recovery developed by and for the Region."

Response: In developing the fish and wildlife program, the Council is governed by two statutes, the Northwest Power Act and the federal Administrative Procedure Act. The Northwest Power Act requirements become operative before the requirements of the Administrative Procedure Act. That is, there are steps the Council must take pursuant to the Northwest Power Act before it can develop a proposed rule of which it is to give notice under the Administrative Procedure Act. First, the Council is required to solicit recommendations. 16 U.S.C. § 839(h)(2). This requirement is mandatory. Even the parties from whom the Council is to seek recommendations are identified. *Id.* Sometimes this solicitation requirement is triggered by events beyond the scope of the fish and wildlife program itself. That is, the Northwest Power Act requires the Council to solicit recommendations before a major revision of the power plan, which was one motivating factor here. In anticipation of the 1995 Power Plan, the Council solicited recommendations related to the anadromous fish chapters of the fish and wildlife program on May 11, 1994. By the August 15 deadline, some 192 recommendations were received from federal and state fish and wildlife agencies, from the region's Indian tribes, the utilities, and members of the public.

The Northwest Power Act then requires the Council to give notice of the recommendations it has received to Bonneville, to the federal and state fish and wildlife agencies, to the Indian tribes, to the federal agencies responsible for operating the hydroelectric facilities on the Columbia River and its tributaries, to any customer or other electric utility that owns or operates any such facility, and to the public. 16 U.S.C. § 839(h)(4)(A). Shortly after the August 15 deadline, the Council mailed three volumes of recommendations to

more than 250 interested parties across the region, and gave notice of the availability of the recommendations for public review.

These activities satisfied the Northwest Power Act's initial procedural steps. In so doing, the Council has also satisfied the legislative intent Congress expressed in setting out these requirements for the fish and wildlife program. "Section 4(h)(1)(C)(ii) provides procedures for making the received recommendations and comments available to all relevant parties and the public, and for conducting hearings and otherwise ensuring public participation and comment on the recommendations." House Rep. 96-976, Pt. II, Interior Committee, p. 44. Giving notice of the recommendations let those with interests in the region's fish and wildlife resources, including the public, know what was at issue in the rulemaking and invited public reaction to the issues raised by the recommendations.

On the basis of these recommendations, the Council drafted proposed amendments to the 1994 Columbia River Basin Fish and Wildlife Program. In accord with the informal rulemaking provisions of the Administrative Procedure Act, the Council gave notice of the proposed amendments on September 30, 1994.

This notice, while reflecting the complexity of the subject matter, fully satisfies the requirements of the Administrative Procedures Act. The relevant Administrative Procedure Act provision says that an agency's notice shall include: "either the terms or substance of the proposed rule or a description of the subjects and issues involved." 5 U.S.C. § 553(b)(3). The Council's notice provides the exact terms of the proposed amendments in most instances, and in some instances, sets out alternatives. Both make clear the subjects and issues involved in the rulemaking, and supply proposed amendatory language. The notice, in short, made clear to the public the nature of the issues the Council is dealing with, and how the Council proposed to approach them.

Again, the Council has satisfied the Congressional intent in requiring such notice. The legislative history of the Administrative Procedure Act says that notice "must be sufficient to fairly apprise interested parties of the issues involved, so that they may present responsive data or argument." Legislative History of the Administrative Procedure Act, S.Doc.No. 248, 79th Cong., 2d Sess. 200 (1945).

First and foremost, the Council's notice contained the proposed amendments themselves. Council Document 94-48, *Draft Anadromous Fish Amendments to the 1994 Columbia River Basin Fish and Wildlife Program*, Northwest Power Planning Council, September 1994, sets out in legislative style mark-up exactly those changes the Council was proposing to make in the anadromous fish portions of the fish and wildlife program. In the area of mainstem survival, the Council set out five alternatives, with an individual description of each option, followed by draft amendment language for the relevant sections of the fish and wildlife program, again in legislative style mark-up for all but one option.

The Council agrees with the commentator who observed that rulemaking notice under the Administrative Procedure Act must make known the agency's views in a sufficiently concrete form that interested parties can critique the proposal or formulate alternatives. The public comment in this rulemaking demonstrates amply that the notice has fulfilled these aims. The Council has received more than 1,000 comments, many of which are detailed and incisive. There have been numerous well-thought out criticisms and a number of alternative proposals. One of the aims of the notice in informal rulemaking is dialogue, an exchange of views. In that regard, this notice has certainly succeeded.

The Council does not agree that the requirement of a clearly focused statement of proposed action precludes setting out alternatives in the draft amendments. The Administrative Procedure Act certainly does not require an agency to set forth every proposal it ultimately adopts, nor does an agency have to publish the very language in draft that it adopts in the final rule. Neither does the Administrative Procedure Act preclude the use of alternatives. Indeed, alternatives have been encouraged, to make clear to the public just what range of actions an agency is considering. So in the current notice, the Council laid out five alternatives for

mainstem survival, and alternatives for other parts of the program, ensuring that all relevant recommendations were given consideration.

The Council agrees with the comment that in informal rulemaking, an agency must also inform the public of the reason for its proposal. Under the Northwest Power Act, recommendations must be supported with “detailed information and data.” 16 USC § 839b(h)(3). The Council distributed this information when it distributed the recommendations for public review. This information, in turn, forms part of the basis for the Council’s draft amendments that were drawn from the recommendations. Moreover, in support of the Council’s draft amendments, and by way of setting out the Council’s thinking underlying the amendments, the Council published with the draft amendments, a volume of appendices. Council Document 94-47, *Appendices to the Draft Anadromous Fish Amendments to the 1994 Columbia River Basin Fish and Wildlife Program*, Northwest Power Planning Council, September 1994. The appendices contained a Council Discussion Paper with background information and brief synopses of the recommendations received. The paper also highlighted key issues on which the Council sought public input, and asked questions to help focus comment. In addition to the Discussion Paper, the appendices included, among other materials, an analysis of potential impacts on River Operations, Rates and Biological Analysis; a Cost Table; and a relevant selection from the Columbia River Inter-Tribal Fish Commission Rebuilding Plan and Integrated System Plan. Again, the Council laid out this background information for the draft amendments to encourage informed public comment.

It has been objected that inclusion of this material made the rulemaking impossibly vast and at the same time made it impossible to know just what the Council was proposing. However, to the extent the notice was broad, this reflects the salmon’s life cycle, its vast migratory range, and its complex interactions with human activities. Indeed, given the breadth and complexity of the subject matter, the notice is relatively specific about the changes the Council was considering. As noted above, the draft rule proposed detailed amendments to the program and, as in the area of mainstem survival, specific options drawn from the recommendations the Council received. In all cases, the notice set out proposed changes, almost always in a legislative-style markup of the program. On an issue of such biological and economic significance, presenting the public with the range of options was a useful way to elicit thoughtful comment, presenting commentators with choices and tradeoffs. The high quality of the comments received in this process is the best evidence that commentators understood the notice.

As to the vastness of the subject matter under consideration, it is important to understand that the current amendment process is only the most recent public debate of these issues. The Council has addressed the subject of salmon restoration at countless regularly scheduled public meetings over the past thirteen years. In the last four years alone, the Council has helped organize a “Salmon Summit” that involved virtually every major party interested in salmon and river operations in a six-month long examination of these complex issues. After the salmon summit, the Council took over two years to involve the public in the process that led to the *Strategy for Salmon*. The *Strategy* identified a number of important mainstem initiatives -- reservoir drawdowns, additional flow augmentation from the Snake Basin through nonstructural and structural measures, and other initiatives. These initiatives were examined at length by broadly representative advisory committees, working with the assistance of agency analysts and outside contractors. In 1994, the Council conducted a major amendment process regarding the scientific basis for flow, velocity and transportation programs for salmon. Over the summer of 1994, the Council issued a series of briefing papers regarding the issues the Council expected to explore in the current amendment process, and these were made available to the public. The Council has been repeatedly briefed both by interested parties and by its own staff in public meetings.

The rulemaking materials in this process raise many of the issues that have been before the Council and the region for the last several years. These issues have been thoroughly debated, both in earlier phases of the Council’s rulemaking process as well as in other forums. The positions of these commentators, as well as the opinions of parties with widely divergent points of view, have been vigorously explored.

Pacific Northwest Utilities Conference Committee, the Direct Service Industries, Idaho Power and other parties who criticize about the lack of notice in this process commented extensively in all the phases of the *Strategy for Salmon* rulemaking. As noted, the issues raised by those recommendations are largely the same as the issues raised by the recommendations that underlie the current rulemaking. The comments these parties have submitted over the last two years, both in writing and in oral testimony, as well as their extensive participation in the current rulemaking, establish beyond any doubt that they are intimately familiar with the issues at hand and with how the Council proposes to address those issues.

Moreover, the Council responded in writing to all the recommendations received in the earlier phases of the Strategy for Salmon. While the Ninth Circuit, in *Northwest Resource Information Center v. Northwest Power Planning Council*, called for incorporation of written findings on the recommendations into the final amendments, the earlier Response to Comments certainly gave interested parties a clear picture of the Council's thinking on the central issues, common to this rulemaking.

Given the posture of the current rulemaking, the Council does not believe that the 40-day period allotted for written public comment (with an extra four weeks for further consulting) is too short. The Council concurs with those commentators who argued against delay. The region is faced with a salmon emergency of sobering proportions. Whether or not the region can act quickly and effectively enough to forestall further extinctions, the Council believes that every effort must be made to act promptly. The Council believes this is fully consonant with the Northwest Power Act. As the court in *Northwest Resource Information Center v. Northwest Power Planning Council* said, the Act "acknowledged fish and wildlife as an irreplaceable finite resource" and so "placed a premium on prompt action." *Id.* at 1395.

B. Deference To Fish And Wildlife Agencies And Indian Tribes

Comments: Several commentators said that the Council must accord "a high degree of deference" to the fish and wildlife agencies' and tribes' judgments in developing the fish and wildlife program, drawing from dicta in *Northwest Resource Information Center v. Northwest Power Planning Council*. The Yakama Indian Nation (730) said that the Council should incorporate various elements of the Ninth Circuit Court's ruling into Section 1 of the program, particularly a clear statement that the recommendations and proposals by the fishery managers should be given "high deference" by the Council. Agencies and tribes' recommendations must be viewed as being based on the best available scientific information on the region's fish resources. American Rivers/Natural Resources Defense Council/Trout Unlimited (715) said that the Ninth Circuit direction to the Council to give greater deference to agencies and tribes is the key to this program amendment process. They are in general agreement on core provisions of a mainstem passage program and the Council should rely on those provisions for the basis of its program.

The Corps of Engineers (728) said that while the court may have found that the Council should rely more heavily on the expertise of the agencies and tribes, that does not absolve the Federal action agencies from Northwest Power Act and Endangered Species Act requirements to base their decisions on the best available scientific information. The agencies and tribes must supply the scientific information to support their recommendations. If such information is not available, the Council should develop or call for research to gain this information before calling for controversial measures without a clear scientific basis. No measure should be adopted unless it is supported by the best available scientific information. The Council should complement the existing activities of the agencies and tribes only when those activities are supported by scientific evidence.

The Direct Service Industries (749) said that the report of the Recovery Team should be given the "due weight" with other agency and tribal recommendations, and the Council "should explain any departures" from the report.

Response: The fish and wildlife agencies and tribes play a special role in the Council's development of the fish and wildlife program. The Northwest Power Act addresses the fish and wildlife agencies' and Indian tribes' role in this process in several respects. The Council must invite recommendations from the agencies and tribes (16 U.S.C. § 839b(h)(2)), whereas other parties need not be invited. The Council's program must "complement" the agencies' and tribes' activities (16 U.S.C. § 839b(h)(6)(A)) and be "consistent with" Indian legal rights (16 U.S.C. § 839b(h)(6)(D)). When recommendations conflict, the Council must resolve inconsistencies "giving due weight to the recommendations, expertise, and legal rights and responsibilities" of the agencies and tribes (16 U.S.C. § 839b(h)(7)).

The fish and wildlife managers' roles derive from these statutory provisions. The agencies and tribes manage fish and wildlife, as no other party does. Their responsibilities, expertise and experience are obviously important in determining whether particular measures would "protect, mitigate and enhance" fish and wildlife. Their involvement in developing the Council's program, and in evaluating whether there is an appropriate "fit" between the program and agency and tribal activities, is essential if the program is to work properly. The tribes' interest in fish and wildlife is based in part on legal principles for which the courts are the ultimate interpreters. These factors explain why the Council must invite the fish and wildlife agencies' and tribes' recommendations for the fish and wildlife program, why the program must complement their activities and be consistent with the tribes' legal rights, and why, when the recommendations conflict, the Council must give their authorities, expertise and rights due weight. This much is the common sense implication of these provisions of the Act, and it points to an important agency and tribal voice in the development of the fish and wildlife program.

The Council does not interpret the *Northwest Resource Information Center v. Northwest Power Planning Council* opinion as saying that agency and tribal recommendations are entitled to conclusive weight in the Council's process. The Council's determinations are governed by the Act, which has particular procedures and standards. In some respects, the fish and wildlife agencies and tribes are held to the same standards as other parties. The Northwest Power Act requires the Council to develop a fish and wildlife program on the basis of recommendations, which may be submitted by any party (16 U.S.C. § 839b(h)(3)). All parties must accompany their recommendations with "detailed information and data" (16 U.S.C. § 839b(h)(3)). In deciding which measures to adopt in the program the Council must judge all recommendations by the same criteria (16 U.S.C. § 839b(h)(5) & (6)). The Council must explain its rejection of any recommendation submitted by any party (16 U.S.C. § 839b(h)(7)).

The agencies' and tribes' special roles in this process do not change the fundamental distinction between the fish and wildlife managers and the Council under the Northwest Power Act. The fish and wildlife managers make *recommendations* to the Council. The Council *determines* whether to adopt these recommendations, under special procedures and standards. The question is not whether the Council has a general obligation to defer to the agencies and tribes, but whether each recommendation complies with these procedures and standards. The special roles played by the agencies and tribes are implicit or explicit in the questions posed by the Act: Would a recommended measure protect, mitigate and enhance fish and wildlife? Would it complement agency and tribal activities? Is it based on the best available scientific knowledge? Is there a less costly way to protect fish and wildlife? The agencies and tribes play an important role in helping the Council to answer these questions. But in each case, the Council must apply the specific provisions of the Act and make a judgment.

The recommendations of the National Marine Fisheries Service Recovery Team are advice to National Marine Fisheries Service, not to the Council. The Team is not itself a fish and wildlife agency or Indian tribe. If National Marine Fisheries Service adopts the Team's recommendations and submits them to the Council as recommended program amendments, then the Team's work would comprise a recommendation of a fish and wildlife agency. Any other party also may submit the Team's work as a recommendation in the Council's process, of course. The Team's views are important, and the Council has taken them very seriously in this process.

C. Equitable Treatment and Related Issues

Comments: Public Power Council (731) said that the Council’s definition of “equitable treatment” in Section 1.2A is mistaken: “Equitable treatment requires balancing the needs of the fish and wildlife with those of the power system;” Bonneville Power Administration and other federal agencies will make this balancing determination at the appropriate times; “[e]quitable treatment means simply that fish and wildlife interests have been taken into account and weighed into the decisions being made by the responsible federal agencies.” Direct Service Industries (749) said that equitable treatment of fish and power is a responsibility of the federal agencies, not the Council. Yet some of the Council’s flow options are inequitable. Option 4, for example, calls for moving the river hydrograph back toward historical timing and duration; this would dismantle the power system for measures whose benefits are speculative. Bonneville Power Administration (750) urged the Council to delete its definition of “equitable treatment” in Section 1.2A; the federal agencies who bear this responsibility should define the term, which is also the subject of litigation and pending in the Ninth Circuit. The Council’s definition is flawed in logic and characterization, as it assumes a comparable level of certainty can be achieved between a mostly engineered system and a biological one.

Response: The Council agrees that the equitable treatment obligation applies to the federal implementing agencies, not to the Council, and the Council does not intend its interpretation to bind other agencies. The commentors are correct that these issues are in the courts, and that is where the obligation’s meaning will be discerned. While the Council does not agree with the Public Power Council’s interpretation, Bonneville makes an interesting point. However, the Council’s interpretation expresses an equitable principle, rather than a precise formula.

Comment: The Public Power Council said that the fish and wildlife provisions of the Act did not create any new substantive mitigation obligations, “only a new process to fulfill existing mitigation obligations.”

Response: The Ninth Circuit has more than once observed that the Northwest Power Act imposes substantive as well as procedural obligations on the federal implementing agencies.

Comment: The Public Power Council warned that multipurpose federal projects have specific statutory purposes; the Council should not assume it can call for changes in project purposes without transgressing statutory purposes.

Response: The Council understands that the primary interpreters of the authorizing legislation are the federal operating agencies.

Comment: Direct Service Industries (749) said the Council’s program should attempt to integrate the Endangered Species Act requirements to the extent possible, while noting which obligations are hydro-related and which are not. The Council “could help provide coordination among the diverse salmon processes by indicating the areas of consistency and inconsistency between the Final Recommendations of the Recovery Team.”

Response: The Council endeavors to integrate Endangered Species Act requirements where appropriate, without losing sight of the fact that the Northwest Power Act has broader purposes than the protection of endangered species. The Council has done extensive work to identify areas of consistency and inconsistency between the Council’s program and the Recovery Team’s report.

II. INSTITUTIONAL ARRANGEMENTS AND AGENCY ROLES/IMPLEMENTATION PROCESS/MANAGEMENT/FISH OPERATIONS EXECUTIVE COMMITTEE

Comments: Laurie Solomon of Friends of the Clearwater/Cove Mallard Coalition (Moscow, Idaho) (397, 482) stressed the need to incorporate public input and participation in various aspects of the program in a role that is more than simply an ability to comment. Friends of the Clearwater questioned role of Independent Scientific Group in the absence of public input.

Response: In addition to the hearings and notice-and-comment procedure used in amendments processes, the Council provides many avenues for incorporating public input and participation in its work generally. This includes advisory committees, work-groups, seminars, etc. The Council fully intends to continue these efforts. Any reports made to the Council by advisory groups such as the Independent Scientific Group will be subject to review and comment by the public.

Comments: Upper Columbia United Tribes (566, 585, 901) urged the Council to formally analyze the Columbia Basin Fish and Wildlife Authority budget priority document (in 1995 and in future years) for: (1) consistency with the Council's Fish and Wildlife Program and (2) providing direct benefits to fish and wildlife. If the Council finds the document to be consistent with the program, the Council should send Bonneville Power Administration a letter supporting full implementation of the Columbia Basin Fish and Wildlife Authority plan. Upper Columbia United Tribes also requested that the Council act expeditiously to prevent Bonneville Power Administration from altering the implementation plan to suit its own whims, including funding projects that are not in the program.

Response: The Council is working with Bonneville and Columbia Basin Fish and Wildlife Authority to review the 1995 Columbia Basin Fish and Wildlife Authority budget priority document. Section 3.1B.1 of the Program calls for an expanded implementation planning process that calls for the participants (including all agencies and tribes) to prioritize and coordinate all program measures including research. The participants will prepare an annual implementation workplan which is to be submitted to the Council to ensure that it is consistent with the Program. The Council works regularly with Bonneville to coordinate implementation with the terms of the program.

Comments: Upper Columbia United Tribes (566, 585, 901) said that the reference in Section 1.1 to treaty fishing rights should also recognize the fishing rights of executive order tribes, such as the Spokane Tribe's rights guaranteed under Reclamation law to fish and manage fish on Lake Roosevelt. Thus Spokane Tribe has a reasonable expectation that their resident fishery and fishing rights will not be damaged by the Council's program. In general, Upper Columbia United Tribes have never ceded any fishing rights and retain those rights throughout their aboriginal territory, which means the right to fish and manage fish in those areas.

Response: The Council has included reference to the rights of executive order Tribes in the amended Section 1.1 of the Program.

Comments: Upper Columbia United Tribes (566, 585, 901) said that federal project operators and regulators need to develop "mutually satisfactory consultation and coordinated management with the agencies and tribes. Important decisions constraining what can be done for anadromous and resident fish are made in forums without significant agency and tribal input, such as the Pacific Northwest Coordination Act agreement and US-Canada Treaty"; Council should perhaps require that agencies and tribes be included on the federal negotiating teams for both. The Shoshone-Bannock Tribes and the Columbia Basin Fish and Wildlife Authority also commented to this effect.

Response: The Council encourages power system operators to include agency and tribal representation in these forums, but cannot force such representation.

Comments: Upper Columbia United Tribes (566, 585, 901, 937) said that the Fish Operations Executive Committee must have membership of all upriver tribes or it may not be consistent with Act in terms of protecting Indian rights; also needed because Fish Operations Executive Committee may not be adequately considering tradeoffs between resident fish and anadromous, “which is needed to treat the Columbia River as an ecosystem” under the Act; Fish Operations Executive Committee should meet on rotating basis throughout the region. Reasonable solution would be for CRITFC to appoint one person, Upper Columbia United Tribes to appoint one person, and all other unaligned tribes to appoint one person.

Response: The Council has invited the Upper Columbia United Tribes and other upriver tribes to designate representatives to the Fish Operations Executive Committee. The arrangements suggested appear to be a reasonable starting point for discussions. However, these matters should be discussed more fully with other tribes and Fish Operations Executive Committee members.

Comments: Upper Columbia United Tribes (566, 585, 901), in a comment that suggests deleting much of Section 3, criticize various processes and committees for basin oversight, expanded implementation planning, subregional planning, management consultants, independent scientific review, and a regional biological analysis center. It is unclear whether the Upper Columbia United Tribes suggested deletion of all of Section 3 or of only those parts noted, but they do make clear that they believe these various provisions add expensive and lengthy process to a program already overloaded with process, without biological benefit to fish, and because no funding was provided to make possible the tribes’ participation.

Response: The Council agrees that coordination of the various elements of the program is essential if the program is to succeed as a systemwide approach. Much of the process and committees called for in Section 3 of the Program has the support of a number of agencies and tribes. At the same time, the Council recognizes that much of the process in the Program could benefit from a streamlined approach and has stated that the Council will hire independent consultants to perform a management review and streamline implementation. (3.1E).

Comments: Shoshone-Bannock Tribes (606) said that the Council's decision-making processes and institutional arrangements are flawed. The Tribes do not see the need for the Fish Operations Executive Committee or to participate in Fish Operations Executive Committee, since it has no authority to manage flows. Columbia Basin Fish and Wildlife Authority should coordinate and implement a fish and wildlife program drafted by resource managers that details hydropower system operations that best fit the needs of the fish.

Response: The Council believes that the Fish Operations Executive Committee provides a valuable forum for agencies and tribes to communicate their concerns and positions, particularly in-season water management issues. When conflicts are identified and cannot be resolved they are elevated to the Council. It is through this forum that Columbia Basin Fish and Wildlife Authority communicates proposals for hydropower system operations to address the needs of fish and wildlife, and river operators discuss their response.

Comments: Save Our Wild Salmon (628) advocates “greater control of fish-affecting hydrosystem operations by Northwest fishery agency and Tribes,” without stating a specific position on transfer from Bonneville Power Administration, implementation, etc.

Response: Measure 1.2C, which calls for exploration of transferring the administration of Bonneville’s Fish and Wildlife Program responsibilities to an entity created by the region’s state and federal fish and wildlife agencies and tribes, responds to this issue.

Comments: Regional Services, Inc. (Charles Pace) (726) said that the Council should not try to resolve Endangered Species Act issues and problems in the program; leave that to National Marine Fisheries Service.

Response: The Council agrees and has stated this explicitly in Section 1 of the Program. The Council hopes that the Endangered Species Act and the Northwest Power Act can function in a coordinated way.

Comments: Corps of Engineers (728) said that it is generally supportive of the institutional concepts discussed in the draft document. However, Council will need to work with the Governors to ensure that state agencies provide credible scientific information and present unified state positions on such matters as water resource management practices.

Response: The Council agrees and has included a number of measures (in particular see Section 3) to ensure that regional decisions will be based on the best available science.

Comments: Columbia River Inter-Tribal Fish Commission (729) said with regard to Section 2.2B Assess Program Measures, that it is unwilling to “trade off” any portion of the obligation to protect, mitigate, and enhance fish and wildlife resources lost due to construction and operation of the hydro system. “The Council must realize that to the extent the region is unwilling to meet this obligation through direct reductions in mortality to anadromous fish populations, it must be met with a combination of production programs, including supplementation.”

Response: Measure 2.2B is not intended to imply that the Council will “trade off” any portion of its obligations under the Act to protect mitigate or enhance fish and wildlife resources lost due to the construction and operation of the hydro system. The Council intends by the existing program language to periodically assess potential trade-offs and conflicts arising in the program.

Comments: Confederated Salish and Kootenai Tribes (778) said that upriver tribes and agencies are under-represented in Council’s program amendment process and in implementation and decisions on river operations.

Response: The Council is aware of this concern. The Council has attempted to increase the representation of the upriver tribes in decisions on river operations through increasing representation on the Fish Operations Executive Committee and periodic government-to-government consultations, but is open to other suggestions. The program amendment process is open to all parties, and the Council specifically invited recommendations from the upriver tribes and fish and wildlife agencies.

Comments: Wallowa County Court (907) said that National Marine Fisheries Service will and should have final say on recovery plan, not the Council.

Response: The Council concurs. Nothing in this program states or implies otherwise.

A. Proposed Role for Council to Develop Basinwide Watershed Plan

Comments: Northwest Environmental Advocates (697) said that the Council is not the appropriate entity to be responsible for basinwide ecosystem/watershed planning. It would be better and easier to place that responsibility in a federal agency with mandate, resources and implementing authority already suited to the task, such as Environmental Protection Agency with its mandate for water quality. The Council's best role is not to take over basin watershed and water quality planning, but to pressure the federal and state agencies to be more aggressive and to support their attempts to get more funding; for example, Council should call for integration of subbasin plans with watershed and water quality approaches and plans of the state agencies, and the Council should call for implementation of total maximum daily load temperature standards throughout the basin. Pacific Northwest Waterways Association (580), Oregon Municipal Electric Utilities (718), Port of Portland (702), Idaho Senator Larry Craig (716), Pacific Northwest Generating Cooperative (719, 759), Canby Utility Board (758), Oregon Representative Chuck Norris (763), Oregon Water Coalition (764), Tidewater Barge Lines, Inc. (765), Idaho Department of Water Resources (766), Douglas County Public Utility District (959) and Public Power Council (731) opposed any new initiatives in regional planning. The Direct Service Industries (749) opposed the proposal, saying that federal and state regulators have a depth of experience in applying land and water statutes that the Council could never achieve. Direct Service Industries are sympathetic to the lack of coordination in execution of all these laws, but the Council's proposal would not solve this problem, just add process without implementation authority or the accountability that comes with implementation. Direct Service Industries are also sympathetic to the importance of salmon to the region, but have grave doubts that basinwide planning should be reoriented around the salmon to the general exclusion of all other interests. At the same time the Council can play a valuable role in identifying non-hydropower measures that can assist in restoring salmon populations. Northwest Forest Resource Council (867) said the proposal appears similar to the attempts decades ago to create a Columbia Valley Authority; same concerns then apply today about creating such a super agency that would intrude on other existing federal agency jurisdictions and authorities; other concerns include broad and equitable representation of various interests, accountability, and scope of authority; also, what precedent is there for a state-appointed panel as proposed in this section to dictate to federal agencies? This proposal would create a bureaucratic nightmare worse than any we have experienced to date.

The Columbia River Inter-Tribal Fish Commission (729) also opposed the proposal. The Commission suggests instead that the Council call for the creation of a Columbia River Watershed Management Program to update and integrate subbasin plans. The Commission argued that although conflicting political and resource management missions and jurisdiction are a problem, they are not the real dilemma. The real problem is that "states and the federal government have persistently bent and broken existing laws in order to avoid having to alter those practices" that harm fish; thus the real issue is proper administration of existing laws; implementing the "experiment" of requiring existing management entities to obey existing laws "would put us far closer to truly sound watershed management than the much more experimental proposal of creating another planning body with no authority to require action."

Michael Blumm, Professor of Law at Lewis & Clark College (707) and CE Exploration Company (757) supported the proposal for basin watershed Council. WaterWatch of Oregon (748) urged the Council to assume a leadership role in basin watershed planning. Oregon Trout (747) supported the basin watershed proposal if new Council has "real clout to implement and enforce decisions"; do not delay current procedures while waiting to pass on watershed council idea. The Corps of Engineers (728) is generally supportive of the idea of a single entity empowered to deal with all issues (regional and international) in the Columbia River Basin. They believe that such a body should be independent of those preparing the various plans. However, for a single federal agency to be designated to represent the federal interests ignores Endangered Species Act and may not take into account the authorizations and responsibilities of the different agencies. Bonneville

Power Administration (750, 761) appears to support general concept of basin watershed planning proposal: “It is imperative that one organization take the lead in comprehensively planning and overseeing regional activities. . . . Before the Council’s role expands, clear criteria, clear objectives, clear delineation of roles and clear responsibility to monitor and evaluate the cost-effectiveness of the basin planning and implementation are necessary.” Good idea to coordinate but too soon to move on it; build on model watershed plans without central planning.

The League of Oregon Cities (738) and PacifiCorp (756) urged delaying consideration of basin watershed planning proposal.

Response: Although this proposal generated a great deal of comment, it is clear that a substantial majority of the region was not in favor of either amending the Northwest Power Act or expanding the role of the Council at this time. Based on the comment received, the proposed amendment was withdrawn for further consultation.

B. Monitoring and Evaluation/Independent Scientific Review and the Independent Scientific Group

Comments: Colville Tribes (868) said that proposed Section 5.5A.2 contains language requiring monitoring and evaluation of the impact of salmon flows on resident fish, whereas the Columbia Basin Fish and Wildlife Authority left that out of their comments. The Council should retain this section until it is replaced by something equivalent as a result of the Columbia Basin Fish and Wildlife Authority upriver/downriver process.

Response: The Council has left this measure in the amended program.

C. Implementation Process

Comments: Upper Columbia United Tribes (937) said that the Implementation Planning Process is broken. The following actions would provide \$1-3 million more for on-the-ground work, provide a strong Council role as Congress intended, and allow the agencies and tribes to develop the program:

- Northwest Power Planning Council and Bonneville Power Administration get together and determine a funding level.
- Columbia Basin Fish and Wildlife Authority develops a master plan.
- Plan goes back to the Northwest Power Planning Council for review, and out for regional review.
- Northwest Power Planning Council comments and changes, if necessary.
- Northwest Power Planning Council tells Bonneville Power Administration to fund.
- Bonneville Power Administration funds the plan.

In addition, resident fish and anadromous fish need to be considered together in a concurrent time frame as occurred in the 1987 Fish and Wildlife Program, and not in two separate programs. Such a combined program would help with upriver/downriver debate as well as would streamline the Council’s program.

Response: The points made are good ones. As noted in the findings on Section 1, the Council has called for Bonneville and the fish and wildlife agencies and tribes to explore transfer of the administration of Bonneville’s fish and wildlife program responsibilities to an entity formed by the fish and wildlife managers. Once it is clearer as to how this proposal might be addressed, the Council can consider amending the

implementation portion of the program. The Council did not otherwise amend this section because the issue is in flux. While it is not possible to say what form the process will take in the future, the Council believes it would be unwise to abandon the old process before the new implementation process is in place.

D. Center for Regional Biological Analysis

Comments: Columbia Basin Fish and Wildlife Authority (629) opposed the regional biological analysis center proposed in Section 3.2F.1, because it is a complicated way to use what already exists; Bonneville and National Marine Fisheries Service should simply fund the Regional Analytical Work Group. Yakama Indian Nation (730) said that regional analytical methods coordination should be staffed by state, federal and tribal entities, with consultation from other experts when needed; center should be fully independent, “not weighted to any particular agency or tribes.” Bonneville Power Administration (750)

Bonneville Power Administration does not support the development of a center for biological analysis; depending on how this group was managed and influenced by different agencies, there is great potential for politically influenced analyses with significant weight on program direction and regional actions.

Pacific Northwest Generating Cooperative (719) suggests adoption of a center for a regional biological analysis jointly administered and funded by National Marine Fisheries Service and Bonneville; acceptable analytical tools are critical to the program’s success and “must be developed independent of political agendas or entrenched viewpoints.” William Stelle, National Marine Fisheries Service (891) said the regional analytical center is worth full consideration.

Direct Service Industries (749) said they support focused research to promote salmon survival; program offer a confusing hodgepodge of new scientific entities, whose roles are unclear and potentially conflicting.

Response: The Council believes that while considerable progress has been made in the last few years in the development and coordination of biological analytical tools, substantial inefficiencies continue to hamper development of systemwide regional analysis. Therefore, the Council supports the development of a regional center, staffed by the various entities involved in regional efforts such as this program and activities in connection with the Endangered Species Act. The mission of the center will be to foster a coordinated and objective approach to development of analytical tools and analysis.

III. MAINSTEM

A. Mainstem Hypotheses

General Comments

Comments: We strongly support the approach of stating explicit hypotheses to aid monitoring, evaluation and research. Lee (79); Bonneville Power Administration (123); Mundy (111). The Scientific Review Group finds the approach both timely and much needed. Scientific Review Group (134) The draft sets the right tone for action without dictating specifics. Mundy (111); Calvin (34). The paper should encourage scientists to raise the right questions and try to find the answers. Calvin (34). This approach should also be used in other contentious areas. Edwards (114). While we may not agree wholeheartedly with the flow, velocity, survival hypothesis, the important contribution of this exercise is the development of a process to test the validity of the hypotheses. Douglas County Public Utility District (97). The hypotheses should guide both evaluation (adaptive management) and research (empirical studies). Pacific Northwest Generating Cooperative (117).

We commend the Council for recognizing that inriver and transportation passage alternatives are intertwined, complex, and not as well understood as we would like. Because water velocity is not the only variable affecting smolt survival and subsequent, adult returns, the Council's hypothesis approach should provide the necessary process to resolve this controversial issue. Bonneville Power Administration (123).

Response: The Council appreciates these comments.

Comments: Idaho Fish and Game urges the Council to take a position on the relationship between flow, velocity and survival. The term "hypothesis" is too weak; the statements now constituting the proposed flow, velocity and travel time hypothesis should be characterized as "positions." The bottom line is that increased flows mean increased fish survival. The next ten years may be important in advancing the region's scientific understanding of these relationships, but they also will be critical to the survival of weak stocks. Success or failure will depend more on strong action than aggressive learning. Idaho Department of Fish and Game (130).

Response: In the mainstem hypotheses amendment process, the Council declined to take a "position" on these questions. The Council said that to do so would imply that it knows more than it really does, and undermine one of the purposes of the hypotheses -- to advance scientific knowledge of these questions. Our knowledge of how to manage a developed river system in ways that minimize harm to wild species is imperfect, the Council said, and that is a reality the region simply has to face. Just as it is unproductive to contend that such uncertainties absolve us of the need to act, we cannot pretend that the uncertainties do not exist. The Council reiterated that uncertainty does not eliminate the need to act on the basis of existing knowledge. In stating hypotheses the Council stresses the need to learn from these actions. In the amendment process that began in August, the Council took further actions that can help test the hypotheses, while continuing to underscore the need for further analysis.

Comments: It will be difficult to ensure institutional support for a long-term evaluation. If either transportation or flow augmentation is discontinued, then one interest or another will try to derail the test. The Council should seek agreement among the parties that flows, spills, transportation and other established measures will continue throughout the test. Lee (79). Some assurance will be needed that manipulations of the fish populations will be held constant for the duration of the experiment; this could mean that all hatchery, harvest, and river managers would provide their best guess as to their actions over the period of the evaluation, and then stick to their prediction. Peterman (132).

Response: The Council kept this advice in mind as it considered substantive amendments to the mainstem passage sections of the fish and wildlife program in the fall of 1994. The amendments the Council adopted in December, 1994, call for a careful and direct comparison of inriver measures with transportation, in a spread-the-risk evaluation.

Comments: While we laud the Council's desire to foster scientific work on these issues, the hypotheses may actually impede progress by distracting attention from the central fact that there are no good data for a flow-survival relationship, and flow proponents will continue to mask this and resist evaluation. Pacific Northwest Generating Cooperative (117); Direct Service Industries (124). Instead of adopting the hypotheses, support the National Marine Fisheries Service/University of Washington studies with Passive Integrated Transponder tags. Douglas County Public Utility District (97); Pacific Northwest Generating Cooperative (117).

Response: One of the characteristics of this debate is that various sides feel that the existing data clearly points in a single direction -- albeit each side sees the data pointing in opposite directions. This is one reason the Council feels compelled to clearly state its own working hypotheses. The Council finds sufficient data to accept the hypotheses stated in the amendments, but strongly believes that better scientific information

is needed. The Council supports the National Marine Fisheries Service/University of Washington studies, but there is a need to fit these studies into the entire life cycle of these fish. In the amendments adopted in December, the Council accepted recommendations of the fishery managers to call for significant new measures to improve mainstem passage, but also emphasized the need to evaluate the relationship further.

Comments: Because this will be an expensive undertaking, consider cost-sharing, prioritizing studies, and a funding cap. Change the provision on p. 9, lines 22-30 to call for Bonneville and the Corps of Engineers to fund the evaluations “as soon as possible.” Bonneville Power Administration (123).

Response: One of the central purposes for the rulemaking is to emphasize the urgency of making progress on these scientific questions. While the Council encourages cost sharing in general, the questions to be addressed in this area of research are aimed directly at the effects of the hydroelectric facilities on salmon and steelhead. Bonneville has flexibility under Section 4(h)(10)(C) of the Northwest Power Act to allocate the costs of this work to other project purposes. For these reasons, the Council believes it is important to progress with this work on an expedited basis, and not to allow discussions of cost-sharing to slow it down. While the Council deleted the phrase “as soon as possible” from the final amendments, it did so because of substantive changes to this part of the amendments, not to undermine in any way the sense of urgency that should attend this work.

Comments: The Council should be cautious about relying on non-peer reviewed studies. Corps of Engineers (120). Supporting elements should contain only statements about which there is consensus in the scientific community. Pacific Northwest Generating Cooperative (117).

Response: The Council agrees that as a general matter, studies that have had review and analysis by independent scientists are entitled to greater credence. Similarly, consensus in the scientific community may be a good indicator of a strong hypothesis. Unfortunately, little information on either of the Council’s hypotheses has appeared in peer-reviewed studies. To limit the supporting elements to those on which there is consensus would exclude most of the available information, which would be inconsistent with Section 4(h)(6)(B) of the Northwest Power Act. The Council must act on the best available scientific knowledge, regardless of whether peer-reviewed studies have been conducted. The Council also has a responsibility to give “due weight” to the expertise, authorities and rights of the fish and wildlife agencies and Indian tribes. At the same time, the Council encourages researchers to submit their results for peer review and supports peer review efforts such as that proposed by the Scientific Review Group.

Comments: The formulation of hypotheses may not be the “critical first step.” Instead, the hypotheses need to be presented in a context that makes clear their connections to the objectives of the Fish and Wildlife Program, the conceptual framework, and a problem statement specific to passage survival. At the same time, translating the hypotheses into evaluation efforts will take time and work. The Council should not forestall action while this process proceeds. Scientific Review Group (134). The Council should consider adopting realistic survival standards for smolt passage and other life stages to return adults. Douglas County Public Utility District (97).

Response: The Council agrees that the development of a conceptual foundation is important, and the final amendments ask the Independent Scientific Group to do this work. This foundation could help inform the development of survival standards for various stages of the salmon life cycle. The framework could address important areas for scientific inquiry that are not now addressed in the region’s fish and wildlife programs. While efforts are being made to develop this foundation, mitigation activities necessarily proceed.

One of the essential purposes of developing a framework is to ensure that management actions such as flow or velocity augmentation or transportation fit within an experimental program. The development of the framework should be overseen by the Independent Scientific Group, which will need flexibility in determining how best to evaluate key uncertainties. At the same time, the hypotheses and supporting elements do not themselves authorize particular mainstem operations, and the Independent Scientific Group

should not understand this section as authorizing substantive changes in mainstem operations that are not called for elsewhere in this program.

Comments: Idaho Fish and Game urges the Council to adopt a 140,000 cubic feet per second water velocity standard for the Snake River, recognizing that the lower Snake dams dramatically decreased water velocities and salmon survival; and recruit/spawner ratios of 2 to 1 as a biological objective. Idaho Department of Fish and Game (130). Another commentator suggested a minimum 110,000 cubic feet per second through Lower Granite and 250-300 cubic feet per second at The Dalles. Menke (40). The Corps of Engineers commented that shaping the flow pattern in the river to mimic the pre-development timing and frequency of flow changes may be more beneficial than simple flow augmentation. Corps of Engineers (120). Anticipating the Council's next rulemaking process, a number of commentators urge the Council to take action to improve survival in the mainstem, through flow augmentation, reservoir drawdowns, spill and ending transportation (Marks (129); Idaho Steelhead and Salmon Unlimited (118); Idaho Department of Fish and Game (130); Northwest Sportfishing Industry Association (106); Wonacott (107); Richmond (98); Kovalicky (99); Smith (95); Connell (96); Hayes (91); Williams (90); Wolf (92); Girvan (92); Evans (76); Williams (77); Scullen (78); Pauley (44); Tolleson (43)), or constructing a migration pipeline. Wolfe (75).

Response: The Council did not propose to adopt water velocity, recruit/spawner, or flow objectives in the mainstem hypotheses process, or to authorize particular changes in river operations. The purpose of the process was to state the rationale behind many important measures in other parts of the program, and to emphasize that they are experimental and need to be evaluated. However, the Council adopted several recommendations based on these suggestions in the amendments adopted in December, 1994. These recommendations are addressed separately in Findings.

Statement of the Hypotheses

Comments: The hypotheses are reasonable explanations of the available observations. To solve problems, we must start with internally consistent explanations of the facts, which are subsequently tested for validity. These hypotheses are acceptable starting points for this process. Mundy (111). The hypotheses are too vague; they should be as clear and concise as possible. Pacific Northwest Utilities Conference Committee (122). The hypotheses lack sufficient detail to provide research direction, although they provide a clear indication of the general areas the Council believes should be pursued. Scientific Review Group (134).

The Council should state scientific, not policy hypotheses. Bonneville Power Administration (123); Pacific Northwest Generating Cooperative (117). The hypotheses should be stated in scientific format, or not characterized as hypotheses. Corps of Engineers (120). Bonneville offers specific null and alternative hypotheses. Bonneville Power Administration (123). It is appropriate to state the hypotheses as you have, rather than as null hypotheses. The low statistical power of most ecological data sets makes meaningful tests of such data difficult. It also is appropriate to avoid the idea that the hypotheses will be "tested;" rather, as the Council suggests, the hypotheses will be refined over time. Peterman (132).

Response: The hypotheses are intended to be starting points from which scientific experiments can be developed, as Dr. Mundy says. The Council is not equipped to develop detailed hypotheses in scientific structure and parlance. Rather, the Council's purpose is to state the assumptions on which many important mainstem measures are based, acknowledge that our knowledge of these relationships is imperfect, and emphasize the need to learn more. Having done so, the Independent Scientific Group is better able to oversee the scientific efforts to address these issues. The Council changed the reference from "tested" to "refined."

Comments: It is appropriate to focus on carrying evaluation through to adult returns. Peterman (132); Menke (37). We agree that adult spawners are the "bottom line," but linking adult returns to any environmental variable in juvenile migration conditions is problematic; multivariate analysis will be needed. Juvenile survival will continue to be the most direct measure. Bonneville Power Administration (123). We

agree with the Council's recognition that mainstem passage survival is a function of more than just water velocity and transportation. Douglas County Public Utility District (97).

Response: The Council recognized both that adult returns are the ultimate question of interest, and that evaluating the effect of particular environmental conditions on adult returns is extremely difficult to discern. Indeed, parties as disparate as the fish managers and the Columbia River Alliance appeared to converge on this point in the fall 1994 amendment process. The Council assumes that individual evaluations will necessarily have to focus on particular aspects of the life cycle, including juvenile survival, estuarine and ocean survival, and the upstream migration. Ultimately, however, the region will have to find ways to link these individual studies to an overall picture of the life cycle to adult returns. The Council understands that the task is complex, and ultimate answers will be elusive.

Comments: I endorse the idea of coupling evaluation of the flow-survival relationship with evaluation of transportation effectiveness. Menke (37).

Response: The Council strongly believes that evaluation efforts will be facilitated by maintaining this linkage, which will provide a kind of basis for comparison. A fundamental problem faced by the region every year is the decision whether to transport fish or leave them in the river and attempt to improve flows and velocities. Both sides of the issue marshal scientific information to support their positions. In order to address this issue, the Council linked hypotheses on these key issues, and called for an ambitious evaluation to focus on the relative merits of these actions. A second fundamental question deals with whether either mode as now designed provides survival necessary to support rebuilding. This question should be addressed as part of the development of rebuilding schedules.

Comments: The hypotheses do not account for confounding variables (e.g., low survival in a low flow year might be explained by tributaries having frozen over because winter stream flows were low). The impact of higher flows on returning adults should be considered. Public Power Council (121).

Response: It is quite true that there are many such confounding variables and incidental impacts, which must be sorted out in a disciplined scientific process. It was not the Council's purpose in this process to identify and specifically account for each one, but to state our understanding of these relationships to make clear the program's rationale for action in other parts of the program, and to encourage and focus scientific investigation.

B. Flow Hypothesis

Comments: The hypothesis will not guide further studies; this is the same hypothesis that has been the basis for past studies. Pacific Northwest Generating Cooperative (117); Pacific Northwest Utilities Conference Committee (122); Corps of Engineers (120).

Response: The hypotheses are consistent with those implied in the fish and wildlife program throughout the Council's history. However, the Council believes that debate over the mainstem research has been hindered by a lack of clarity in the assumptions underlying mainstem actions. The Council hopes that by explicitly stating these assumptions, scientific evaluations will be facilitated.

Comments: The only uncertainties in the data regarding the flow-survival relationship are how beneficial flows are at given levels, not whether they are beneficial. Idaho Department of Fish and Game (130); Sierra Club (126). What are the "scientific uncertainties" the Council refers to in its issue paper? Sierra Club (126). This relationship cannot be quantified to the satisfaction of the opponents of flows, at least in the near term; any test will only produce more debate. The Council cannot wait to act until scientific verification is indisputable, although careful monitoring and evaluation of recovery measures is appropriate. Sierra Club (126); Friends of Earth (105). The relationship between higher flows and improved fish survival is not a hypothesis, it is proven. Action is needed. Friends of Earth (105); Northwest Sportfishing Industry Association (106); Sierra Club (126).

The hypothesis should posit a relationship between flow, travel time and fish survival. While data show benefits in low flow ranges, the benefits flatten out or disappear at higher flows. All supporting elements but the first paragraph of "e" should be deleted. Once more is known about other aspects of juvenile survival, additional hypotheses can be developed. Pacific Northwest Generating Cooperative (117). Smolt survival is affected by a host of variables, so there should not be an overemphasis on flow-survival. Bonneville Power Administration (123); Douglas County Public Utility District (97).

There is no defined relationship between travel time and water velocity. There are no data on the relationship between travel time and survival except at extremely low flows. Pacific Northwest Utilities Conference Committee (122).

Response: The Council received comments from parties who said that the available data clearly show a positive and definite flow/velocity-survival relationship. Other commentators said that the same body of information showed that there was clearly no such relationship. A similar debate surrounds transportation. This dichotomy simply reinforces the need for the Council to explicitly state its working hypotheses. The Council finds sufficient reason to believe that increasing water velocity increases salmon survival to adopt inriver objectives and measures recommended by the fishery managers, but also finds that there is uncertainty about the degree of benefit of particular measures. The flow-velocity-survival hypothesis and supporting elements acknowledge this. Within this broad hypothesis, there are a number of uncertainties, many of which are referred to in the supporting elements -- for example, the mechanisms that relate flow in the outmigration to returning adults, and the differences that may exist between races of fish, hatchery versus wild populations. The supporting elements are intended to make explicit what we assume to be true about these underlying mechanisms, so that they can be evaluated.

Comments: The flow-survival hypothesis will not help generate objective, empirical data, but is designed to serve a particular agenda. Eight of ten supporting elements refer to flow and water velocity, which include only information that tends to support your premise. Direct Service Industries (124).

Response: In stating its hypotheses, the Council seeks to clarify the assumptions under which it is working and upon which program measures are based. It is not seeking to characterize the views of different

parties. The Council's purpose is to determine whether and to what extent flow and velocity augmentation and transportation benefit salmon and steelhead. In the final amendments, the Council added more detailed supporting elements to the transportation hypothesis, based on the U. S. Fish and Wildlife peer review study conducted by Mundy, et al., the Council's technical workshop on transportation, and the comments the Council received.

Comments: Studies would have to be partitioned to examine particular life stages. The hypothesis could be broken down in this fashion. Corps of Engineers (120); Bonneville Power Administration (123). Discrete components such as the "biological window" and other subjects listed in the supporting elements should be evaluated. Bonneville Power Administration (123).

Response: The Council assumes that aspects of the life cycle will have to be partitioned for experimental purposes, although this judgment is for the Independent Scientific Group in the first instance.

Comments: The hypothesis confuses the question of flow-survival and the question whether we can attain certain survival levels. The second question should not be addressed by the hypothesis. Bonneville Power Administration (123).

Response: This comment apparently addresses the need to both determine how velocity augmentation and transportation compare and to determine survival levels needed to support rebuilding. The Council proposes to address the first question through an adaptive experiment while the second should be addressed in the development of rebuilding schedules.

Comments: Slackwater reservoirs deplete energy reserves of juvenile salmon, and are likely to facilitate the horizontal transmission of disease. These factors are compounded by stresses from collection and containment in high-density tanks, raceways and barges. Menke (37).

Response: The effect of these factors should be apparent in an experiment comparing transportation and river passage, particularly if the experiment can include a comparison with fish that did not enter the bypass systems. It is unclear if an experiment that includes the latter aspect can be designed, but it should be considered.

Comments: The relationship between flows and survival is not correctly characterized by the Sims and Ossiander or Raymond data. Recent PIT tag data show much higher survivals. Bonneville Power Administration (123). Data on flows and survival are based on a river system that no longer exists; we need better data before making additional decisions. Pacific Northwest Utilities Conference Committee (122).

The Sims and Ossiander data emerged from particular river conditions that masked the benefits of higher flows. Taking these factors into account, the benefits of 140,000 cubic feet per second are clear, as documented by Raymond and Petrosky. Idaho Department of Fish and Game (130). The Iwamoto, et al. data referred to in the discussion paper are consistent with the Sims Ossiander data in that they tend to show that the first pool encountered by juvenile migrants does not appear to exact a high mortality, even under moderately low flows. Cumulative effects through several pools, however, show much higher mortality; it is a mistake simply to extrapolate from the Iwamoto data. Idaho Department of Fish and Game (130).

Response: The Council agrees that there are many problems in interpreting the Sims and Ossiander data. At the same time, while the research methods that are being used by Iwamoto et al. are promising, it is too early to draw conclusions from that research. The Council also is reluctant to expand information from a portion of the river to the entire river. For this reason, we feel that installation of PIT tag detectors in the lower river should receive the highest priority.

Comments: The "uncertainties" section of the flow hypothesis should be deleted. Uncertainties should be considered in evaluation; as written, however, this section appears to state an alternative hypothesis

that would make testing difficult. Oregon Department of Fish & Wildlife (119). We agree that these uncertainties are critical. Douglas County Public Utility District (97).

Response: The purpose of the “uncertainties” paragraph following the flow-velocity-survival hypothesis is to clarify the nature of the uncertainty the Council sees. By doing so, the Council hopes to focus research, monitoring and evaluation on these uncertainties.

Comments: Supporting element a: The University of Washington study of sub-yearling survival in the mid-Columbia was seriously flawed by use of lower river tule chinook releases as controls. Consistent releases of tagged sub-yearlings from Priest Rapids hatchery provide an opportunity to evaluate survival if a suitable control can be found to separate ocean effects. Douglas County Public Utility District (97). We caution you against using non-peer review studies such as Petrosky (1992), which have technical problems. What are the “similar relationships” noted on p. 5, lines 17-18? Corps of Engineers (120). Figure 1 hypothesizes one line, but others may be as reasonable; what is the unit of observation, a year? Calvin (34).

Response: The Council is aware of the limitations of this study and that the analysis is still being finalized. The Council has not endorsed the results but mentioned them to summarize the limited data available on the needs of summer juvenile migrants. The “similar relationships” have been developed by the fishery managers particularly in response to the settlement discussions associated with *Idaho Department of Fish and Game v. National Marine Fisheries Service, et al.* Other hypotheses for Figure 1 are certainly possible. The Council did not endorse this particular representation but provided it for illustrative purposes. The unit of observation is one year.

Comments: Supporting element c: Many factors affect stock productivity, not just juvenile migration conditions. Douglas County Public Utility District (97).

Response: The Council agrees. Accounting for confounding variables such as this will be a challenge to research, monitoring and evaluation.

Comments: Supporting element d: It is likely that much of the mortality that occurs in the estuary and the ocean is unrelated to juvenile migration conditions. Douglas County Public Utility District (97).

Response: Certainly this is true. However, it also seems plausible that conditions in the river during the outmigration can affect both the time of entry into the estuary and nearshore oceanographic conditions. These factors could affect survival. The Council is interested in how human actions affect survival rates at all life stages, including the estuary and ocean.

Comments: Supporting element e: It is possible that there is a threshold above which increases in flow or velocity do little good. Rebuilding these populations should not be viewed solely as a problem of river conditions. Douglas County Public Utility District (97). The slope and intercept should probably be called parameters, not variables. Also, the intercept is not properly defined (the intercept is the value of the variable at the point where the other variable is zero). Calvin (34). Avoid the debate over which of the two lines in figure 2 is correct, recognizing that only a portion of the effects of water velocity occurs in downstream migration. Oregon Department of Fish & Wildlife (119).

Response: The Council agrees that it is possible that there is a threshold above which flow increases do little good, with full reservoirs, and that rebuilding these populations should not be viewed solely as a question of river conditions; other sections of the Council’s program address habitat, harvest and hatchery issues. The Council changed the amendments to refer to slope and intercept as “parameters.” The Council agrees that it should at this point avoid the debate over which of the two lines in figure 2 is correct, and the amendments recognize that the effects of water velocity may occur in other parts of the life cycle.

Comments: Supporting element f: A number of variables are mentioned, and you might mention that most of them are not easily measured. Calvin (34).

Response: The debate on this issue over the past decades has demonstrated that none of these factors is easily measured. The factors mentioned in the comment are included to expand the discussion of possible elements of the relationship.

Comments: Supporting element g: It is possible that spring chinook data are a surrogate for sockeye, but it is also possible that sockeye respond differently. Douglas County Public Utility District (97).

Response: The Council agrees. However, based on the discussion at the Council's technical workshop on flow-survival, the Council believes that the assumption stated in element g is a suitable working assumption.

Comments: Supporting element i: Instead of saying that ocean conditions can vary independently of river or estuary conditions, acknowledge that river and estuary conditions can compound the effects of unfavorable ocean conditions. Oregon Department of Fish & Wildlife (119). Research in the estuary and ocean is important, Douglas County Public Utility District (97), but will be difficult to do. Corps of Engineers (120). There is a possibility that ocean and atmospheric conditions will change to improve the productivity of Oregon and Washington stocks, which would confound interpretation of results. Peterman (132).

Response: The Council changed the amendments in response to the first comment. The Council agrees that the effects of estuary, ocean and atmospheric conditions will be difficult to evaluate, and are likely to make difficult the evaluation of the effect of flow and velocity on adult returns.

C. Transportation Hypothesis

Comments: A fuller process, comparable to that used for the flow-survival hypothesis, should be used to develop a transportation hypothesis. The process should include independent review of the transportation data and a workshop with experts to identify key elements of a hypothesis. Oregon Department of Fish & Wildlife (119). Remove the transportation hypothesis from the rule. Sierra Club (126).

Response: Based in large part on the commentor's suggestion, the Council held a second technical workshop to discuss and refine the transportation hypothesis. The U. S. Fish and Wildlife Service review of transportation data conducted by Mundy, et al., constitutes a thorough review of the transportation data, and the Council relied on this review in this process.

Comments: At best, under some conditions, transportation may not decrease salmon survival. Low transport benefit ratios are confirmed by the Columbia River Basin Authority report and recent PIT-tag data. Sierra Club (126). We support adoption of the flow-survival hypothesis, but it should be apparent that transportation is a failure. Washington Trollers Association (89). The paragraph summarizing uncertainties surrounding the transportation hypothesis should say that transportation may, unavoidably, cause harm, not just result in uncertain benefits. Menke (37).

The paper overemphasizes the lack of data. There are more data on transportation than on spill and turbine survival; recent results are statistically significant, and show a positive relationship for transportation. Corps of Engineers (120); Direct Service Industries (124). Delete the qualifier "under some passage conditions;" Unlike the flow-survival relationship, we have adequate data about the benefits of transportation. Pacific Northwest Utilities Conference Committee (122). The transportation hypothesis should assert that transportation produces higher survival benefits than inriver migration. Pacific Northwest Generating Cooperative (117).

Response: The Council understands the Mundy review to say that transportation can increase salmon survival under some adverse river conditions, but there is insufficient evidence to indicate that transportation alone could rebuild upriver runs. Like the velocity-survival data, the information on the effectiveness of transportation has led to strongly held, but conflicting, opinions by different parties. This can only be resolved by focused research and meaningful action.

Comments: It is possible with transportation that we are losing significantly more fish in the ocean due to impacts of stress and disease. If there are backup data to support the transportation hypothesis, include them. It is doubtful that any of the transportation improvements can offset the effects of stress and disease. Menke (40).

Response: These questions can only be resolved by research. On the other hand, it is also clear that the benefits of any mode of passage must be evaluated in light of whether it can support rebuilding. The Mundy review, and the present condition of the runs, suggests that existing actions such as transportation have not been sufficient, particularly when compounded by adverse natural survival conditions in the ocean and elsewhere.

Comments: The return of transported smolts to spawning areas has meager scientific data; this could be an uncertainty that should receive additional emphasis in research. Douglas County Public Utility District (97).

Response: The Council agrees that the return of transported fish is an area of uncertainty that merits emphasis in research. The paragraph summarizing the uncertainties regarding transportation reflects this.

Comments: Supporting element h: This element is supported by the recent independent review of transportation, funded by National Marine Fisheries Service. Douglas County Public Utility District (97). Acknowledge that virtually all transportation studies show a positive relationship between transportation and fish survival, and delete paragraph "h". Pacific Northwest Generating Cooperative (117).

Response: The Council has elaborated on supporting element h, based on the Mundy review and the Council's technical workshop on transportation. The supporting elements in the final amendments acknowledge that there appears to be a positive correlation between transportation and fish survival under some conditions, but these benefits are in relation to river conditions.

Comments: Add a supporting element asserting that the effect of predation on survival of transported smolts may be different in the lower Columbia River. Poe (125).

Response: While this was not included as a specific supporting element for the transportation hypothesis, predation is a major element of inriver passage mortality, and should be considered in transportation evaluations.

D. Research Process

General

Comments: In carrying out the experimental work, try to ensure that all parties understand the risks and potential benefits of adaptive management. For example, to those who ask why these experimental actions are undertaken, ask what alternatives are more likely to work? Avoid knee-jerk actions that cannot be evaluated. The common assumption that a new action is the solution is the main reason why it is so hard to interpret historical data, because there was no experimental design. Peterman (132).

Response: The Council agrees with these comments. By calling on the Independent Scientific Group to oversee the process of developing an adaptive framework, the Council hopes to minimize the tendency to assume that mitigation measures require no evaluation.

Comments: In the next stage of experimental design, highest priority should be on getting high statistical power for the two main working hypotheses. Before the experiment starts, decide on rigorous and firm criteria for evaluating the results (e.g., a difference of 2 percent between the mean survival rates of transported and nontransported fish will be needed to continue the transportation program). Consider a staircase research design. Insist on doing the transportation experiment with enough tags to estimate smolt-to-adult survival rate well. Peterman (132).

Response: The Council agrees that power of test is a critical factor in experimental design. Professor Peterman's help throughout this process has been invaluable, and we hope that he will continue to address these issues as the actual experimental designs of the spread-the-risk and other evaluations are developed.

Comments: Bonneville Power Administration does not agree that the Fish Operations Executive Committee should coordinate the research to address the amendment. Fish Operations Executive Committee is a policy body. We suggest use of a technical study group linked with and appointed by the Independent Scientific Group. Adopt a three-tiered process: A technical study group should be appointed by the Independent Scientific Group to formulate hypotheses and study designs, and work with researchers to implement a comprehensive study plan. Policy makers, such as the Fish Operations Executive Committee, should secure buy-in among operating agencies, tribes, and fish and wildlife agencies. Bonneville Power Administration (123).

Insist on independent scientific review of all steps of the program. Peterman (132); Corps of Engineers (120). The experimental program should not be developed, implemented and evaluated by the same entities; external input is essential. Douglas County Public Utility District (97). Testing should be initiated by an independent scientific (not politically representative) body, such as the Independent Scientific Group. This group should develop experimental design criteria; selection criteria for prioritizing research proposals; a process to permit scientific peer review of the findings. Periodic reports should allow peer review and communication to decision makers and the public. Different scientific panels could work on different aspects of this work. Edwards (114). An independent scientific committee formed by the Council, Bonneville, National Marine Fisheries Service and the Corps of Engineers should report to the Council's Fish and Wildlife Committee, not the Fish Operations Executive Committee. Pacific Northwest Generating Cooperative (117). The proposed policy and technical groups are too much like the Implementation Planning Process groups; select the technical group with extreme care. Poe (125).

The Corps of Engineers and Bonneville should create a process for establishing and reviewing regional research policy, and discuss issues with the Fish Operations Executive Committee. Corps of Engineers (120).

The manner in which the research program is organized depends on how high a priority the region puts on these questions, compared to other critical uncertainties. I rate it as high, but not at the top. It deserves a well-organized effort supported by Bonneville Power Administration, with greater emphasis by the Policy Review Group. Calvin (34).

The initial task for the technical work group should be to develop a framework for monitoring, evaluation and research. This group should oversee the assessment. Oregon Department of Fish & Wildlife (119).

Response: The Council agrees that the research, monitoring and evaluation process is most suitably overseen by independent scientists, and these responsibilities should not be lodged with implementing agencies. Accordingly, the Council has changed the final amendments to create an oversight role for the Independent Scientific Group. The Independent Scientific Group has also been asked to develop a framework for monitoring, evaluation and research. The Council calls on the implementing agencies to ensure that sufficient resources are made available to the Independent Scientific Group to carry out these additional tasks.

Comments: A number of commentors had suggestions for the manner in which the research should be carried out:

- It should be possible to combine research on flows and transportation. To the extent possible, Bonneville would be interested in implementing study designs for water velocity and transportation evaluations in which the river is manipulated to provide some control of flows. Bonneville Power Administration (123).
- When research proposals are submitted, evaluate their potential power, bias and precision, and rank them by simulating their expected performance, as is done for proposals for alternative harvest regimes. Peterman (132).
- Within nine months of the end of a migration season, comprehensive data should be archived and made publicly accessible at region's universities. The principal investigators should publish a paper reviewing the data at least every three years in a peer reviewed journal. The Council should pay page charges for at least two commentaries on these papers. If a peer-reviewed journal does not accept a paper, the Council should determine why. The value and reliability of these investigations should be reviewed by the National Research Council five years after the hypotheses are adopted. Lee (79). Review and evaluation of research proposals should be patterned after peer review process for scientific journals, including at least one reviewer from outside the region. Poe (125).
- Recognize that an adaptive approach will require monitoring to adult returns, and the primary tools will be coded wire tags and Passive Integrated Transponder tags. Oregon Department of Fish & Wildlife (119). Passive Integrated Transponder tags are unlikely to provide enough data on adult returns, because return ratios are so low. Fish might have to carry two tags -- a PIT tag and a coded wire tag to gather data. Bonneville Power Administration (123). Passive Integrated Transponder tags are unlikely to tell us much about ocean mortality. Menke (37).
- For 1995, Bonneville and the Corps of Engineers are planning a full-scale transportation evaluation using PIT and coded wire tags. The Council's action should be coordinated with this work. Bonneville Power Administration (123).

Response: The Council appreciates these observations, which will be passed on to the Independent Scientific Group as they develop the adaptive management framework and experimental program. The suggestions for screening proposals and peer review are creative, and merit consideration. Similarly, coordinating research with ongoing projects, and using appropriate tags to generate the best information on adult returns are important considerations.

Comments: The Council should not attempt to define criteria for sufficiency of information to validate the hypotheses; this is a scientific task. Pacific Northwest Generating Cooperative (117); Calvin (34). Sufficiency of information is a technical question, not a political question, and should be addressed at a scientific level. Bonneville Power Administration (123). The Council should not try to define a threshold regarding the sufficiency of information to establish a scientific hypothesis. Pacific Northwest Generating Cooperative (117).

Response: The Council agrees that it should not seek to define such criteria.

Comments: Call on the fishery managers to provide test fish. Oregon Department of Fish & Wildlife (119); Corps of Engineers (120).

Response: The Council calls for the fishery managers to provide test fish in Section 5.0F.7 of these amendments.

Comments: The studies referred to on p. 9, lines 41-43 should not be limited to the Lower Granite-to-Bonneville reaches. Corps of Engineers (120). Expedite the identification of specific indicator stocks. Oregon Department of Fish & Wildlife (119).

Response: The Council does not intend that studies addressing its hypotheses be limited to the Lower Granite-to-Bonneville area. Indeed, the hypotheses stress that the bottom line is how conditions and actions in the mainstem affect the return of adult fish. The identification of indicator stocks is called for in the Council's program. They will be an important aspect of development of rebuilding schedules.

E. Passive Integrated Transponder Tags

Comments: We support expansion of PIT tag studies and funding for installation at dams. Douglas County Public Utility District (97). The Corps of Engineers has included John Day and Bonneville PIT tag detectors in its Columbia River Juvenile Fish Mitigation Program to expedite funding, has notified Congress of this change and is awaiting Congress's concurrence before releasing funds. Corps of Engineers (120). Bonneville supports and is funding installation and use of PIT tag detectors in the lower Snake, and mid- and lower Columbia. We also support installation of facilities in the estuary. Pending installation of permanent facilities, we support portable facilities. Bonneville Power Administration (123).

Response: The Council finds widespread support for installation of PIT tag facilities, and conduct of PIT tag studies, but given the urgency of the questions the region is attempting to address, the schedule for installation needs to be accelerated. With this in mind, the Council has called for more ambitious efforts to install appropriate facilities.

III. RESERVOIR IMPACTS/CONSTRAINTS/RESIDENT FISH

A. General

Comment: Upper Columbia United Tribes called for developing a coordinated flow augmentation plan each year based on run-off forecasts. It noted the plan should include a description of the projected impacts to resident fish in Grand Coulee, Hungry Horse, Libby and Dworshak reservoirs. It should also specifically evaluate tradeoffs between anadromous fish and resident fish and be consistent with equalizing the benefits to both types of fish.

Response: During this amendment process, the Council analyzed the projected impacts and evaluated tradeoffs using the best available scientific information for these reservoirs. The result was 1) the adoption of integrated rule curves for Hungry Horse and Libby reservoirs, and 2) a call for no significant reduction in nutrient retention time in Lake Roosevelt. The Council's understanding is that the fish managers intend to evaluate resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation and submit a report next year. The Council encourages this analysis and the submission of a report addressing these matters.

Comment: Shoshone-Bannock Tribes (606) said the fishery managers, in consultation with the appropriate agencies, will integrate the flow augmentation volumes identified from the middle and upper Snake River through Brownlee Reservoir with the natural resource needs and the existing hydropower and irrigation operations of the middle and upper Snake River and with the rest of the Columbia system. Flow volumes that are to be provided for salmon must also provide fish and wildlife resource needs in the upper-river areas, where most of the flows originate.

Response: The Council agrees with this comment and encourages the fish managers to evaluate resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation and submit a report next year (see response 1).

Comment: Chelan County Public Utility District (622) supported the concept of having a set of criteria for review of proposals to impose constraints on hydro project operations, as proposed in Section 2.2E.6. The first criterion should be the existence of peer-reviewed science substantiating the linkages between such project constraints and protection of fish stocks at risk. Columbia Basin Fish and Wildlife Authority (629) would delete proposed Section 2.2E.6 establishing criteria for reservoir constraints. Supports having a set of criteria as a good idea, but Council should not develop these criteria. Instead wait until agencies and tribes submit their report to the Council in mid-February, which will examine and try to resolve issues of operational criteria. Mark Reller stated concerns about the proposed reservoir constraint criteria in Section 2.2E.6. He questioned whether these type of criteria (e.g., availability of peer-reviewed science substantiating the links between the constraints and the stocks at risk, or consideration of the effects of the constraints on other species, on hydropower and on other river users) have been fairly applied to mainstem flow, spill, and drawdown proposals and actions.

Response: Criteria have been adopted in Section 2.2E.6. The Council encourages the fish managers to use these criteria in evaluating resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation. If the fish managers identify other useful criteria, they should submit them to the Council for review.

Comment: Washington Department of Fish and Wildlife (751) said fisheries managers are working to provide, by December, proposals regarding reservoir rule curves necessary to protect resident fish and wildlife. Columbia Basin Fish and Wildlife Authority has informed the Council that February/March is more likely.

Response: The Council encourages the fish managers to pursue this activity and looks forward to receiving a report (see above).

Comment: Idaho (766) urges the Council to call on the Corps of Engineers and the Bureau to minimize the impacts of reservoir drafting on resident fish and wildlife. It notes that operations can be coordinated to benefit resident fish and wildlife and anadromous fish. It states that the Council should direct the Bureau to consider resident fish and wildlife impacts in its operations now, and not wait until the resident fish and wildlife amendment process.

Response: The Council adopted a number of measures designed to minimize the resident fish and wildlife impacts of salmon flow augmentation measures (Montana integrated rule curves, Grand Coulee nutrient retention times, considerations in Fish Operations Executive Committee planning and Fish Passage Center implementation). The Council did not receive recommendations for the Bureau *per se* to develop special protections, and is not free to adopt them without notice and public comment.

B. Montana Reservoirs

Comment: Jim Abbott, Member of Canadian Parliament, representing Kootenay East Constituency of British Columbia, stated that reservoir fluctuations have serious negative consequences for resident fish and wildlife and for cultural resources in the Canadian portion of the Columbia Basin. He noted that extreme drawdowns of Libby potentially create serious problems for waterfowl in Creston Valley. Fluctuations also expose and erode Ktunaxa/Kinbasket Heritage Sites and U.S. activity exacerbates problems caused by low snowpack in recent years. He states that Canadians must have a voice in these actions.

Response: The Council adopted integrated rule curves for Libby reservoir. These rule curves will prohibit, in most instances, severe drawdowns.

Comment: The Corps of Engineers said that it has already mitigated for operation of Libby and that no further mitigation for flood control actions should be required. The Corps of Engineers agreed with proposed funding of the additional generating units at Libby, as stated in Section 10.3B.9, although this may require legislative measures in addition to funding.

Response: The program calls for mitigation of resident fish losses caused by exceeding drawdown under the integrated rule curves at Libby Dam. This would be mitigation in excess of losses caused by flood control operations of the dam under normal conditions (integrated rule curves). The amount of loss and mitigation would be determined through negotiations between the Corps of Engineers and the fish managers.

The Council notes the Corps of Engineers comments regarding installation of additional generating units at Libby Dam. These comments should be addressed in implementing program language regarding the added generators (see section 10.3B.9)

Comment: Pacific Northwest Utilities Conference Committee (733) urged the Council to provide up to 1.2 million acre-feet from Libby to maintain reservoir flows of 11 to 20 thousand cubic feet per second at Bonners Ferry during sturgeon spawning season “for the purpose of testing the benefits” of flow augmentation to sturgeon spawning. Columbia Basin Fish and Wildlife Authority stated that Libby Dam should provide flows for Kootenai sturgeon as determined by the agencies and tribes.

Response: The Council did not receive a recommendation on this subject, and is not free to adopt them without notice and public comment. Implementation of integrated rule curves should help address this

issue. In addition, releases to provide flow for salmon and steelhead mitigation lower in the Columbia River Basin should benefit sturgeon, too.

C. Grand Coulee

Comment: Upper Columbia United Tribes supported calling for designation of a water retention time at Lake Roosevelt (Section 10.3E.3).

Response: The biological evidence for a higher retention time for water needs to be further developed. The Columbia Basin Fish and Wildlife Authority members plan to discuss this further and report to the Council in February. In the meantime, the Council adopted language that calls for no significant reduction in nutrient retention time in Grande Coulee reservoir below existing conditions.

Comment: Bonneville Power Administration suggests that the daily draft rate at Grand Coulee be increased from 1.5 feet per day to 2 feet per day, providing about 1,200 average megawatts per day, as a way to maintain the ability to meet hourly loads.

Response: The Council did not receive a recommendation on this subject, and is not free to adopt this proposal without notice and public comment.

D. Albeni Falls/Lake Pend Oreille

Comment: Upper Columbia United Tribes stated that the Pend Oreille measure should also include language funding Kalispel Tribe to assess impacts of Pend Oreille study on resident fish in Box Canyon Reservoir. It also stated that if Council approves Pend Oreille amendment, Coeur d'Alene trout pond recommendation should also be "fast tracked."

Response: The Coeur d'Alene Tribe's trout pond recommendation has been submitted in the resident fish and wildlife amendment process that will be initiated early next year. The Kalispel Tribe proposal to assess impacts of Lake Pend Oreille lake level changes should be submitted as a recommendation in that rulemaking, if desired.

E. Dworshak

Comment: Direct Service Industries notes that federal projects such as Dworshak were authorized with limited purposes and authorities, and fish enhancement is not one of them. The Council must consider whether and to what extent recommendations for project operations are lawful. In some cases, including massive releases from Dworshak Reservoir, they are not. Changing Dworshak operation to provide fish enhancement that substantially reduces power production is illegal without 1) Congress' approval; 2) a reduced allocation of project costs to power generation and, 3) non-federal sponsor funding. Public Power Council states that Dworshak is now largely operated for fish, which is not a project purpose. The Council should not assume it can call for changes in statutory project purposes without transgressing statutory purposes for the projects.

Response: Operation of Dworshak Dam is under the authority of the Corps of Engineers, which also interprets the authorizing legislation for its projects.

IV. HABITAT AND PRODUCTION

A. General

Comment: Bonneville Power Administration (750) made a general comment for all of Section 7 stating that implementation would be facilitated by a clear statement in the program that the primary reason for Section 7 is biological production and habitat. Many of Bonneville Power Administration's comments on Section 7 were relatively minor wording changes to specific measures (i.e., Bonneville Power Administration suggests changing "expeditiously fund" to "continue to fund" for a measure that Bonneville Power Administration considers ongoing).

Northwest Forest Resource Council (867) commented that the Council must involve potentially affected local land owners and businesses in development and review of habitat and production measures.

Response: The Council believes that the program is infused throughout with the premise that its activities have as their goal the survival of fish and wildlife. The thrust of this section is to ensure habitats and production will meet the biological needs of fish. In addition, suggestions for minor wording changes, for the most part, are not responded to. The Council has set forth a subregional and subbasin approach which will give opportunities to local land owners and businesses in the development and review of habitat and production measures.

B. Habitat

Comment: In Columbia Basin Fish and Wildlife Authority's (629) comments, it revised a number of the habitat provisions in the draft amendments, including revisions in the draft amendments. Some of these alterations reflected recommendations from Columbia River Inter-Tribal Fish Commission that were not incorporated into the draft rule, but many more are alterations of or additions to what Columbia River Inter-Tribal Fish Commission recommended. That is, Columbia Basin Fish and Wildlife Authority recommended wholesale changes in the habitat provisions that are not based on any August 1994 recommendations. The more significant alterations are noted below. Where nothing is said, assume either the habitat provision proposed by the Council corresponded to Columbia River Inter-Tribal Fish Commission's recommendation and Columbia Basin Fish and Wildlife Authority left it alone, or Columbia Basin Fish and Wildlife Authority altered the proposed provision to reflect precisely what Columbia River Inter-Tribal Fish Commission recommended. While those changes are sometimes noted, most of the time they are not. The main emphasis in the following comments is on Columbia Basin Fish and Wildlife Authority's additional changes.

Response: The Council wishes to acknowledge the time and effort Columbia Basin Fish and Wildlife Authority put into its comments. To the extent their comments brought forth new issues and new proposed sections which went beyond the recommendations and the Council's proposed amendments, the procedural rules of both the Northwest Power Act and the Administrative Procedures Act preclude the Council from adopting them during this rulemaking process.

Comments: Bonneville Power Administration (750) commented generally with relation to most of the habitat section of the program that the measures in Sections 7.6 -7.9 should include resident fish and wildlife considerations to reflect the program's ecosystem and watershed approach.

Response: While primarily addressing anadromous fish, Sections 7.6 -7.9 are to be read and implemented in such a way as to be consistent and coordinated with goals, policies, objectives, and other measures that address the entire program including resident fish and wildlife.

C. Land Management Activities

Comments: A number of comments were received supporting the Council's land management proposed amendments. Bonneville Power Administration asked the Council to urge states and federal agencies to ensure biologically sound grazing practices and enforce water quality standards for mining and logging. Idaho Department of Fish and Game's Anadromous Fish Management Plan which opposes any activities resulting in significant loss or degradation of habitat capable of supporting self-sustaining fish populations was submitted. Pacific Northwest Utilities Conference Committee suggested increasing riparian conservation areas, modifying grazing to be consistent with riparian conservation standards, and prohibiting recreational activities "that impact riparian reserves." The Mazamas called for aggressive action to restore degraded watersheds and riparian areas by better land management practices and regulations (attaching documents to that end, including program brochures and explanations about the work of the Pacific Rivers Council and a copy of the book by Bob Doppelt, et al., Entering the Watershed: A New Approach to Save America's River Ecosystems). Similarly, the Society Advocating Natural Ecosystems is in favor of stopping mining and grazing in riparian zones. Boise Cascade (594) suggested the Council incorporate Endangered Species Act principles such that activities on public (primarily federal) lands address the restoration of threatened and endangered species, while the responsibility on private lands is to address maintenance of these species.

Response: In Section 7.7 and appendix of the plan, the Council addresses these concerns. The program language supports biologically sound grazing practices as well as mining and logging activities that comply with water quality standards as Bonneville Power Administration requests. The Council does not have the authority to stop mining and grazing in riparian zones, as requested by Society Advocating Natural Ecosystems. The Council knows its program is felt to be too aggressive by some in calling for not only preservation but also improvements to riparian areas, and recognizes it may not be as aggressive as others would like it to be. The Council's goals are consistent with Idaho Department of Fish and Game's Anadromous Fish Management Plan. While recognizing its limited authority, the Council believes, in answer to Boise Cascade's suggestion that Endangered Species Act principles be used, that the need for habitat protection for anadromous fish goes beyond just federal land areas. In an ecosystem, everything is linked: there is no distinction between the artificial, man-made boundaries of public and private land. The evidence demonstrates that maintaining the current degraded condition of Columbia Basin watersheds would continue to hamper efforts to rebuild salmon and steelhead populations. The Council calls for participation by all private and public landowners to work together in improving watershed and therefore fish habitat.

D. Land Management Activities: Water Quality -- Including in Mainstem and Estuary

Comments: Bonneville Power Administration said the Council should urge states to enforce water quality standards and work with the Federal Energy Regulatory Commission to include minimum stream flow requirements to maintain water quality at federally licensed hydroelectric projects. Oregon Department of Environmental Quality expressed a desire to work more with the Council and stated the Council should include the objective that all program actions are to protect water quality, including restricting pesticide use in sensitive watersheds, and designing and maintaining road drainage systems in habitat areas to prevent pollution. Northwest Environmental Advocates commented that state water quality agencies and Environmental Protection Agency have not done a good job implementing Clean Water Act requirements and that the Council should pressure federal and state agencies to be more aggressive and support their attempts to obtain additional funding.

Response: The Council does urge the states to enforce water quality standards, as both Bonneville Power Administration and Northwest Environmental Advocates request. It also urges states to work with

Federal Energy Regulatory Commission on appropriate issues. The Council would be pleased to work with the Oregon Department of Environmental Quality program. Its stated objectives are consistent with the program's goal, policies, and objectives. Program language calls for meeting state and federal water quality standards. The Council will work with the agencies responsible for enforcing standards to procure adequate funding.

E. Water Quantity/Water Rights

Comment: Columbia Basin Fish and Wildlife Authority (629) suggests specific changes, altering Sections 7.8F, Water Regulation; 7.8G, Instream Flows; 7.9, Subbasin Water Projects; and 7.10A, Accelerated Screening. Additionally, Columbia Basin Fish and Wildlife Authority submitted several new sections, including Section 7.8F.2 calling for funding of a programmatic study to evaluate cumulative impacts and mortalities associated with cumulative passage delays that salmon encounter while navigating passage through many diversions; Section 7.8F.3 providing increased funding for state water resource agencies to increase monitoring and evaluation of water use and diversions given that excessive water withdrawal is a major factor affecting fish production and that in many critical watersheds there is an insufficient level of monitoring and enforcement to prevent unauthorized or illegal withdrawals of water; and Section 7.8F.4 calling for funding to evaluate the use of “private-sector auditing systems (such as that used in Canada) to monitor water use in the Columbia basin.”

Other new sections include: Section 7.8F.7 calling on the Bureau of Reclamation to immediately cease contracting for the sale of uncontracted firm yield of any Bureau project, to immediately cease renewal of water contracts for more than one year until fish flows and water quality are improved, to prepare a programmatic Environmental Impact Statement on the impact of renewed water contracts, and to develop a plan for a surcharge on all water and power sales to generate funds for a fish and wildlife restoration affected by Bureau projects (this proposal is fashioned on the Central Valley Project Improvement Act.). Also, Section 7.8G.5, which would add to the water leasing demonstration projects a call to investigate the feasibility of replacing surface water diversions with ground water sources in appropriate tributaries and developing at least one demonstration project. Columbia Basin Fish and Wildlife Authority noted that the replacement of surface diversions with ground water may improve surface flow in critical spawning and rearing areas and negate the need for fish screens. California Department of Fish and Game, with other agencies, has successfully implemented several of these projects in the upper Sacramento River Basin to benefit chinook salmon and steelhead.

Columbia Basin Fish and Wildlife Authority revised other sections. Existing Section 7.8F.2, concerning improved enforcement of the duties of water rights holders, was revised into a new Section 7.8F.5 that provides that diversions should not only have flow measuring devices but also lockable headgates and that calls for an annual progress report by state water resource departments. Various provisions of Section 7.9, Subbasin Water Projects, were altered, mostly in minor ways. Changes proposed to the Willamette subbasin measures include: update Section 7.9A.2 to reflect that the McKenzie temperature control studies are complete and the results indicate that temperature control devices would be beneficial and stating that the modifications should be 100 percent federally funded; modify Section 7.9A.3 to ensure that both minimum flows and ramping rates below Willamette projects be modified to prevent fry stranding and loss of fish production; and Section 7.9A.8 to reflect that the instream flow study at the Eugene Water and Electric Board projects was completed several years ago and the licensing process for the Leaburg/Waltermville project is nearly complete.

With regard to the Umatilla Subbasin, new language in Section 7.9B.2, concerning McKay Reservoir, called on the Bureau to report semi-annually on progress toward ending water spreading in the Umatilla basin, to ensure that no new water is spread, to reduce the irrigation district contracted space in the reservoir by the amount that had been delivered without authorization, to reallocate that water to instream uses with

senior water right dates, and to recover the government's full cost of water delivered outside irrigation district boundaries.

In the Grande Ronde Subbasin provision, Columbia Basin Fish and Wildlife Authority deleted the specific language on a water temperature evaluation in Section 7.9C.1 and called more generally for the implementation of riparian protections and restoration projects through the model watershed. The changes were intended as an update and to indicate that addressing water temperature problems alone will not solve the problems in the subbasin.

With regard to the irrigation diversion screening provisions in Section 7.10A, Columbia Basin Fish and Wildlife Authority made a number of minor editorial changes that are not summarized here. More significant changes include those to Section 7.10A.3 calling for a prioritized list of screening projects and consideration of innovative approaches to end diversions rather than simply adding screens to diversions, such as switching to electric pumping on groundwater sources. Columbia Basin Fish and Wildlife Authority also added language calling for a list of diversions where inadequate screens are a secondary problem when compared to the way in which the diversion simply impairs instream flows. Columbia Basin Fish and Wildlife Authority explained this change by noting that chinook and steelhead no longer utilize many small tributaries because of low instream flow as a result of surface diversions; often insufficient instream flow is a greater problem than the lack of a fish screen.

With regard to Section 7.10A.4, concerning funding for screening, Columbia Basin Fish and Wildlife Authority deleted the Council's proposal for an increase in funding to \$15 million per year to expedite the screening effort, stating instead that progress is being made and should continue. Columbia Basin Fish and Wildlife Authority explained that nearly 50 fish screens are currently being installed per year in Idaho and Oregon and to further accelerate the program would require additional personnel and infrastructure. It noted that pre-project coordination with water users is the major limiting factor to the programs and that an 8-year program (by 2002) at this pace would assure that the screens installed in the Basin are of high quality.

Columbia Basin Fish and Wildlife Authority added language to Section 7.10A.5 reflecting that many inadequate screens still exist on public lands and that the Forest Service and Bureau of Land Management need to proceed with screening actions. Also, these screens must meet Fish Screening Oversight Committee criteria and implementation must be coordinated with the state anadromous fish screen programs.

Columbia Basin Fish and Wildlife Authority modified proposed Section 7.10A.7 to call for the states to amend their water laws to require the forfeiture of water rights after three, not five, years of unscreened or substandard screened diversions. Columbia Basin Fish and Wildlife Authority noted that potential forfeiture of water rights is a good incentive to provide screening, but five years is too long to wait. Columbia Basin Fish and Wildlife Authority also added language calling on the states to evaluate government subsidies for the funding of screens where the water users have been diverting significantly more water than allowed by their water right. Columbia Basin Fish and Wildlife Authority explained that taxpayer subsidies for fish screens have been greater in many instances than what they would have been if users were only diverting the amount allowed under their right.

Response: As noted above, the Council was not able to include many of Columbia Basin Fish and Wildlife Authority's comments as amendments because they were not the subject of recommendations, or otherwise proposed in the draft amendments, and therefore could not be adopted without proper notice and comment (Sections 7.8F.2-5, 7.8F.7, 7.8G.5, 7.9B.3, 7.9C.1, 7.10A.3). The Council strongly supports consideration of these ideas in the revision of subbasin plans. In various provisions of Section 7.9, Columbia Basin Fish and Wildlife Authority made minor alterations incorporating updates into the program. The Council adopted these changes. With regard to Section 7.9C.1 concerning the Grande Ronde Subbasin, the Council believes it is important to continue with the water temperature study. The Council did not agree with Columbia Basin Fish and Wildlife Authority's proposed deletion of the proposal for \$15 million per year to

expedite screening efforts. We retained this provision, believing that it is necessary to expedite screening efforts which are vital to achieve the habitat goal. Columbia Basin Fish and Wildlife Authority suggested a timeline of completion by 2002 which we feel is not soon enough. We continue to call for completion of these efforts by 1996, which we believe to be a reasonable length of time, more effective and necessary for protecting fish resources.

The Council incorporated Columbia Basin Fish and Wildlife Authority's suggested revisions to Section 7.10A.5 requiring screens to meet Fish Screening Oversight Committee criteria. The Council believes that these criteria, but their specific addition to this section adds clarification. Columbia Basin Fish and Wildlife Authority asked that Section 7.10A.7 be amended to call states to amend their water laws to require the forfeiture of water rights after three, not five, years of unscreened or substandard screened diversions. In the draft amendments, this issue was presented in Section 7.6 as a three year limit and in Section 7.10A.7 as a five year limit. The Council has decided the three year standard will be more effective and adopted it in this section.

Comment: Oregon Water Resources Department submitted a host of instream flow and water rights comments. These included: the proposed amendment to require forfeiture of water right for unscreened diversions creates complex legal problems for water rights not originally conditioned on screening; Oregon Department of Fish & Wildlife's screening program provides appropriate enforcement authority; resources have not yet been identified to accomplish the full range of actions called for in the Council's program to increase instream flows on available space in Bureau projects such as McKay; the Oregon Water Resources Department is concerned about expressions in the program that state water laws are not being enforced as Oregon Water Resources Department's monitoring indicates few problems.

Response: The Council recognizes that forfeiture of water rights for unscreened diversion may cause legal problems as suggested. But the threat of water rights forfeiture is likely to be very effective in obtaining compliance of this illegal activity. The Council calls on the states to develop legislation that will authorize forfeiture in cases where objectives are being ignored. The Council will work with Oregon Water Resources Department to address concerns about limited resources available to implement program measures. In addition, the Council requests reports on state water law monitoring and is pleased that these reports indicate few problems.

Comment: Save Our Wild Salmon (628) called for the operation of all Bureau of Reclamation reservoirs to maximize flow benefits in mainstem and in tributaries for salmon spawning, rearing and migration and for other aquatic species, the increase of available water by eliminating waste and unauthorized use through administrative and legislative procedures which would adopt and enforce strong water conservation laws and standards, field assessments for long-term streamflow commitments that should be integrated into Bureau of Reclamation projects, watershed management plans to be conducted where information on fish flow needs in various tributary reaches is inadequate, new authorities to protect instream flows where existing laws are insufficient, screen promptly all unscreened water diversions, fully mitigate fishery impacts before new state or federal diversions are approved, and to finance instream flow purchases.

Response: Save Our Wild Salmon's requests were not the subject of recommendations, or otherwise proposed in the draft amendments, and so the Council could not adopt them without notice and comment. It is the law that fishery impacts be fully mitigated before new state or federal diversions are approved. The Council is aware that water laws are not consistently and uniformly enforced, and we encourage that the proper authorities do so. The program contains measures which address and are consistent with the other requests here.

Comment: Bob Hoeffel, a consultant for the Oregon Water Coalition (388) submitted comments opposing inclusion of the Umatilla Basin Project in the Council's program and opposition to any significant Council action on water spreading. He makes a general criticism that the draft amendments reflect too little consideration for agriculture and irrigation. More specific comments included deleting proposed Section 7.8H.4 (irrigation surcharge); opposing the change in Section 7.8J.1 calling for "interstate mechanisms" for

coordinated planning to protect Columbia water from additional harmful appropriations; and a criticism about existing Section 7.9B.2 which calls for the use of 6,000 acre-feet in McKay Reservoir for flow augmentation in the Umatilla, on the ground that this water is still agricultural water and the project purposes cannot be changed.

Response: The Council dealt with the Umatilla Basin Project several years ago and did not reopen it during this rulemaking process. The Council disagrees that it gave little consideration to agriculture and irrigation. When the survival of wild stock is at stake, the Council is required by law to develop a program to protect, mitigate, and enhance fish and wildlife, 16 U.S.C. §839b(h)(7), and the needs of agriculture and irrigation do not have priority. The Council believes that water spreading is an issue that needs to be addressed and potentially could provide additional instream flows for fish. The other issues raised are new ones and could not be considered during this rulemaking process.

Comment: Corps of Engineers (728) stated that the Council “should go beyond the issue of spread water and review the efficiency of all water use. By eliminating inefficient water use, more water would be left inriver than by draining all the storage in the Snake River Basin.”

Response: The Council calls for review of the efficiency of all water use, as well as water spreading, in the program.

Comment: WaterWatch of Oregon (748) had a number of comments. It supported continued moratoria on new water withdrawals in the basin; stated the Council’s language needs to be stronger urging states to eliminate wasteful uses of water and to ensure that conserved water provides some instream flow benefits; supports language in Section 7.9A calling for use of stored water for minimum flows in Willamette basin; supported an irrigation surcharge; stated that minimum flow provisions in Umatilla Basin are stuck in the Oregon Water Resources Department’s administrative process and thus requests the Council to add a new Section 7.9B.13 calling on Oregon Water Resources Department to “Process water rights providing for McKay Reservoir storage and releases for instream flows.”

Response: The Council has taken a strong position urging states to eliminate wasteful water use. We would be happy to work with the affected parties to assist them moving the process forward in the Umatilla Basin Project. The proposed language does not address a recommendation and, therefore, can not be amended into the program at this time.

Comment: Bonneville Power Administration (750) asked the Council to urge states to compel compliance with diversion screening requirements and limit withdrawals from already over-appropriated streams and river reaches. Bonneville Power Administration stated the Council could be instrumental in helping the region develop an interstate compact for coordinating the recognition and protection of instream water rights.

Response: The program already calls on the states to complete compliance with diversion screening requirements and limit withdrawals, as needed to benefit fish, from streams. We encourage Bonneville, and the region, to develop an interstate compact as described and will participate in any such effort.

Comment: Idaho (766) supported obtaining additional water for instream flows only on a willing seller/buyer basis and supported a call for water bank prices to achieve market levels, but opposed the waiver of water bank rules, such as the last-to-refill rule, which protects spaceholders who have not leased their water. Idaho also stated the elimination of obstacles to downstream use of this water for salmon is not objectionable, but indicated it does not have the authority to curtail valid water rights in downstream areas. Idaho does have an effective moratorium on new water rights, but cannot ensure that downstream states have the same protection in place.

Response: The Council recognizes that Idaho does not have the authority to control water rights outside its boundaries. Oregon and Washington have similar moratoria on new water rights. The program already includes the purchase or lease of water on a willing seller-buyer basis.

Comment: The Bureau of Reclamation (870) commented it is interested in expanding water conservation demonstration projects to full-scale activities.

Response: This is a new proposal, but the Council encourages the Bureau to submit proposals to expand water conservation demonstration projects to full-scale activities.

F. Watershed Enhancement and Management/Watershed and Habitat Protection and Enhancement Projects/Model Watershed Program

Comment: The Council received comments which included suggested additional amendments to the Draft Amendments to the 1994 Columbia River Basin Fish and Wildlife Program from the Kalispel Tribe of Indians. It opposed language in Section 7.7A.1 that allows state agencies to select the lead agency for watershed activities. The Tribe also opposed program language "that funds or identifies non-managing agencies as lead agencies" such as the U.S. Soil Conservation Service. "This is unacceptable to the Tribe as we feel that only fish and wildlife managers should be funded for projects/programs or identified as lead agencies within the Council's Program." The Kalispel Tribe stated that a "separate bullet" in Section 7.7 should be included to "identify the 'tribal role' in habitat protection and enhancement throughout the system." The Tribe also noted that it has been more than two years since the it has received reports from Washington state concerning watershed activities.

Response: Watershed activities include all interested and affected entities, including the tribes. The Council does not select the lead agencies; the states do. Tribes are not precluded from being selected as the lead agency by any language in the program. The Council is not in the position to determine which agency or tribe could be most effective in the different states, and particularly would not like to preclude the selection of any entity which might be most effective in getting the full involvement and trust of private landowners as well as public entities. The local subbasin efforts are to include "all interested parties" among whom the Council expects full participation by the tribes. The Council will arrange for the tribe to receive the reports from Washington State concerning watershed activities.

Comment: The Yakama Indian Nation requested that the Council include the new section 7.6A.3 - "Fund an entity with resource mapping expertise to evaluate, classify and digitally map riparian plant community status in all anadromous fish-bearing watersheds in the Columbia River Basin." A detailed description of the proposed amendment and implications of its adoption was attached to the comments.

Response: The Yakama Indian Nation's request was not the subject of a recommendation, or otherwise proposed in the draft amendments, and so the Council could not adopt them without notice and comment.

Comment: Columbia Basin Fish and Wildlife Authority (629) submitted a variety of comments and program revisions most of which were addressed in the Findings, but also stated that lists of potential land purchases or exchanges be updated. In addition, it noted that the cost of exchanges and purchases should include investments needed to benefit anadromous fish habitat or production, pointing out the cost of screening could be a significant factor.

Response: These comments were incorporated in program language at Section 7.8E.1.

Comment: The Shoshone-Bannock Tribes supported the use of the subregional process to update and implement the subbasin plans as the foundation for watershed actions. In their comments, the Corps of Engineers expressed support for the Council's watershed projects and other provisions. The Corps of Engineers stated that the model watershed concept should be expanded to all watersheds supporting listed species as rapidly as funds and capability allow.

The Oregon Water Resources Department commented the Council should call for even greater levels of support and funding for watershed management efforts. Oregon Department of Fish & Wildlife supports expedited watershed management activities and commented that measures must focus on those that can be implemented without lengthy process or litigation, pointing out there is a need to distinguish between near-term and long-term activities. Oregon Department of Fish & Wildlife endorses viewing and managing Columbia basin as a single ecological system or watershed, and using a "structured watershed approach to restoring fish populations" by integrating subbasin plans and model watershed plans into Columbia River Basin Watershed Management Plan which it believes can be done without additional legislation, orders, institutions or directives.

Save Our Wild Salmon (Save Our Wild Salmon) submitted their Wild Salmon Forever plan which sets forth a set of general suggestions focused on the restoration of habitat by watershed management. Save Our Wild Salmon stated a number of goals, such as ensuring the existence of adequate habitat to support the ecological roles of wild anadromous fish and protecting and restoring adequate flow quantity and quality to support wild salmon populations. The Save Our Wild Salmon plan then specified a number of "actions" needed to achieve the goals, most stated very generally, such as "[p]rotect and restore Federal, State, and private lands," "[r]emove and/or reform dams," "[r]ecognize the watershed as the primary scale for habitat protection and restoration," "[e]xtend PACFISH protections to upland as well as riparian habitats," "[e]liminate livestock grazing impacts," "[r]educe polluted runoff (apply Clean Water Act)," and "[e]ncourage integrated pest management and sustainable farming (apply Farm Bill)."

Friends of the White Salmon River, Trout Lake Chapter, noted the beginning development of watershed enhancement planning in the White Salmon watershed and elsewhere and asked the Council to take a more active role in surveying, evaluating, and coordinating watershed enhancement efforts.

Some comments included suggestions, modifications or clarifications. Boise Cascade cautioned the Council not to implement the Upper Grande Ronde Plan without prior review by an interdisciplinary team and due approval through the National Environmental Policy Act process. The Lower Columbia Basin Audubon Society (Pasco) commented that the Council should include in the program a call for the designation of the entire Hanford Reach as a National Wild and Scenic River and the establishment of a National Wildlife Refuge north and east of the river.

Response: The Council agrees that watershed approaches should be applied to all subbasins in the Columbia and Snake basins as rapidly as feasibly possible. The factors and ideas suggested above should be considered in updating subbasin plans and in the subregional process.

Comment: Bonneville Power Administration suggested the region needs to work further to clarify the distinctions between the roles of funding agencies, commenting that off-site mitigation funded by Bonneville Power Administration should be directly linked to credit for hydrosystem mitigation and that the Council take this opportunity to promote and develop cost sharing of watershed enhancement activities. Bonneville Power Administration asked for the deletion of Section 7.6D., "Expedited Process for Funding Projects," because it does not conform to the principles of biological and cost accountability. Bonneville Power Administration commented that priorities for expedited funding will arise out of the watershed planning programs and processes.

Response: The Council agrees that rate payers should receive credit for off-site mitigation activities and that cost-sharing is an important element in implementing the program habitat section. The Council retained Section 7.6D because we believe it is important and needed.

G. Tributary Passage

Comment: Columbia Basin Fish and Wildlife Authority (629) modified a host of the tributary passage provisions in Section 7.10, and modified the passage and flow provisions in the Yakima Basin provisions of Section 7.11. The changes concern Sections 7.10D, Dryden Dam on the Wenatchee River, 7.10E, Green Peter and Foster Dams in the South and Middle Santiam Rivers, 7.10F, Willamette Falls on the Willamette River at Oregon City, 7.10G, Clackamas River Dams, 7.10H, Eugene Water and Electric Board's Leaburg and Waltherville Facilities on the McKenzie, 7.10J, Marmot Dam, Portland General Electric's Bull Run/Sandy River project, 7.10K, Starbuck Dam, 7.10L, Passage into Historic Habitat (one change to add the Deschutes to the list of subbasins to be evaluated), 7.11, Yakima River Basin, 7.11A, Additional Water Storage (delete references to re-regulating dams), 7.11B, Passage (implement passage recommendations), and 7.11C, Flows (implement minimum flow recommendations). In general, these program revisions update the situation at these projects, noting what evaluations have been completed, what project modifications have been called for, initiated or completed, what the next step is at various projects. These program revisions all tend toward a call for expedited study or, usually, installation or modification of facilities to introduce or improve juvenile or adult passage.

Response: Comments that were updating program language (i.e. deleting completed actions, incorporating results of actions called for, etc.) were incorporated. New actions could not be incorporated because they do not address recommendations that are the subject of this rulemaking.

Comment: Friends of the Cowlitz/Friends of the Toutle (287) asked for a variety of actions to establish salmon in various tributaries, minimize water diversion, improve spawning habitat, and develop other energy opportunities to replace hydro. Save Our Wild Salmon (628) proposed the systematic review of all existing dams that lie within or have blocked wild salmon habitat to determine whether they should remain in place. Save Our Wild Salmon asked for the removal of unnecessary dams, called for a moratorium on new dams in anadromous fish habitat, upgrading dams not removed with state-of-the-art fish passage, adequate flows, and watershed restoration funding to address past damage, and also suggested the decommissioning funds be obtained from owners and users.

Response: These topics should be addressed in updating subbasin plans and provided to the Council as projects through the subregional process.

Comment: There were a number of comments specifically directed at Enloe Dam. Columbia Basin Fish and Wildlife Authority (629) called for Okanogan Public Utility District to provide passage by the end of 1996 or dam removal completed by 1999, depending on which alternative provides the optimum anadromous fish access and in consultation with National Marine Fisheries Service, Yakamas, Colvilles, Columbia River Inter-Tribal Fish Commission, WDFW and USFWS (the same program language regarding Condit Dam submitted by American Rivers et al. (109, 715), discussed in the Findings). Okanogan County Public Utility District (753), however, commented that the Enloe Dam provision in tribal restoration plan subbasin plan failed to note that fish never scaled natural falls below the dam, and that first talk to the Canadians before providing passage into Canadian waters. Richard B. Price, attorney for Oroville-Tonasket Irrigation District, (704) commented that the Canadian government will oppose introduction of salmon stocks above Enloe Dam, that the natural falls below Enloe Dam blocked salmon runs before the dam existed and that the statement that Enloe Dam blocks 95 percent of anadromous habitat in Similkameen River is in error.

Response: The Council did not receive any recommendations regarding Enloe Dam, therefore, this is not an appropriate topic for the rulemaking. These comments should be addressed in updating the Okanagon subbasin plan.

Comment: Pacific Rim International (579) supported a comprehensive supplementation program and asked for continued consideration of their proposal for a captive broodstock program.

Response: The extent of supplementation and need for captive broodstock programs will be determined by the fish managers in updating subbasin plans.

H. Specific Production Proposals/Supplementation/Fall Chinook/Sockeye

Comment: In addition to its comments that envision most of the production planning, approval and implementation take place within the context of the subbasin planning process, Columbia Basin Fish and Wildlife Authority (629) made specific comments on production projects and supplementation as follows: Insert a new section 7.3B Final Planning and Implementation of High Priority Supplementation Experiments, calling for: 1) Fish managers to use supplementation guidelines in Chapter III.C of the Integrated System Plan and Regional Assessment of Supplementation to evaluate and plan for high priority supplementation projects, by June 30, 1995; 2) fish managers, following Council review, to implement the projects; 3) National Marine Fisheries Service to provide a schedule for expeditious review of projects for Endangered Species Act compliance; and 4) Bonneville to fund evaluation, risk assessment, planning and implementation of projects. Columbia Basin Fish and Wildlife Authority asked for expedited supplementation of Snake River fall chinook, Sections 7.5B.1, 7.5B.6-7; funds for project maintenance of the Umatilla facility, Section 7.4I, rather than construction and operation, as well as funding for construction and operation of juvenile release and adult holding facilities, Section 7.4J; and for Bonneville to fund Hood River Production Project, Nez Perce project, and Pelton Dam fish ladder project consistent with Council's 1992 letter. Columbia Basin Fish and Wildlife Authority asked for additions to: Section 7.4O.1 for the investigation of artificial spawning channels, on-site streamside incubators, acclimation ponds, and other technologies, coordinated with portable acclimation facility demonstration projects under 7.4F; Section 7.5A.1 to add various elements to Snake River sockeye project; and to include Wallowa and Warm Lakes in the feasibility study of sockeye reintroduction as well as to develop a protocol for fostering natural lake production. William Stelle of National Marine Fisheries Service (891) commented that supplementation should occur on an experimental basis and supported the Council's participation in the hatchery survey being prepared by Columbia Basin Fish and Wildlife Authority.

Response: The Council incorporated these requests into the program.

Comment: The Yakama Nation (730) generally agreed with Columbia Basin Fish and Wildlife Authority's comments on Section 7, with the following additions and exceptions: The Yakama Nation does not condone marking all hatchery-produced fish, either for genetic identification or for selective fisheries, Section 7.2D; National Marine Fisheries Service should not be the sole authority for determining when emergency actions are appropriate, Section 7.4C.2. The Yakama Nation remains unconvinced that the genetic refuge is a prudent or viable management strategy and suggested the deletion of Section 7.5C.

Response: The Council deleted Section 7.5C because of the lack of agreement that genetic refuge would be a viable management strategy. If, during the subregional planning process it is determined to be needed, it can be incorporated then. The Council asks National Marine Fisheries Service to develop guidelines in Section 7.4C for determining when immediate actions are required for emergency cases. The Council strongly suggests that National Marine Fisheries Service include opportunities for input by fishery

managers and other interested parties when doing so. The Council believes that fishery managers should have the option to mark hatchery fish when to do so would assist in the protection, mitigation, and enhancement of fish.

Comment: Columbia River Inter-Tribal Fish Commission (729) deferred to the comments of the Yakamas, adding its support for a combination of production programs, including supplementation to the extent the region is unwilling to meet its obligation to protect, mitigate and enhance anadromous fish through direct reductions in mortality to anadromous fish populations.

Response: This comment is consistent with the program, which calls for a mix of measures for both hatchery and wild fish.

Comment: Upper Columbia United Tribes (585) asked for the deletion of Section 7.3A.2 commenting the Regional Assessment of Supplementation project has reached its useful end and the process does not further on-the-ground supplementation efforts. It also asked for the deletion of sockeye provision in Section 7.5A.1 stating the stock is functionally extinct so money is wasted as well as Section 7.5F stating sea-run cutthroat trout is found predominantly in rivers below Bonneville, so is not a ratepayer responsibility under Act.

Response: The Council declined to delete the sockeye provision in Section 7.5.A.1 as National Marine Fisheries Service has not come to Upper Columbia United Tribes' conclusion. This stock is endangered and the Council is obligated to use its efforts to protect, mitigate and enhance their survival. The Council finds that the Regional Assessment of Supplementation project provides training and tools to help evaluate situations and to determine if the problem will require supplementation or if, perhaps, improvement of habitat is required. Most anadromous fish are found in free-flowing tributaries of the lower Columbia. There has been a potentially substantial loss of cutthroat trout above Bonneville which is the responsibility of ratepayers to mitigate.

Comment: Doug Taki of Shoshone-Bannock Tribes (605, 606) opposed Columbia River Inter-Tribal Fish Commission's recommendation for the production of sockeye based on "technical" comments received as project leader of Shoshone-Bannock Tribes' sockeye research project, and not from Shoshone-Bannock Tribes policy-makers. He stated Shoshone-Bannock Tribes, in coordination with Idaho Department of Fish and Game, Sawtooth Basin Technical Oversight Committee and others have better understanding of specific habitat available in and the carrying capacity of each lake for sockeye production that supplementation based simply on massive numbers of smolts for each lake could have negative effects that far outweigh any recovery advances already made that Columbia River Inter-Tribal Fish Commission comments that due to "current broodstock rearing protocol" there are no true sockeye left and that there is a need to bring in sockeye from Columbia River stocks are false and opposite to all efforts made by Shoshone-Bannock Tribes and Idaho Department of Fish and Game to restore the unique ESU of endangered Snake sockeye, and that most recent genetic analyses do not show problems. Taki also stated that the Council should set interim rebuilding targets for sockeye of 1,000 naturally produced sockeye, and he noted that Shoshone-Bannock Tribes suggested to the Recovery Team a recovery goal of no less than a mean of 6000 adults over two life cycles returning to the upper Salmon Basin. Finally, he objected to the deletion of the specific reference to Shoshone-Bannock Tribes and Idaho Department of Fish and Game as entities to be funded for sockeye program in proposed revision to Section 7.5A.

The official comments of the Shoshone-Bannock Tribes echoed all of Taki's comments and added others. The Council's proposal to continue the Snake River sockeye captive broodstock program through a second generation should be evaluated with extreme caution to prevent stretching the progeny from such a small gene pool too far. They are in the process of combining their tributary harvest management framework with the integrated natural and artificial production needs of the Salmon River. The integration of salmon harvest and production management in the Columbia River Basin has remained unrefined too long. They want artificial production reform in the Salmon River system to include pathogen-free water, reduced or

eliminated handling of the fish, the elimination of erythromycin injections of naturally spawning salmon, the development of techniques to obtain hatchery broodstock without trapping and handling the entire run at the hatchery weirs, and the development of low technology, natural rearing and release facilities. Shoshone-Bannock Tribes request Council support for progress towards the implementation of their natural production facilities and associated Tribal trainee programs in the Yankee Fork, Lemhi River, and Johnson Creek and need low-technology, natural production facilities in place now for the 1996 and 1997 returns. Finally, the Shoshone-Bannock Tribes want to coordinate with the other resource managers in the Salmon River and Council support for this process.

Response: The Council added language to the program to address the concern about genetic risks of the Snake River sockeye captive broodstock program through a second generation. These comments address issues and concerns which should be brought up in the updating of the subbasin planning process. The Council suggests that the Shoshone-Bannock Tribes participate in those efforts.

Comment: Save Our Wild Salmon (628) asked for the following principles to guide conservation efforts while artificial propagation research and debate continue: (1) do no harm to wild salmon stocks; (2) for re-creating self-sustaining populations in natural waters, stock fish that are as locally adapted and undomesticated as possible in as small amount as possible for as few years as possible; and (3) operate, evaluate, and revise propagation programs as part of an ecological approach to fishery management. With these principles in mind, federal, tribal, state, and private managers of aquatic resources should develop stocking policies to implement management regimes for wild salmon. These policies should include: (1) complete a full inventory of the biological diversity of native salmonids in the region, and identify the habitat needs of each species for each life history stage; (2) natural production should be the region's top priority; stocking hatchery-produced salmonids should be done in accordance with the natural capacities and needs of the receiving waters and their biotic communities; (3) do not accept artificial production in lieu of habitat protection and restoration; (4) devise fish culture that is less domesticating; (5) rigorously monitor and evaluate stocking programs and act on results; (6) when sufficient reason exists to suspect that stocking will yield unsatisfactory returns or will harm a wild population, do not stock; and redirect funds saved by downsizing hatchery programs to other essential improvement programs, especially habitat preservation and restoration.

Response: The Council's program generally supports Save Our Wild Salmon's stated principles and addresses the above-stated policies to some degree, recognizing that there is no consistency among the agencies and tribes on these policies.

Comment: Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service (910) comments consisted of an exchange of letters and other information between Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service in September 1994, at the time of the U.S. v. Oregon conflict over the fall chinook fishery, concerning general agreement regarding fall chinook supplementation using Lyons Ferry hatchery stock (with newspaper article).

Response: The program language reflects the Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service agreement.

Comment: Corps of Engineers (728) supported production goals in the Integrated System Plan. Corps of Engineers also stated the ongoing programmatic Environmental Impact Statement for hatchery production could address most of the supplementation issues, and that Lyons Ferry is essentially a Snake River fall Chinook supplementation/captive breeding hatchery and changes in management at the hatchery could be used to accomplish the Council's goals. Pacific Northwest Utilities Conference Committee (733) supports "reprogramming Lyons Ferry fall chinook production into supplementation in the Hells Canyon reach."

Response: These comments should be brought to the subbasin planning process.

Comment: Idaho Department of Fish and Game submitted two issue papers discussing strategies for preserving weak stocks: “Recovery Plan Recommendations for Hatchery Production” (1994) and “Operation of Compensation Hatcheries with a Conservation Framework” (1993). The first report explains how to use hatchery and natural production in combination to preserve genetic diversity within the Snake River spring/summer chinook. Its approach is to make limited use of hatcheries as an interim tool to preserve the stocks pending improvements in migration habitat conditions. The second report analyzes using supplementation consistent with genetic considerations to optimize production of mixed hatchery/natural stocks. Both papers recognize that the productivity bottleneck constraining adult returns is caused by poor migration survival. Columbia River Inter-Tribal Fish Commission submitted five papers in support of the concept of outplanting. The first discusses the status of Columbia Basin salmon stocks based on redd counts. The second describes a risk-based protocol for supplementation of barren habitat and diminished salmon populations. The third concludes that achieving the doubling goal requires an increase in egg-to-smolt survival as well as changes in the hydropower system. The fourth proposes standards for a workable conservation unit for salmon, and argues that extirpation is likely if such a unit is not developed. The fifth provides a modeling tool for screening proposed supplementation projects and evaluating existing projects.

Response: These are excellent discussion papers and should be used and reviewed by the agencies and tribes in the updating of the Columbia and Snake subregional planning and subbasin plans. These papers should also be reviewed by National Marine Fisheries Service, particularly where there are differences in policy in the use of artificial propagation under the Endangered Species Act.

I. General Comments on Hatchery Programs and Production

Some commentors supported hatchery operations as being an important way to make up for system losses of fish, while others criticized them as potentially doing further damage.

Comment: Northwest Forest Resource Council (867) stated that 1) artificial production is the only way to make up for the loss of over 30 percent of historical base habitat regardless of system losses and 2) to overcome the problems caused by past hatchery practices, concerted fisheries management efforts have to be made today to use hatchery production programs that are complementary to wild fish populations.

Response: The Council agrees and the program recognizes that we cannot reach our doubling goal with natural production alone, but must use hatchery production in such a way as to complement and rebuild wild fish production.

Comment: Upper Columbia United Tribes comment asked for the deletion of the requirement in Section 7.4B.1 for hatchery master plans. Upper Columbia United Tribes stated the process has delayed low capital Coeur d’Alene hatchery and will delay others, expressing the concern that if it continues, “it is likely that cutthroat and bull trout in tributaries of the Coeur d’Alene Reservation will be extirpated.”

Response: The Council did not delete the requirement for hatchery master plans. The measure (7.4B.1) only calls for detailed master plans where there is not a National Environmental Policy Act or Endangered Species Act document that provides enough information to evaluate new artificial production projects. The Council wants the process to move more quickly and is encouraging the speedy development of master plans. Delays which occurred in the past were caused not so much by the requirement of a master plan, but by lack of consensus on production objectives and methods and the lack of basic biological information.

Comment: Direct Service Industries (749) commented current hatchery operations harm wild salmon stocks and pointed out there are few proposed amendments for hatchery issues. They commented that immediate reductions in hatchery production injuring wild salmon stocks would be appropriate.

Response: The program contains several measures focused on improving hatchery operations (see Section 7.2 Improve Existing Hatchery Production), including but not limited to the formation of the Integrated Hatchery Operations Team and the development of hatchery policies, performance standards and an independent audit of hatcheries for compliance. There are several measures related to questions of carrying capacity and biological interactions between wild and hatchery fish. As a result of the listing of some salmon stocks under the Endangered Species Act, ongoing hatchery programs are being reviewed and programs modified.

Comment: Pacific Northwest Utilities Conference Committee (733) commented that hatchery operations should be altered and enhanced to support terminal fisheries, to improve hatchery fish quality and survival and to avoid negative impacts to natural populations; implement hatchery audit process proposed by Integrated Hatchery Operations Team on a more aggressive schedule than Integrated Hatchery Operations Team suggested.

Response: The Council agrees with the Pacific Northwest Utilities Conference Committee comments on the need to change hatchery operations and has included several measures to facilitate these changes. The Council encourages timely hatchery audits and has asked for such audits at least once every three years.

Comment: Chelan County Public Utility District (622) questioned the scientific justification for studying the effects of high-level sound on survival of hatchery fish, and the Corps of Engineers (728) supported increased research on hatchery noise levels. The Corps of Engineers suggested the establishment of a hatchery management committee to unify state and federal hatchery production methods, and goals for the Columbia River Basin, but does not support reprogramming to shift lower-river production upriver until questions of competitive effects of natural production are answered.

Response: The Council has called for a study to find out if noise is a problem for fish survival, such study to be completed as quickly as possible. The Council agrees there is a need to unify state and federal hatchery production methods and believes that Integrated Hatchery Operations Team committees can fill that role. The Council has asked for studies to be initiated concerning carrying capacity and to examine the competitive effects of hatchery production on native stocks.

V. HARVEST

Comments: Pacific Northwest Waterways Association (580) said to mark all hatchery fish and allow inriver commercial harvest only of hatchery fish.

Response: The Council's program (8.3D.3) provides for the marking of all hatchery-reared chinook to facilitate selective harvest in the future, pursuant to the findings from the marking feasibility study called for in 7.2D.3. The program also contains other measures (see Section 8.3 Develop Alternative Harvest Opportunities) to facilitate selective harvest of hatchery fish while letting weak or listed stocks return to the spawning grounds.

Comments: Upper Columbia United Tribes (585) said that ratepayers should not fund a commercial fishing buy-back program; Upper Columbia United Tribes members who lost fishing opportunities by lower river interceptions and by Grand Coulee construction were never compensated; if buy-back program continues, upper river tribes are entitled to a compensation program; states should employ instead the concept of limited-entry fisheries, revoking or refusing to renew licenses to get numbers down; delete Section 8.5C.2, which provides for expanded enforcement program to protect weak stocks, as no data to show this program is effective; last sentence in Section 8.5F, concerning increasing abundance of some Canadian runs, may need to be changed in light of recent news about dramatically lower than expected returns of sockeye.

Response: The Council's buy-back and lease-back measures are designed to secure a voluntary reduction of harvest over and above what the Council has identified as a "fair share" in the reduction of overall mortality needed to recover weak and listed stocks. These measures are not designed to redress compensation levels for fishers who have lost opportunities to harvest salmon as a result of impassable dams. The Council's program does contain measures that provide for resident fish substitutions in such cases. Entry into the existing commercial salmon fisheries in the ocean and Columbia River is limited to a certain number of permits by the states. Fishery managers in Oregon must reissue permits to qualified fishers when the number of permits drop a below level established by the state legislature. The Council's program allows for a voluntary and temporary suspension of permits (lease-back) or a buy-back of permits above the minimum level required by the state. The Council reviews the enhanced law enforcement program annually but has not come to a conclusion as to its overall effectiveness. There may be a opportunities to increase law enforcement efforts in the area of habitat protection while scaling back fisheries enforcement. The Council believes that the statement about the increasing abundance of some Canadian salmon stocks being intercepted by fishers from the United States is accurate. Annual variation around an increasing trend is to be expected.

Comments: Washington Trollers Association (603) said, regarding Section 8 of the program, that the "almost total lack of scientific data make meaningful comments difficult."

Response: Measures calling for a reduction of harvest or a change in the location of harvest or the continuation of existing fishing regimes in some cases are based on data bases retained by the fishery managers. Where the Council called for a reduction in harvest, it was not prescriptive but left to the fishery managers (including their scientific data bases) to determine how best to manage the fisheries. For many of the measures that related to improving harvest management, the Council asked the fishery managers to evaluate the need for additional information and return to the Council with their suggestions.

Comments: Columbia Basin Fish and Wildlife Authority (629) did not change or comment on a number of the proposed harvest amendments; these provisions are not noted here. Columbia Basin Fish and Wildlife Authority also made a number of changes to other proposed harvest provisions, which are broken down as follows:

Comment: Editorial changes to introduction for Section 8: Removed references to alternative capture technology (because there are no corresponding measures) and mass marking (which would cause

more damage than representational marking). Delete reference in introduction to Section 8 and in Section 8.5D to include Idaho and upper river tribes in the Columbia River Compact, which would conflict with *U.S. v. Oregon* and treaty rights.

Response: The Council's program included measures for developing alternative harvest opportunities, but the measure titles were not always descriptive (see Section 8.3 Develop Alternative Harvest Opportunities). Expanding membership in the Columbia River Compact, which establishes commercial fishing regulations, is not intended to conflict with *U.S. v. Oregon* but only allows the state of Idaho and other Indian Tribes to participate in fishery management decisions that directly impact production and harvest activities in their areas.

Comment: Section 8.1: Change measure 8.1A.2 to provide "management goals and timelines" for Snake River chinook and sockeye as opposed to "providing explicit protection." Change measure 8.1A.4 to provide closure of ocean salmon fisheries as needed for protection of Snake River fall chinook. They felt measure as written was too prescriptive. Delete measure 8.1A.6 concerning management restrictions based on amount of information available to manage the fishery as it "contravenes the statutory management and operational responsibilities of the fishery management agencies and is unacceptable."

Response: No change was made in measure 8.1A.2 as the existing language signifies a greater level of protection than establishing "goals and guidelines." The Council agreed with Columbia Basin Fish and Wildlife Authority that measure 8.1A.4 was too prescriptive and it was rewritten. Measure 8.1A.6 was retained as written because it provides an example of how fishery managers could approach more conservative management of harvest and it is not intended to be prescriptive or "contravene the statutory management and operational responsibilities of the fishery management agencies."

Comment: Section 8.2: Delete last paragraph under 8.2 "Fishery managers should adopt more conservative.....of fishing effort" because it "contravenes the statutory management and operational responsibilities of the fishery management agencies." Delete reference in Section 8.2B.1 to fishery above Snake confluence as inconsistent with treaty rights; *U.S. v. Oregon* is the best place to address this issue. Also, the proposed language appears to condition "usual and accustomed" fishing areas. Deleted Option 2 in Section 8.2C Fall Chinook but did not provide a rationale. Deleted 8.2F.6 calling for pass through of harvest savings because this issue must be dealt with in *U.S. v. Oregon*.

Response: The last paragraph in the introduction to Section 8.2 was retained to provide general guidance to harvest managers that more conservative regulations are need to help ensure increases in the escapement of weak and listed stocks. We agree that *U.S. v. Oregon* is the best form to discuss the harvest strategies for sockeye. The original language was not changed to highlight the area above the confluence of the Snake River as a possible site. The Council acknowledged the treaty right by including the language "while respecting tribal treaty rights" in the original draft. Option 2 was deleted because of the uncertain impact on fisheries, particularly treaty fisheries, if there is no reduction in the Canadian fisheries intercepting Snake River fall chinook. The Council added language to reduce the exploitation rate below 50 percent and linked harvest "to measures of recent productivity and recent and projected escapement." Measure 8.2F.6 was not deleted because the Council believes that the actions called for are needed if lease-back and buy-back are to be implemented. The fishery managers are free to use whatever forum most appropriate, including *U.S. v. Oregon*.

Comment: Section 8.3: Delete the proposal for a direct subsidy to known-stock fisheries in Measure 8.3A.1, as such a direct subsidy "will compete with higher priority Program needs and is not appropriate." Modified Measure Section 8.3A.2 to make a more 'affirmative statement.' In terminal fishery study (Measure 8.3C.1), deleted reference to experimental fish releases, as the measure is only for a feasibility study and the release of fish "would be an implementation action and in this instance would probably violate genetic impact and supplementation guidelines."

Response: In Measure 8.3A.1, the Council retained the provision for subsidies because they believed them to be important for having the participation by fishers. The question of priority will be dealt with later in the Implementation Planning Process. The Council believed that it was necessary to provide a standard for “adequately managed” and in this situation the Council choose “...harvest at levels exceeding those in this program or where the release of fish would aggravate mixed stock fishery problems.” The release of experimental fish was retained in Measure 8.3C.1. The release of fish is necessary to fully evaluate the “potential” of terminal fishing sites. If the releases “violate genetic impacts and supplementation guidelines,” then the site is probably not suitable and no releases would be made.

Comment: Section 8.4: Revise proposed Measure 8.4C.3 to reflect that Bonneville will fund fishery managers to refine estimates of abundance and fishery impacts. Section 8.4D to reduce harvest of non-targeted species puts an impossible burden on fish managers and may contravene their authorities; instead, fund fish managers to study strategies for achieving this objective.

Response: Measure 8.4C.3 and 8.4C.4 now correctly show the Implementor to be the fishery managers and the funding source to Bonneville and the United States Department of Commerce. The Council is asking the fishery managers to study the problem with “the goal of reducing genetic impacts of harvest.” in 8.4D.2. Measure 8.4D.1 (now 8.5B.2) was retained as written because the Council is asking only for a report based on existing data sources.

Comment: Section 8.5F: Delete Measure 8.5F.4 because measure “appears to contravene the statutory management and operational responsibilities of the fishery management agencies and Tribes.”

Response: This measure was retained because the Council believes that additional reductions in U.S. fisheries will be necessary, “absent further reductions in harvest in Canadian fisheries.” The Council is not telling the fishery managers how to make the needed reductions.

Comment: Corps of Engineers (728) -- The Corps of Engineers also supports opening of the *U.S. v. Oregon* proceedings.

Response: The court has jurisdiction over the parties with standing in *U.S. v. Oregon*. It is our understanding that the Technical Advisory Committee (harvest management issues) and the Production Advisory Committee (natural and hatchery production issues) are open to observers. The Council has no legal standing with respect any aspect of *U.S. v Oregon* proceedings.

Comments: Direct Service Industries (749) said that the first step toward salmon recovery is marking hatchery fish and requiring selective harvest, which can be achieved promptly through methods employed for decades in the basin. A principal problem has been lack of implementation of program measures, such as the one calling for marking all hatchery-reared chinook by 1995 to facilitate selective harvest. There is no more important step that can be taken to improve salmon populations in the Columbia Basin, and the Council should feel even more urgency about making these changes than in engaging in vast experiments on flow and survival. Bonneville Power Administration’s program to reduce illegal harvest has had dramatic positive results in reducing interdam losses, but it makes no sense for Bonneville Power Administration ratepayers to pay the states to enforce their own laws.

Response: The program does contain a measure calling for the marking of all hatchery-reared chinook by 1995 pursuant to findings from the marking feasibility project called for in 7.2D.3. In the final analysis, it will be the managers decision as to what stocks to mark for selective harvest to complement their overall management program. The Council believes that enhanced law enforcement is appropriate for Bonneville funding. The fishery agencies had an existing program that needed to be enhanced to help reduce mortality between dams. If the dams were not in the river, additional enforcement efforts might not be needed.

Comments: Bonneville Power Administration (750) said that the harvest section is a mix of related ideas and measures, rather than a cohesive and comprehensive treatment of harvest management; preservation of genetic diversity and limits on mixed stocked fisheries and on harvest of weak stocks should be coordinating philosophy of this section of the program. Sport fisheries and U.S./Canada treaty negotiations should be separate measures, not grouped under Section 8.5 (Pursue Other Harvest Measures).

Response: Several formatting and language changes were made to address some of Bonneville Power Administration's general and specific comments.

Comments: Bonneville Power Administration's limited funds would be better spent aiding the fishing industry by developing terminal fisheries and by researching terminal gear technology than by funding the lease-back or buy-back of fishing licenses; if a buyout of Zone 1-5 licenses were implemented, there would have to be agreement that the fish could pass through Zone 6.

Response: The Council believes that all of the above measures should be implemented. A new measure was added to specifically address the need to "pass through" to the spawning grounds weak stocks saved by reductions in fishing capacity or intensity (see Measure 8.2F.6).

Comment: Washington Department of Fish and Wildlife (751) endorses Columbia Basin Fish and Wildlife Authority's comments on the Fish and Wildlife Program. The department suggests the inclusion of language extracted from the Recovery Team's Recommendations as follows:

"Fisheries managers should establish an exploitation rate schedule over all fisheries affecting Snake River fall chinook. The allowable exploitation rate in any given year should be directly linked to measures of recent productivity and escapement. The schedule should reflect the ultimate intent of restoring runs to levels that can sustain spawning escapement objectives and healthy fisheries."

Response: The Council agrees and a slightly modified version of this language was added to Section 8 (see Measure 8.2C.1).

Comments: Idaho Department of Fish and Game (766) said that its Anadromous Fish Management Plan, 1992-1996, encourages the restoration of sport and treaty fisheries for salmon and steelhead in light of short- and long-term utilization objectives developed by public advisory groups and Idaho tribes. Harvest in ocean and Columbia River fisheries is identified as one of three major mortality factors and, being human-caused, can be reduced. The Idaho Plan proposes to integrate and coordinate Idaho anadromous fish management with the remainder of the Columbia River Basin. Fisheries policies and principles from the Idaho Department of Fish and Game Policy Plan, 1990-2005, are also included to provide for tribal and non-tribal long-term fishery benefits of natural, wild and hatchery stocks. Commercial fishing in Idaho will not be permitted. Efforts should continue to modify Columbia River and ocean harvest processes.

Response: Many of the measures in Section 8 respond to Idaho's concern about reducing fishing mortality and improving the processes and data used in harvest management.

Comments: Northwest Forest Resource Council (867) included a copy of its comments on the PACFISH Environmental Impact Statement; the harvest comments focused on reducing Canadian interception of northwest salmon relative to U.S. fisheries. Analysis of total marine mortality is partitioned into commercial catch and incidental fishing mortality. The overall suggestion is to "reduce excessive mortality rates while protecting, enhancing, and restoring freshwater salmonid habitat."

Response: The array of measures developed for Section 8 are focused on controlling fishing mortality while seeking ways to harvest the more robust stocks of salmon.

William Stelle, National Marine Fisheries Service (891) said that harvest is problematic; need to develop unified policies; need to meet rebuilding goals under Pacific Salmon Treaty.

Response: The array of measures developed for Section 8 are focused on controlling fishing mortality while seeking ways to harvest the more robust stocks of salmon. These measures should complement the policies developed by the National Marine Fisheries Service. The Council also considered the report of the Recovery Team in amending Section 8.

VI. COSTS/COST EFFECTIVENESS/FUNDING

A. Cost Estimates/Cost Analysis Issues/Cost Effectiveness and Methodology

Comment: Idaho (766) commented that the Corps of Engineers is biased against drawdown and its cost and timelines are too high and long, attaching as an appendix the December 1993 analysis by its construction consultant Edward McLean, "Lower Snake River Drawdown: Comparison Study of Estimated Construction Cost and Construction Schedule," which shows much lower costs and construction times.

Don Reading, Idaho's consulting economist also commented on the cost of drawdowns; most drawdown costs are power costs (which include capital costs to modify the dams as well as lost power production), and that is the best basis for comparing alternatives; System Operation Review and Huppert reports agree that the cost of a two-month, four-pool drawdown would be about \$150 million -- about a 5-8 percent wholesale rate increase; Natural Resources Defense Council estimated the cost much lower (\$116 million regionally, \$50 million to the West), for a 5-6 percent rate increase; Council staff's higher estimate results from: (1) staff's use of the Salmon Strategy as the base period; (2) staff assumes a wider range of actions in addition to drawdown; and (3) staff's assumptions (level of real interest rates, number of years for pay-back, and value selected for levelization) are more pessimistic; even under Council staff's analysis, however, there would be a 9-10 percent rate increase, bringing rates back to where they were 10 years ago in real terms, and at half the national average. Mr. Reading also offered a table showing cost-effectiveness of various options, with drawdowns more cost-effective than heavy flow augmentation or heavy transportation.

Regarding the use of the Environmental Defense Fund's cost-effectiveness analysis in selecting flow augmentation measures, Idaho Department of Fish and Game believes it would be unduly rigid for the Council to require this or any other particular methodology, especially where the method is largely undefined. Idaho Department of Fish and Game has a number of specific concerns about the Environmental Defense Fund methodology, especially the "decay" function that reduced the biological benefits of an alternative for each year it was delayed in implementation, an approach that seemed to put a premium on land fallowing and other non-structural approaches and biased against structural approaches; also questioned the reliance on the System Configuration Study, which substantially overstates the cost of drawdown. Moreover, acquiring the amount of water Environmental Defense Fund identifies through land fallowing is simply unrealistic, especially the shorter time period for acquisition used; delays and political obstacles could be very long and high, which needs to be considered in the analysis. Finally, the report does not analyze the likelihood that each option would achieve rebuilding goals, or some other biological standard. It would be better for the Council to include a more general directive in the program to consider costs and benefits.

Response: The Council received numerous criticisms of the cost estimates prepared by the Corps of Engineers. It used the Corps of Engineers' estimates, however, where available to compare the cost of recommended measures. The Council used the Corps of Engineers' estimates because of the level of detail generally provided and the ability to compare between alternatives. Comments, such as those referred to by the State of Idaho, which challenged the estimates, were useful for suggesting means of shortening

construction schedules and reducing costs. The Council suggests that these comments be incorporated into project designs and future evaluations.

With respect to the comment on the Environmental Defense Fund analysis, this comment was considered in the provisions for obtaining Upper Snake river water for flow augmentation, and appropriate changes were made. The Bureau of Reclamation and Bonneville are encouraged to use a variety of mechanisms to secure water from willing sellers.

B. Funding Issues

Comment: Bureau of Reclamation (595) said that it does not have authority nor a source of funding to mitigate for fish losses when drafting limits are exceeded at Hungry Horse for flood control requirements, as stated in Section 10.3A.7; Corps of Engineers has flood control responsibility for whole basin, and Bureau operates Hungry Horse as directed by Corps of Engineers for flood control purposes. Congressional authorization would be necessary in either case.

Response: The referenced assignment of responsibility was an element of the existing program. The reference to the Bureau of Reclamation was changed in this amendment process to refer to the Corps of Engineers. The Council will review with the Corps of Engineers any questions about the need for Congressional authorization.

Comment: Doug Taki, of Shoshone-Bannock Tribes (605) objected to the deletion of the specific reference to Shoshone-Bannock Tribes and Idaho Department of Fish and Game as entities to be funded for sockeye program in proposed revision to Section 7.5A.

Response: The amended language identifies the various entities involved in the current sockeye program. In general, the Council prefers to structure measures so that specific entities are not identified to be funded to implement the measure. In this way, participation of additional entities, such as is the case with the sockeye program, can be obtained.

Comment: Columbia Basin Fish and Wildlife Authority (629) said, with regard to the issue of economic mitigation in Section 9, that the appointment of an economic transition and renewal panel is premature, given uncertainties in the fish and wildlife program, biological opinions, the Endangered Species Act recovery plan and the settlement in *Idaho, et al. v. National Marine Fisheries Service*; reconsider when the impacts of these initiatives are clearer.

Response: The necessary work to develop a mitigation strategy will be complicated and difficult. The Council expects that, by identifying responsible entities and a schedule for developing a strategy, the needed work can occur to speed implementation of the program.

Comment: Washington Department of Transportation (703) said that if drawdowns take place, it “strongly supports” mitigation plans to address direct and secondary impacts to physical facilities.

Response: The Council continues to call for mechanisms to provide this mitigation as an element of the program.

Comment: Pacific Northwest Generating Cooperative (719) opposed the amendments to Section 9 concerning economic mitigation plans; language of Act and legislative history clearly demonstrate that Council has no authority under the Act to compensate any party for fisheries or cultural losses.

Response: The Council acknowledges that it lacks authority to direct mitigation for such losses. However, the Council believes that such mitigation is appropriate and desirable given potentially disproportionate impacts to these and other sectors.

Comment: Corps of Engineers (728) said the Council should continue to support Bonneville's recouping of costs and continued investment of appropriated funds by the Corps of Engineers and other implementors. In some cases consideration should be given to cost sharing as already provided for in statutes pertaining to the Federal action agencies. The costs should borne equitably by all parties; e.g., the use of irrigation water will have to be considered or it will not be possible for salmon restoration to occur.

Response: The Council provides for continuation of the current procedure for appropriating funds for dam modifications and other measures implemented by the Corps of Engineers. These costs are then repaid according to the designated allocation for hydropower as a share of the project purposes. The Council attempted to identify opportunities for additional cost sharing of those measures that do not have clear provisions in law allocating repayment or distribution of expenses. In addition, the Council believes additional federal assistance is needed to allow Bonneville to fund and repay its share of these measures without becoming an uneconomical supplier of electricity.

Comment: Public Power Council (731) said the Council should determine the extent of the hydropower-related effect on the salmon runs and focus on achieving sound biological objectives at the minimum economic cost; when the subject of funding salmon measures does come up, Public Power Council expects to support full utilization of Section 4(h)(10)(c) of the Northwest Power Act. Chances of obtaining significant amounts of money from taxpayers seem remote; instead of searching for more funding, the Council and region ought to be searching for cost controls, budget limitation and elimination of unnecessary projects as a way to lower costs. Council should not assume it can rely on Bonneville Power Administration transmission services for revenue to fund fish and wildlife measures.

Response: In 1987, the Council estimated the extent of the losses of salmon due to construction and operation of the hydroelectric system. The Council addresses the use of biological objectives for the selection of measures in Section 4 of the revised program. The Council is determined to review the ability to adjust or reallocate current program funding to implement the added measures in this program. Doing so requires more information about current contracts than Bonneville has provided to date. The Council supports the use of the mechanisms provided by Section 4(h)(10)(c) to provide assistance for program funding and incorporated this expectation into the discussion of program funding in Section 1. The Council has not eliminated from consideration any alternative source of funding for program implementation. Additional discussions are needed.

Comment: Bonneville Power Administration (750) said the allocation of expenses under Section 4(h)(10)(c) is vital to its ability to fulfill the purposes of the Northwest Power Act; Bonneville needs the Council's support for implementation of this section; Bonneville has thoroughly interpreted this section, and the Council should not adopt a contrary interpretation; Bonneville Power Administration's allocation under Section 4(h)(10)(c) is properly limited to amounts expended under Section 4 and should not include lost revenues.

Bonneville Power Administration opposes the assignment of all or most program funding authority to ratepayers; this assignment is based on the concept that the doubling goal is within historic loss estimates due to hydropower; if a historic loss estimate is used to allocate costs, hydropower losses should bear their proportionate amount; hydropower share in the Columbia system should be estimated in comparison to declines in stocks in non-hydro basins; mitigation costs should be shared each year among river operators and fishery management agencies to encourage a common interest in efficient solutions.

The Council is correct that there are myriad potential funding sources for habitat improvements; region needs to work further to clarify the distinctions between the roles of funding agencies; off-site

mitigation funded by Bonneville Power Administration should be directly linked to credit for hydrosystem mitigation; the Council should take this opportunity to promote and develop cost sharing of watershed enhancement activities.; delete Section 7.6.D., Expedited Process for Funding Projects, because it does not conform to the principles of biological and cost accountability; Council's program emphasizes coordinated watershed planning, and it is out of the watershed planning programs and processes that priorities for expedited funding will arise.

Council should delete Section 9 from the program; economic mitigation is not appropriate for the program because it neither protects, mitigates or enhances fish and wildlife, nor does it ensure an adequate, efficient, economic, reliable power supply; other funding sources, not Bonneville Power Administration, should fund economic mitigation; focus of economic mitigation should be on facilitating the transition from one economic structure to another, not on "mitigating disproportionate impacts" or compensating for "economic and cultural losses"; there does not appear to be any established process for spreading the impact of any costs beyond Bonneville Power Administration ratepayers, and so it is inappropriate to say such a process is "readily available."

Response: The Council views the mechanism of Section 4(h)(10)(c) as a potential means to preserve Bonneville's ability to provide an economical power supply while funding the implementation of these additional measures. The Council has not had the opportunity to thoroughly review Bonneville's interpretation of the language and has not developed a conflicting interpretation. The Council will place a high priority on assisting Bonneville in implementing use of the section.

Bonneville is correct that the doubling goal is within the historic loss estimates for the hydropower system. An accurate discussion of the relative distribution of costs for salmon rebuilding measures would require additional estimates of costs, losses and economic impacts to other industries, land owners, tribes, and land and water management agencies; both within the Columbia River system and in other basins. The Council did not receive any summaries of direct costs or economic impacts that would have supported such a deliberation of relative allocations in this rulemaking. The Council agrees that there should be a common interest among all parties in efficient solutions but did not generally assign to the officials charged with resource management a share of the costs for redressing past impacts from development of the Columbia River Basin.

The Council accepts the general comments concerning identification of alternative funding sources and participation in watershed enhancement activities and other measures. The Council has separately pursued developing improved planning and implementation coordination with Bonneville and other parties. The Council expects these efforts to continue and has assigned staff to do so.

The Council did not delete section 7.6.D because it views the measure as improving implementation. The measure should incorporate management improvements and efficiencies and should not violate any principles of biological and cost accountability. It simply seeks a mechanism to get agreed-upon projects implemented more quickly.

The Council did not delete Section 9. The Council acknowledges that it does not have directive authority for economic mitigation. However, the Council believes that appropriate mitigation is necessary for orderly implementation of the program. The comment correctly identifies the uncertainties present in this effort. It is for that reason that the Council seeks to convene the best assistance available for regional development of an economic mitigation strategy.

Comment: Direct Service Industries (759) said that Bonneville Power Administration ratepayers are paying to offset the effects of drought, overfishing, Idaho water withdrawal, and other habitat degradation in ways that were never intended by Congress, are unlawful, and are destroying Bonneville Power Administration's competitiveness; Bonneville Power Administration ratepayers are obligated to pay only for

measures to mitigate losses caused by the dams, not for fish enhancement costs. Estimates for historic losses associated with hydropower are grossly inflated, and do not take into account habitat, harvest and other factors that depleted populations. Also, given the estimates that of the total loss attributable to the dams (whatever it is), about half of the historic salmon loss is due to the effects of mainstem dams on migration and the other half is the result of lost habitat as the result of no fish passage at Chief Joseph and Hells Canyon, then ratepayers should only have to pay half as much as they are now. Council should do a better job of assessing the contributions to salmon recovery that should be made by others, and then bring public scrutiny to bear on the agencies and tribes for failing to implement Council program measures.

Response: The Council did not revisit the assessment of historic losses, which the Council developed in a process that included extensive public review in 1986. While this comment, and others, asserted that these estimates are incorrect, there was no alternative evaluation offered. The Council attributes a significant portion of historic losses to loss of habitat due to dam construction as well as losses due to impacts on survival through the hydropower system. These losses, taken together, form the obligation for mitigation borne by the power system.

The Council agrees that a better job should be done in assessing the contributions made by others to salmon recovery. Additional effort is needed on the part of all who benefit from the system. At the same time, the contributions of others through direct contributions, volunteering, restriction and loss of economic and cultural uses and other participation is poorly understood and displayed. The Council adopted several measures specifically addressing this need. For its part, the Council will continue to develop its monitoring of program implementation and efforts to promote participation.

Comment: Idaho (766) opposed the use of program funding for new habitat projects on federal lands except where benefits are exceptional and alternative funding sources have first been explored.

Response: The Council adopted revisions to its subregional planning approach to integrate land and water management. The Council believes that a certain level of Bonneville funding on federal lands is appropriate, particularly where it acts as a catalyst for larger effort. Appropriate management direction should be in place. The Council expects that cost sharing will be incorporated and that provisions for long term operations and maintenance are established when ratepayer funding is contributed. The Council's cost estimates assumed a moderate increase in Bonneville funding for habitat projects.

Comment: Lincoln County, Montana (Libby) Board of County Commissioners (598) said that electrical rates will increase and system reliability will decrease for most options, and both will adversely affect residents and businesses in northwestern Montana and "may drastically affect the competitiveness and viability of some major employers"; Council should consider a "reduced rate for communities making major sacrifices for the dams located in their areas."

Response: The Council's analysis of rate impacts from implementing these additional measures is in Appendix B. Bonneville's rate structure is determined through its ratemaking procedure. The Council adopted the measures in Section 9 to direct a coordinated regional consideration of disproportionate local impacts resulting from the implementation of these measures.

VII. POWER PLANNING ISSUES/POWER SYSTEM IMPACTS

A. Power System Impacts/Energy Cost Estimates/General Power System Issues

Comment: Pacific Northwest Utilities Conference Committee (733) -- After all non-power constraints are met, maximize system availability, reliability, flexibility, and efficiency; follow rules of

Pacific Northwest Coordination Act; refill by July 31 to meet following year's power and fish needs; maintain needed flexibility to meet hourly demands.

Response: With the adopted measures, not all projects are not able to meet refill objectives by July 31. There are specific July elevations specified for Dworshak and Grand Coulee, for example, that allow drafting to meet July and August flow objectives. The Council did provide language clarifying the operators' ability to maintain flexibility to meet hourly demands.

Comment: Direct Service Industries (749) said that various flow options and recommendations call for incorporating flow measures into firm planning, but that could substantially increase the cost of salmon measures. The Council offers no rationale for incorporating flow measures into firm planning, while river operators need the flexibility to implement measures however is best suited to maximizing the power system. This suggestion should be dropped.

Response: The only measures that Council calls for incorporation into firm planning are the original 1984 water budget (including the 1 million acre feet draft from Dworshak) and drafts at Grand Coulee to 1280 feet above mean sea level and Dworshak to 1520 feet above mean sea level in July. The remainder of the flow augmentation measures are to be provided through operational management.

Comment: Bonneville Power Administration (750) is unsure how the Council determined the rate increase estimates presented in the amendment; at a minimum, this process should be fully described for public review; also, Bonneville Power Administration expects that the rate increase estimates in the amendment may be understated because they do not capture the risk of bad years; it should also be made explicit that the cost increases calculated are regional and that the full cost of these increases is assumed to be paid by Bonneville Power Administration ratepayers.

In the summary of effects of reservoir elevations, effects on Treaty reservoirs should be described to avoid giving the impression that there are none; also, the results of the Detailed Fishery Operations Plan analysis do not make clear whether Canadian storage was used.

In Appendix B-1, the cost of replacing lost Firm Energy Load Carrying Capability is assessed at 35 mills per kilowatt hour minus any salvage value, which implies the acquisition of a non-displaceable, non-dispatchable resource; this seems inappropriate for any of the options; in all cases, a displaceable resource, such as a combustion turbine, should be used to replace lost firm energy load carrying capability, as was done in Option 4.

The Council appears to have assumed that the lost hydro energy-producing capability can be replaced megawatt-hour for megawatt-hour with power purchases or combustion turbines. Bonneville does not think that is true.

To analyze the power impacts of the drawdown alternatives, Snake flows must be measured at Ice Harbor Dam, not Lower Granite; the effects of drafting and refilling for drawdown alternatives are not apparent at Lower Granite, but would be at Ice Harbor.

Response: The Council used the same method to develop estimates of potential rate impacts as it has in previous rulemakings. Modeling of power system changes is calculated using power system models. Estimates of non power system changes are provided from amendment proponents, comment, and staff estimates. These are then interpreted as rate impacts using calculations of adjustments to Bonneville's revenue requirements. The assumptions used for these estimates are available as part of the Council's record. In estimating potential rate impacts from the measures, the Council did not assume that Bonneville would pay the full regional costs of power system impacts; only the portion of impacts to the federal power system. The Council is familiar with the risk of bad years. However, these are properly an element of rate design where

revenue requirements are considered along with the probability of poor water and poor markets as part of an overall risk assessment.

The effects of measures on Treaty reservoirs were not displayed in the staff summary. For brevity, the summary displayed effects on major U.S. storage reservoirs of significant concern. The effects on Canadian reservoirs were calculated and are available as part of the Council's record.

The Council acknowledges the comment on the estimate for replacing lost Firm Energy Load Carrying Capacity. The Council revised its assumptions and now assumes replacement by dispatchable, displaceable combustion turbines.

The comment expressed a valid concern about the assumption of replacing lost hydro energy-producing capability on a megawatt-hour for megawatt-hour basis. However, changing this assumption will require a revision to policies guiding Pacific Northwest power planning. Current practices use the flexibility of the hydro system to make up differences on a one-to-one basis. The Council recognizes that the region is quickly running out of this flexibility and will address this issue in the revisions to the regional power plan in the coming year.

The Council continued to use measurement of Snake River flows at Lower Granite, rather than Ice Harbor as was suggested. The purpose is to provide an evaluation of the effectiveness of drawdown conditions for meeting the 140 thousand cubic feet per second flow objective equivalence. This measurement will occur at Lower Granite which will be the first reservoir to be drawn down.

B. Adequacy, Efficiency, Economy and Reliability of The Region'S Power Supply (AEERPS)

The Council received many comments on the adequacy, efficiency, economy and reliability of the region's power supply with the adoption of the proposed fish and wildlife amendments. For the most part, these comments are addressed in the Council's paper, "Assuring an Adequate, Efficient, Economical Power Supply and the Ability to Carry Out the Other purposes of the Northwest Power Act," Appendix C. In this section of the response to comments, we point summarize the comments received, refer readers to Appendix C on most points, and responds here to other comments.

General

Comments: The Council consulted with Administrator Hardy of the Bonneville Power Administration, who said first, that he would be concerned that if Grand Coulee had to be operated on upper rule curves, there may be blackouts this winter. He emphasized that Montana reservoirs and Albeni Falls must be available to help with emergency situations. He said that Detailed Fishery Operations Plan flows in particular would leave reservoirs dry, and his staff commented that several options under consideration (especially Detailed Fishery Operations Plan/Option Four) could violate the adequate, efficient, economical and reliable power supply requirement in the Northwest Power Act. In connection with operating John Day reservoir at minimum operating pool, the system may need to vary from that level for load following purposes outside the fish migration season.

Response: The Council did not call for Grand Coulee to be operated on upper rule curves or adopt Detailed Fishery Operations Plan objectives in firm planning. The flow/velocity objectives are objectives the region will endeavor to meet with a combination of flow augmentation, velocity improvements, and other measures. The Council shares the Administrator's concerns over system reliability, and in the Council's finding in section 1 of the program, recognizes that some reservoirs may have to be drafted to maintain system reliability in emergencies. The Council recognizes that John Day may be used for load-following outside the fish migration season, and that under some conditions a slightly higher elevation and daily flexibility may be required.

Comments: Lincoln County, Montana (Libby) Board of County Commissioners (598) said that electrical rates will increase and system reliability will decrease for most options, and both will adversely affect residents and businesses in northwestern Montana and "may drastically affect the competitiveness and viability of some major employers." The Council should consider a "reduced rate for communities making major sacrifices for the dams located in their areas." Upper Columbia United Tribes (585) said that Options 3-5 not achievable without either severe impacts to resident fish or to adequate, efficient, economical and reliable power supply; increased rates (and other economic costs) have greater impact on tribal members due to lower income and greater unemployment.

Response: The fish measures will increase rates, and in section 1 of the program the Council estimates these impacts (see also Appendix B, Rate Analysis). The Council agrees that there may be impacts to particular customer classes, which may be addressed in Bonneville's rate-setting process (see Appendix B, pp. 18-20). The amendments contain protections for resident fish.

Legislative Intent

Comments: Michael Blumm, Professor of Law at Lewis and Clark College (707) said that the Council does not need to define adequate, efficient, economical and reliable power supply, except in the context of showing why any measure is rejected on the basis of its affecting adequate, efficient, economical and reliable power supply. Congress expected fish and wildlife restoration to be a factor in the power system, not a conflicting element. Bonneville's inability to meet repayment or to conduct conservation programs might be an ultimate bottom line; but phasing in some measures should reduce conflicts and costs. Timing can affect the meaning of an economical power supply. Overall fish and wildlife costs are still small relative to power system costs, even to Washington Public Power Supply System-related costs. "With fish and wildlife costs small relative to power expenditures, and average regional power costs cheap compared to other regions in the country, the circumstances under which a fish and wildlife program measure could jeopardize an economical power system would seem to be truly extraordinary."

Norm and Shelley Cimon of La Grande (487) said that the Council should begin with the view that ecosystem to support salmon must allow for fast flowing stream conditions, and that Council's efforts to provide a better system for fish means the Council must take a broad approach to the adequate, efficient,

economical and reliable power supply question, emphasizing power marketing, hydropower alternatives, the fact of the growing wealth of the region, etc.

American Rivers/Natural Resources Defense Council/Trout Unlimited (715) said the adequate, efficient, economical and reliable power supply standard requires Council to restore fish but to mitigate the cost to power system. In assessing economic impacts, the Council should consider the effects on the region's power system caused by uncertainty over what will be required to protect dwindling salmon runs. The Council should also consider how Bonneville Power Administration can structure its business arrangements to support higher flows in spring and summer, how the power system can discourage electric use in the winter, and how Bonneville Power Administration can retain flexibility without financial penalty to meet fish flow needs. To answer these changes, Council must investigate how changes in rates, power sales contracts, Pacific Northwest Coordination Act, and other business arrangements can be used to reduce "costs" of fish measures.

Columbia River Inter-Tribal Fish Commission (729) said "[i]t is axiomatic that the plain meaning of the statute's language is the single most important source for understanding statutory intent." Besides the Act's language, "the most persuasive evidence of legislative intent is the report of the committee sponsoring enactment of the bill." The Ad-Hoc Committee Report is not a report of a legislative committee and does not reflect the views of the tribal representatives who participated only to a certain extent, mostly as observers, in the activities of the committee. Columbia River Inter-Tribal Fish Commission cites a number of sections of the Act and the committee reports to bolster their argument that Congress fully intended the internalizing of all fish and wildlife costs that were caused by the development and operation of the power system and that Congress believed that mitigation for salmon losses could be substantially achieved through changes in hydropower operations. More important, treaty rights are a limit on hydropower operations and the power supply, and not the opposite, and the Council and others must devise a power supply that accommodates the treaty rights.

Bonneville said that, as a general rule, program measures that would burden the ability of the power system to reliably provide electric power, cause economic hardship, or reduce Bonneville Power Administration's ability to provide low-cost competitive electric service would not be consistent with the fish/power balance Congress intended by adequate, efficient, economical and reliable power supply in the Act; any changes to the operation and use of the hydro system must be adequately planned, economic and efficient changes that consider comprehensively the burden being imposed on Bonneville Power Administration's provision of electric service.

Response: The Council believes that the Act calls for a broad judgment on the adequacy, efficiency, etc., of the power supply, considering the factors discussed in Appendix C, and that there is no precise formula for making the judgment. The Council's view of Congressional guidance in the legislative history is summarized briefly at Appendix C, p. 16. The Council agrees that burdens on consumers are a factor, and should be addressed where burdens are undue (see Appendix C, pp. 16-20). The Council also agrees that the hydropower system is an integral part of the region's power supply, and an important part of the judgment. The question under the Act, however, is the adequacy, etc. of the region's power supply, not just its hydropower supply. The Council agrees that the adequate, efficient, economical and reliable power supply issue may be raised with respect to any single measure or the program as a whole.

Comments: Public Power Council (731) said it is not the province of the Council to single-handedly define what is an adequate, efficient, economical and reliable power supply; Bonneville Power Administration and utilities have ultimate responsibility for meeting region's electrical power needs. The Council should work with Bonneville Power Administration and the power industry to identify interim definitions for purposes of applying the test established in Section 4(h)(5) of the Act. Do not define the adequate, efficient, economical and reliable power supply in the short time frame of this rulemaking; at most, adopt a temporary definition and work at refining it in the future. Pacific Northwest Utilities Conference Committee (734) said the Council should defer rulemaking or any precise definitions of adequate, efficient, economical and reliable

power supply in this rulemaking. adequate, efficient, economical and reliable power supply is a power issue, not a fish issue, and Council should delay decisions on this issue until Bonneville Power Administration defines in a rulemaking or at least to its own power plan revision. It will be Bonneville that “will balance the regional definition of adequate, efficient, economical and reliable power supply against program measures,” when Bonneville Power Administration “evaluates the Council’s amended program for purposes of implementation.

Bonneville Power Administration (750, 926) said it, and not the Council, should make this determination. It had not had sufficient time to fully respond to the Council’s questions on adequate, efficient, economical and reliable power supply. It intends to undertake its own adequate, efficient, economical and reliable power supply determination as part of the Business Plan or in a separate policy development. The Council should work closely with Bonneville Power Administration in describing program measures that might affect the adequate, efficient, economical and reliable power supply, and rely on power system managers to determine what constitutes an adequate, efficient, economical and reliable power supply. While it is clear Council must do some balancing of fish and power concerns in this rulemaking, it is more appropriate for Council to fully address this issue in its power plan revision and defer final adoption of the fish and wildlife program until that time.

Direct Service Industries said the Council cannot assure the region an adequate, efficient, economical and reliable power supply (AEERPS) by adopting measures first and figuring out what constitutes an adequate, efficient, economical and reliable power supply afterwards. Before the Council may make an adequate, efficient, economical and reliable power supply determination, it must first determine, for each measure: (1) accurate and detailed information on the costs and biological effectiveness; (2) the cause of the adverse fisheries impacts addressed by the measure, that is, whether it is a hydropower problem or instead overharvest, farming, weather, etc.; and (3) specific and certain sources of funding. Public Utility District No. 1 of Douglas County (600) said it is “essential that the meaning and intent of words like economical and reliable be established before [Council] can judge merit of each recommended amendment.” The Council has not done this in this draft.

Response: On the question of who must make the determination, section 4(h)(5) of the Act states that the Council, not Bonneville, must make a determination of this matter. The Council need not make the adequate, efficient, economical and reliable power supply determination before making fish and wildlife decisions; rather, it has made the determination simultaneously with its fish and wildlife decisions. The Council has surveyed information on costs and biological effectiveness of the proposed measures individually and in total, and has addressed causes and funding responsibilities with regard to the measures themselves.

In addition to having consulted with Bonneville in the course of this amendment process, the Council will work with Bonneville and others during the power plan revision. The Council did not defer fish and wildlife revisions until the power plan revision process, in part because Congress specifically indicated that fish and wildlife measures should not be delayed pending power plan development.

Comments: Public Power Council (731) said the Council should preserve the hydroelectric system. Congress did not intend the Act to result in replacing the unique hydroelectric opportunity with non-renewable thermal generation. The Council’s implied endorsement of extraregional sales and non-preference sales, in pursuit of an adequate, efficient, economical and reliable power supply would be an ill-considered step away from public preference and the region. Pacific Northwest Utilities Conference Committee described the economic and social benefits protected by adequate, efficient, economical and reliable power supply, and the risks to public health and safety that will flow from degradation below adequate, efficient, economical and reliable power supply. Power adjustments for fish were contemplated under Act, but not any significant alteration of the power system. Council has no authority to order even a short-term deprivation of adequate, efficient, economical and reliable power supply; adequate, efficient, economical and reliable power supply is in the Act to ensure that hydrosystem is not sacrificed to fish and wildlife measures. Council must

take hydrosystem as it finds it for purposes of adequate, efficient, economical and reliable power supply analysis; if fish measures push system over the brink of uneconomical or unreliable or inadequate, Act is violated, even if other factors drove the system to the brink.

Pacific Northwest Utilities Conference Committee said that the clear language of Act and its legislative history indicates the Council cannot divorce the hydrosystem from concept of adequate, efficient, economical and reliable power supply; e.g., the Act came into existence because of competing demands for low-cost federal hydropower; the Act recognizes the “unique opportunities provided by Federal Columbia River Power System”. Thus while adequate, efficient, economical and reliable power supply refers to “power” supply, Congress understood that a coordinated hydrosystem must remain an integral part of that power supply. “The Act clearly did not contemplate that the hydro system could be sacrificed to fish measures so long as it could be hypothetically replaced by other resources (especially non-renewable resources), for the right price.”

Direct Service Industries said adequate, efficient, economical and reliable power supply has five distinct elements -- the four parameters and the concept of “assure.” Any fisheries measures adopted by the Council, funded by Bonneville Power Administration, or implemented by Bonneville Power Administration, the Corps of Engineers or the Bureau must meet the adequate, efficient, economical and reliable power supply standard, and each agency must independently measure the fish and wildlife measures against the adequate, efficient, economical and reliable power supply standard, since adequate, efficient, economical and reliable power supply is not just a fish and wildlife program standard applicable to the Council, it is also a general purpose of the Act, and each agency is explicitly instructed to act consistently with the purposes of the Act.

Response: The Council took note of the view that the hydropower system must itself be protected on p. 2 of Appendix B. The Council is not obliged to publish its findings in advance for public comment, or defer to a Bonneville consideration of the issue. The Council issued a discussion paper on the issue, and consulted with Bonneville, the utilities and others in determining the appropriate analysis, information, and potential impacts.

Financial Impacts to Bonneville

Comments: The Montana Council members submitted an analysis by Tom Trulove produced under contract (531) which examined the costs and impacts and proper standard for judging when power system will no longer be adequate, efficient, economical and reliable; arguing for a basic “Bonneville Power Administration survival test” and for cost-effectiveness planning and sensitivity to local and regional differences in impact and economic situation. Columbia River Alliance (587) said that the key to maintaining an economical and reliable hydroelectric power system, while protecting and recovering weak salmon and steelhead stocks, is to make management decisions that reflect basic cost-effectiveness criteria.

Response: The Council considered financial impacts to Bonneville in considering whether the fish and wildlife measures permit Bonneville and the Council to carry out the purposes of the Act. This is not, however, a cost-effectiveness determination, which is governed by Section 4(h)(6)(C) of the Act. The Council recognizes that Bonneville’s Treasury obligations are a factor Bonneville considers in operational and other decisions (see Appendix C, pp. 20, 32-33).

Adequacy and Reliability

Comments: Industrial Customers of Northwest Utilities (698) said the region no longer has an adequate or reliable power supply, since drought and non-power requirements are leaving reservoirs 60 percent full rather than average of 90 percent full, resulting in increasing reliance on out-of-the-region spot purchases to meet firm load. They are also concerned about definitions of term economical; entire adequate, efficient, economical and reliable power supply term meant to be a constraint on the fish and wildlife program. An “economical” power supply cannot be predicated on funds from other sources, such as

Congressional appropriations and 4(h)10(C) reallocations. The program should be based solely on “cost impact to Bonneville Power Administration, other regional utilities, and ultimately, their customers.” With a number of Bonneville Power Administration’s customers leaving or thinking of leaving, “a clear case can be made that the economical limit has already been exceeded.” Defining economical “on the basis of program costs versus the value of the regional economy or on a comparative analysis of Northwest rates versus rates in other regions completely misses the point,” economical should be viewed instead from the perspective of utilities and customers that have to pay the costs.

Pacific Northwest Utilities Conference Committee and Direct Service Industries (749) said on the issue of “adequacy,” that because of the dominance of hydro in the region, adequacy on an annual basis is based upon energy considerations and not peak considerations, which is the norm elsewhere; annual adequacy is evaluated by use of critical year planning, combining load forecasts, usable reservoir space, historical streamflows and runoff forecasts to provide a level of generation that can be “guaranteed with a relatively high level of certainty.” Reductions in usable storage and operational flexibility have reduced planned generation and the level of certainty. Adequacy on daily or weekly basis must be measured against severe winter weather conditions; record peaks in February 1989 and December 1990. An adequate power supply “should get the region through an Arctic outbreak of up to two weeks duration without running out of reservoir storage”. The system has been planned to accommodate multiple contingencies. At the current time, with increasing fish operations limiting capacity and flexibility and with heavy reliance on extra-regional resources, “it is quite possible region will be unable to cover subsequent contingencies.”

Public Power Council supports the Pacific Northwest Utilities Conference Committee comments on standards for adequacy and reliability of the power supply. The Council should not adopt any measures that place constraints on the operational flexibility of the system in a manner that impedes the ability to meet load. Direct Service Industries said that an “adequate” power supply is one that can meet firm loads in the Pacific Northwest. When a proposed measure would derate the system, the Council must show how environmental and siting concerns for any new transmission or generation would be overcome. Congress never envisioned that the Northwest would become a net importer of energy by reason of the fisheries program. The Council’s primary focus must be on the continued adequacy of the hydropower supply, not the region’s power supply as a whole.

Don Reading, consulting economist for Idaho (766), said adequacy and reliability should not be a problem, given that the power plan shows a total of 6,500 average megawatts of power available from conservation, renewable resources and others at a real levelized cost of 3.4 cents per kwh. It would make sense to begin acquiring gas-fired resources to ensure adequacy in the long run. In addition, it is likely that more transmission capability will be built, and this will make it easier for different regions to support each other; and it liberalizing water and power planning away from rigid critical year planning could also help to provide an adequate and reliable power supply while operating the system to be more fish friendly.

Response: The Council discusses the adequacy of the power supply in Appendix C, p. 5, and the region’s reliance on purchases in Appendix B, p. 3. For concerns over reliability, see below.

Comments: Bonneville Power Administration said the Council should recognize that the terms “adequate” and “reliable” as used in the Act refer to commonly understood utility practices for insuring service on a continuous basis and commonly applied utility industry standards. The issue for the Council is whether or not its fish and wildlife program impairs the power system’s ability to meet accepted utility industry standards of reliability. A financially depressed Bonneville will be unable to maintain an adequate and reliable power system. Bonneville Power Administration will have difficulty assuring adequate, efficient, economical and reliable power supply if it is expected to operate on the edge of power system or financial constraints; and if Bonneville Power Administration’s customers perceive Bonneville Power Administration’s power system as threatened, this can lead to load instability or withdrawal and force a loss of adequate, efficient, economical and reliable power supply.

Reliability cannot be determined without knowing which projects can be used under various options. In analyzing high-flow options, for example, the Council appears to have assumed that Libby and Hungry Horse would be drafted first and Grand Coulee last. Whether its Libby and Hungry Horse or Grand Coulee that is empty when power is needed significantly affects reliability. And given the current state of the power system, reliability is a major concern with the significant flow proposals, especially Detailed Fishery Operations Plan (analysis does not indicate that additional spill by itself presents a reliability problem). In general, a thorough analysis of the effects of the various flow options on power system reliability was not possible given the information the Council presented in its plan; one issue is whether the capacity costs listed on pages 52-57 of Technical Appendix B are sufficient to restore system reliability; without additional information about the options, this was not possible to assess.

Operating Hungry Horse, Libby and Albeni Falls at higher levels would degrade the power system and cause reliability problems; Bonneville Power Administration analysis shows there would be reliability problems during a period of severe weather in winter if these projects were operated to their upper rule curves; on an hourly basis, reliability problems occur without any contingencies during an Arctic outbreak if the generation from the three headwater projects is not made available; sufficient energy cannot be purchased to replace the lost generation; without these projects, the remainder of the system is unable to meet peak loads even when combined with purchasing all import capability; insufficiency is as high as 5,000 megawatts in some hours. While operating headwater projects to upper rule curves on a monthly basis otherwise appears feasible, it has severe economic impacts, averaging \$93 million in low runoff years (below 90 million acre feet), with a maximum of \$132 million in the lowest year.

In its suggestions for how to maintain the ability to meet hourly loads, Bonneville Power Administration suggests that the daily draft rate at Grand Coulee be increased from 1.5 feet per day to 2 feet per day, providing about 1,200 average megawatts per day.

In a response to a request for clarification on actions the federal system would take to maintain reliability, Bonneville Power Administration replied that “[a]ctions for reliability will be taken only to meet firm load needs and only to the extent that reasonable purchases are insufficient.” During the time of the year when storage for anadromous fish flows is taking place at federal projects (Hungry Horse, Libby, Dworshak, Albeni Falls and Grand Coulee), “such storage will be temporarily drafted for reliability purposes under the following conditions:” “[d]uring periods when major temperature departures below normal are forecasted”; “[t]he loss of a major resource (i.e., Washington Nuclear Plant 2 or a large Grand Coulee unit)”; “[t]he loss of either the Northern or the Southern Intertie.” Bonneville Power Administration also stated that it had the responsibility under the Pacific Northwest Coordination Act, the Northwest Power Pool and the Western Systems Coordinating Council “to maintain reliability standards for voltage and transmission stability” and that “system instability could result in local or regional blackouts.”

On the issue of “reliability,” the Direct Service Industries said this is “the constant availability of electricity to customers in terms of quality, quantity, duration, cost and adequacy.” Given the unique nature of electricity as a human necessity and the possibilities of utility management and coordination, “reliability exists when interconnected systems are in balance or can be quickly returned to balance after any disruption. Utilities fulfill this requirement by following “time-tested standards and practices,” one such standard defined by the North America Reliability Council, with minimum criteria for reliable interconnected operations. The transmission system is an important part of reliability, measured by “an agreed to set of rules (criteria) determining acceptable frequency, duration, and magnitude of adverse effects on consumer service.” The primary transmission criteria are the Western System Coordinating Council Criteria for Transmission System Planning plus each individual utility’s reliability criteria. Acquiring new resources within the region and/or importing more power from outside the region to meet firm load both adversely affect the reliability of the transmission system without adjustments. The Council cannot assume that system reliability can be assured over the long term. Fish measures of substantial cost and questionable benefit have already caused the system to become unreliable. An operational plan that results in consistent curtailments of one quarter of their power

cannot be fairly characterized as reliable. The Direct Service Industries provide transmission stability reserves, and so the continued economic vitality of Bonneville Power Administration service to the Direct Service Industries loads is vital to the continued reliability of the entire Northwest power system. Thus, an economical power supply and a reliable power supply are interrelated. "To the extent that the Endangered Species Act threatens the economy of the Region's power supply, the Council has an affirmative obligation under the Northwest Power Act to remedy that situation."

Response: The Council did not depart from traditional standards of adequacy and reliability. Some fish measures will limit the flexibility of the system, but the Council's findings address reliability concerns. The system's longer term adequacy is addressed on pp. 5-10 of Appendix C. In addition to addressing power needs, the Council is attempting to respond to the Endangered Species Act developments by developing a program the Council believes the region can implement, rather than having one imposed on the region.

Economical Power Supply

Comments: On the issue of an "economical" power supply, Bonneville said that if costs were imposed as the result of some of the options, they could not be recovered in competitive rates and Bonneville Power Administration is likely not to be able to make its full Treasury payment. Public Power Council said the cost of fish and wildlife measures should not undermine Bonneville Power Administration's ability to implement all the purposes of the Act. There probably is no "bright line" to tell when fish and wildlife costs are so great that the region can no longer be assured of an economical power supply, that Bonneville Power Administration is uncompetitive, or that power costs are "unreasonable." It is probably easier to identify specific examples when the costs have become a burden to consumers -- plant closures, for example, are a drastic, delayed reaction and as a delayed reaction the Council should not rely on economic dislocation to be the indication of loss of an economic power supply. Personal or regional income or electrical rates in other parts of the country are not appropriate frames of reference for the discussion of an economical power supply in the region. Unlike National Marine Fisheries Service, the Council has a mandate to assure the power system stays economical, and so the Council must carefully consider any recommendation that calls for more expenditures of money for salmon by Bonneville Power Administration. The Council should reject any measures that would threaten Bonneville Power Administration's Treasury payment if implemented between now and the end of the current fiscal year. Council should insist that fish and wildlife measures be cost-effective; this is fundamental to the Council's assignment to balance the needs of the fish and wildlife program with the assurance of a healthy power supply system. Public Power Council expects to support full utilization of Section 4(h)(10)(c) of the Northwest Power Act; obtaining significant amounts of money from taxpayers seems unlikely; Council should not assume it can rely on Bonneville Power Administration transmission services for revenue to fund fish and wildlife measures.

Bonneville said that these factors are part of the equation: 1) no unreasonable costs; 2) not a burden to ratepayers; 3) no costs for mitigation of impacts caused by factors other than the power system; 4) preserve low-cost hydropower as envisioned in the Act; 5) be able to pay for the federal investment in the Federal Columbia River Power System; 6) maintain Bonneville Power Administration's ability to sell power; and 7) avoid undue impacts on customer classes. Fish and wildlife program costs should not be allocated to other Bonneville products, such as transmission; generation costs are to be allocated to power customers, and transmission costs to transmission users.

Direct Service Industries said that an "economical" power supply is not simply a ceiling at which power costs become uncompetitive. Instead, economical is determined measure by measure. Central to the interpretation of the term "is an appreciation that the [Act] was primarily a power act; the principal goal was the allocation of federal power among competing users. An interpretation of 'economical' that does not preserve the value of this allocation is not credible." An economical power supply (1) must not pay to mitigate adverse impacts caused by factors other than the hydro projects, nor (2) undo the statutory allocation

of federal power by making federal power uncompetitive, nor (3) include measures that impose costs on the power system that exceed their fisheries value.

An economic power supply must consider the economic impact of program measures on each customer class; for industrial customers it is no longer the case that the Northwest has the lowest cost power. For the preference utilities and their residential customers, the rates are approaching parity with other generation. The Act requires that an economic power supply leave Bonneville Power Administration competitive and able to make its treasury repayments. The Council cannot call the system “economical” based on a comparison to national power costs or power costs as a percentage of regional GNP, if the result is the collapse of Bonneville Power Administration. Bonneville Power Administration has already determined that it has no reserves and no short-term ability to raise rates to cover new fish measures. And the Council cannot assume, legally or otherwise, that fish costs imposed on Bonneville Power Administration, which it cannot recover in power rates because Bonneville Power Administration has become uncompetitive, can be recovered through “redistribution,” taxpayer funding, or in Bonneville Power Administration transmission charges for non-federal power sales that recover more than transmission costs. The Council has no authority to cause redistribution or taxpayer funding.

An “economical” power supply is also one that shows a “prudent” use of resources, which means that it “requires that each measure be tested -- weighing the cost against the fisheries gain.” Measures cannot be funded “which will not reliably result in increases in juveniles and adults.”

Don Reading, consulting economist for Idaho (766) said that economic and efficiency in the sense required by the Northwest Power Act and other power laws means internalizing externalities to the greatest extent possible and producing a maximum optimized output given system constraints, including the maintenance of fish and wildlife populations.

Response: The Council responded to these views on pp. 16-35 of Appendix C. The Council believes that rates in other parts of the country are informative, not determinative. Burdens to consumers are relevant, and the Council considers them in Appendix C, at pp. 16-20. The Council recognizes that there are limits to Bonneville’s financial resources, especially in the new competitive environment (see Appendix C, at pp. 20-35), and that this can affect the Council’s and Bonneville’s ability to carry out the purposes of the Act.

Efficiency

Comments: Pacific Northwest Utilities Conference Committee, Direct Service Industries (749) said that an “efficient” power supply in general means a system in which “resource operation maximizes power and energy production.” It also refers to efficient use of resource, including considerations of resource renewability and ability to match generation to load. In the hydrosystem, efficiencies include the water storage, shaping, shifting and load following capabilities; hydro is 90 percent efficient, while thermal plants are 30-50 percent efficient; various efficiencies allow Bonneville Power Administration and operators to serve loads in excess of system load carrying capacity, such as historically reliable service to Direct Service Industries top quartile; since 1991, system capabilities reduced to extent Bonneville Power Administration has to restrict top quartile in all months except April-July runoff. Public Power Council supports the comments of Pacific Northwest Utilities Conference Committee on the mechanics of efficiency of the power supply. From an environmental perspective, it is inefficient and therefore inconsistent with stated purposes of the Act to transmit thermally generated power a long distance to replace renewable resources available in the region. The Direct Service Industries said that assuring an “efficient” power supply was intended to impose an additional and distinct requirement that preserves the flexibility of the hydrosystem, taking advantage of the unique capabilities of the hydrosystem (recognized in the Act), such as its water storage and shaping capabilities and its efficiency in generation compared to thermal plants, qualities that have allowed Bonneville Power Administration to serve loads in excess of system load carrying capability. The obligation to assure an “efficient” power supply prohibits the Council from adopting fish measures that (in the context of other

measures that are adversely affecting fish) would eliminate or substantially reduce this capability. Contrary to this prohibition, since at least 1991 system capability has been significantly reduced.

Response: The Council addresses the efficiency issue beginning on p. 14 of Appendix C. The Council does not agree that maintaining an efficient power supply for the region requires operating the dams for the most efficient power operation, but the most efficient power operation within the constraints imposed by law, which includes not only the Northwest Power Act's fish and wildlife provisions, but those of the Endangered Species Act.

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GLOSSARY

The definitions in this list have no legal significance and are provided only for clarification of terms used throughout this program.

acclimation pond

Concrete or earthen pond or a temporary structure used for rearing and imprinting juvenile fish in the water of a particular stream before their release into that stream.

Act -- See Northwest Power Act.

adaptive management

A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as vehicles for learning. Projects are designed and implemented as experiments so that even if they fail, they provide useful information for future actions. Monitoring and evaluation are emphasized so that the interaction of different elements of the system are better understood.

adult equivalent population

The number of fish that would have returned to the mouth of the Columbia River in the absence of any prior harvest.

af (acre-foot)

Unit of volume measurement used to describe a quantity of water stored in a reservoir. One acre-foot of water covers one acre to a depth of one foot or 325,850 gallons.

anadromous fish

Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn. For example, salmon or steelhead.

approach velocities

Water velocities at or near the face of a fish screen.

artificial production or artificial propagation

Spawning, incubating, hatching or rearing fish in a hatchery or other facility constructed for fish production.

assured refill curve

A curve showing minimum elevations that must be maintained at each storage project to ensure refill even if the third lowest historical water year occurred; it sets limits on the production of energy.

attraction

Drawing fish to dam fishways or spillways through the use of water flows.

aMW (average megawatts)

The average amount of energy (number of megawatts) supplied or demanded over a specified time.

barrier net

A net system that is placed across a river, stream or channel to block the passage of fish from dam turbine intakes or other hazards without blocking the water flow.

baseload

In a demand sense, a load of electricity that varies only slightly over a specified time period.

baseline stream survey

A survey of the physical and biological resources and characteristics of a stream.

base load

The minimum load in a power system over a given period of time. Base load resources run continually except during maintenance and outages.

billing credits

Under the Northwest Power Act, a payment by Bonneville to a customer (in cash or offsets against billings) for actions taken by that customer to reduce Bonneville's obligations to acquire new resources.

biological diversity

The variety of and variability among living organisms and the ecological complexes in which they occur. Biological diversity at its most basic level is the genetic diversity (genetic variation found within each species), phenotypic and morphological diversity (physical, life history and behavioral variation found within each species), species diversity (number of species in a given ecosystem), and community/ecosystem diversity (variety of habitat types and ecosystem processes extending over a region).

blocked areas

Areas in the Columbia River Basin where hydroelectric projects have created permanent barriers to anadromous fish runs. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller locations.

Bonneville Power Administration (Bonneville)

The sole federal power marketing agency in the Northwest and the region's major wholesaler of electricity. Created by Congress in 1937, Bonneville sells power to public and private utilities, direct service customers, and various public agencies in the states of Washington, Oregon, Idaho, Montana west of the Continental Divide, (and parts of Montana east of the Divide)

and smaller adjacent areas of California, Nevada, Utah and Wyoming. The Northwest Power Act charges Bonneville with additional duties related to energy conservation, resource acquisition, and fish and wildlife.

brood stock

Adult fish used to propagate the subsequent generation of hatchery fish.

Bureau of Reclamation, U.S. Department of the Interior

An agency that administers some parts of the federal program for water resource development and use in western states. The Bureau of Reclamation owns and operates a number of dams in the Columbia River Basin, including Grand Coulee and several projects on the Yakima River.

bypass system

A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.

captive brood stock

Fish raised and spawned in captivity.

carrying capacity

The number of individuals of one species that the resources of a habitat can support.

cfs (cubic feet per second)

A unit used to measure water flow.

collection and bypass system

A system at a dam that collects and holds the fish approaching the dam for later transportation or moves them through or around the dam without going through the turbine units.

Columbia River Compact

An interstate compact between the states of Oregon and Washington by which the states jointly regulate fish in the Columbia River.

Columbia River Inter-Tribal Fish Commission

The Commission is the coordinating body of the Yakama, Nez Perce, Umatilla and Warm Springs Indian tribes. These tribes all signed the 1855 treaties that reserved their rights to Columbia River salmon and steelhead, certain wildlife and other resources.

Columbia River System

The Columbia River and its tributaries.

Columbia River Treaty

The treaty between the United States and Canada for the joint development of the Columbia River. It became effective on September 16, 1964.

Coordinated Information System

Still under development, this system is designed to allow interested parties to access technical information about Columbia River salmon and steelhead.

Corps of Engineers, U.S. Department of the Army (Corps)

An agency with the responsibility for design, construction and operation of civil works, including multipurpose dams and navigation projects.

creel census survey

The collection of data concerning the number of fish caught by sport fishers on a particular stream or in a particular area.

critical period

The sequence of low water conditions during which the hydropower system's lowest amount of energy can be generated while drafting storage reservoirs from full to empty. Under the Pacific Northwest Coordination Agreement, the critical

period is based on the lowest multimonth stream flow observed since 1928. Based on analysis of flows at The Dalles, this streamflow is also the lowest since recordkeeping began in 1879.

critical water

The low streamflow conditions in the critical period, under which the hydropower system will generate only about 12,300 average megawatts. In an average year, the Northwest hydropower system will produce about 16,400 average megawatts.

cryopreservation

The long term preservation of fish gametes by freezing.

deflector screens/diversion screens

Wire mesh screens placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.

demography

The study of characteristics of human populations, especially size, density, growth, distribution, migration and vital statistics and the effect of these on social and economic conditions.

dissolved gas concentrations

The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).

drawdown

The release of water from a reservoir for power generation, flood control, irrigation or other water management activity.

economies of scale

Reductions in the average cost of a product that result from increased production.

ecosystem

The biological community considered together with the land and water that make up its environment.

electrophoresis

A technique that allows biologists to determine fish origins by analyzing the genetic variation in fish body fluid and muscle tissue. The technique is used to determine which stocks are being caught in ocean fisheries in order to better regulate ocean fishing.

embeddedness

The degree to which dirt is mixed in with spawning gravel.

emergence

The act of fish leaving their incubation environment in the gravel to forage for food.

escapement

The number of salmon and steelhead that return to a specified point of measurement after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.

estuary

The part of the wide lower course of a river where its current is met and influenced by the tides.

evolutionary biology

The study of the processes by which living organisms have acquired distinguishing characteristics.

extinction

The natural or human-induced process by which a species, subspecies or population ceases to exist.

exotic species

Introduced species not native to the place where they are found.

Federal Energy Regulatory Commission (FERC)

The Commission issues and regulates licenses for construction and operation of non-federal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects.

federal land managers

This category includes the Bureau of Indian Affairs; the Bureau of Land Management; the National Park Service, all part of the U.S. Department of the Interior; and the Forest Service, U.S. Department of Agriculture.

federal project operators and regulators

Federal agencies that operate or regulate hydroelectric projects in the Columbia River Basin. They include the Bonneville Power Administration, the Bureau of Indian Affairs, the Bureau of Reclamation, the Corps of Engineers and the Federal Energy Regulatory Commission.

FELCC (firm energy load carrying capability)

The amount of firm energy that can be produced from a hydropower system based on the system's lowest recorded streamflows and the maximum amount of reservoir storage currently available to the system.

fingerling

A young fish from the time of the disappearance of the yolk sac to the end of the first year of growth. It ranges in size from approximately 1 to 3 inches.

firm energy or firm power

Electric energy that is considered assurable to the customers to meet all agreed upon portions of the customers' load requirements over a defined period.

fish and wildlife agencies

This category includes the Fish and Wildlife Service, U.S. Department of the Interior; the Idaho Department of Fish and Game; the Montana Department of Fish, Wildlife and Parks; the National Marine Fisheries Service, U.S. Department of Commerce; the Oregon Department of Fish and Wildlife; and the Washington Department of Fish and Wildlife.

fish flows

Artificially increased flows in the river system called for in the fish and wildlife program to quickly move the young fish down the river during their spring migration period. (See "water budget.")

fish guidance efficiency

The percentage of the total number of fish approaching a turbine intake that are deflected from a dam's turbine units by a fish guidance device such as a turbine intake screen.

Fish Passage Center

Part of the water budget program, the center plans and implements the annual smolt monitoring program; develops and implements flow and spill requests; and monitors and analyzes research results to assist in implementing the water budget. (See water budget.)

fish passage efficiency

The percentage of the total number of fish that pass a dam without passing through the turbine units.

fish passage managers

Located at the Fish Passage Center, the two fish passage managers are responsible for the specific

planning, implementation and monitoring activities of the Center aimed at helping fish on their migratory routes in the Columbia River Basin. One manager is designated by a majority of the federal and state fish and wildlife agencies, and the other manager is designated by a majority of the Columbia River Basin Indian tribes. (See Fish Passage Center.)

fish screen

A screen across the turbine intake of a dam, designed to divert the fish into the bypass system.

fishway (also called a fish ladder)

A device made up of a series of stepped pools, similar to a staircase, that enables adult fish to migrate up the river past dams.

flows

The rate at which water passes a given point in a stream or river, usually expressed in cubic-feet per second (cfs).

flow augmentation

Increased flow from release of water from storage dams.

forage species

Fish that serve as a food source for carnivorous fish.

forebay

The part of a dam's reservoir that is immediately upstream from the powerhouse.

forebay guidance net

A large net placed in the forebay of a dam to guide juvenile fish away from the powerhouse.

fry

The stage in the life of a fish from the hatching of the egg through the absorption of the yolk sac until it is about 1 inch long.

full pool

The maximum level of a reservoir under its established normal operating range.

game fish

A fish that is regulated by law for recreational harvest.

gametes

The sexual reproductive cells, eggs and sperm.

gas supersaturation

The overabundance of gases in turbulent water, such as at the base of a dam spillway. Can cause fatal condition in fish similar to the bends.

gene

The chemical unit of hereditary information that can be passed on from generation to generation.

gene pool

The total genes in a breeding population.

genetic conservation

The preservation of genetic resources in breeding populations.

genetic conservation refuge

Reserve area whose goal is to protect genetic diversity and natural evolutionary processes within and among natural populations, while allowing varying degrees of exploitation and modification.

genetic diversity

All of the genetic variation within a species. Genetic diversity includes both genetic differences among individuals in a breeding population and genetic differences among different breeding populations.

genetic integrity

The ability of a breeding population or group of breeding populations to remain adapted to its natural environment.

genetic introgression

The entry or introduction of a gene from one gene complex into another, as in introgressive hybridization, which is the spread of genes of one species into the gene complex of another as a result of hybridization between numerically dissimilar populations in which extensive backcrossing prevents formation of a single stable population.

genotype

The complement of genes in an individual.

glides

Stream areas with velocities generally less than one cubic foot per second and with a smooth surface. Water depth generally is less than two feet.

gpm (gallons per minute)

A unit used to measure water flow.

gravity feed system

A system that provides flow in a channel or conduit through the use of gravity.

habitat

The locality or external environment in which a plant or animal normally lives and grows.

harvest controls

Regulations established for commercial and sport fisheries to ensure that the correct proportion of the different stocks escape to spawn.

harvest management

The process of setting regulations for the commercial, recreational and tribal fish harvest to achieve a specified goal within the fishery.

headworks

A flow control structure on an irrigation canal.

headwaters

The source and upper part of a stream or river.

homing behavior

Behavior that leads mature salmon and steelhead to return to their stream or lake of origin for spawning.

husbandry

The scientific management and control of the hatchery environment for the production of fish or wildlife.

hydroelectric power or hydropower

The generation of electricity using falling water to turn turbo-electric generators.

hydrology

The scientific study of the water of the earth, its occurrence, circulation and distribution, its chemical and physical properties, and its interaction with its environment, including its relationship to living things.

hydropower system

The hydroelectric dams on the Columbia River and its tributaries.

impoundment

A body of water formed behind a dam.

imprinting

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

incubation

The period of time from egg fertilization until hatching.

Instream Flow Work Group

An interagency group that simulated the effects of various fish flow regimes by using hydropower-regulation computer models. The group was composed of technical experts and water resource managers from the fish and wildlife agencies, federal dam operators and regulators, and state water management agencies.

instream flows -- See flows.

intake traveling screens -- See turbine intake screens.

interim spill

The spilling of water over John Day, The Dalles, Bonneville, Lower Monumental and Ice Harbor dams to aid fish passage. This method will be used until permanent solutions to juvenile fish passage problems are developed.

intertie

A transmission line or system of lines permitting a flow of energy between major power systems. The Northwest has an intertie connection with California.

juvenile

Fish from one year of age until sexual maturity.

kcfs (thousand cubic feet per second) -- See cubic feet per second.

kcfs-month

One kcfs-month is a flow of 1,000 cubic feet per second for one month or 0.0595 million acre-feet.

kilowatt-hour (kWh)

A basic unit of electrical energy that equals one kilowatt of power applied for one hour.

known-stock fishery

A harvest management technique by which specific stocks are harvested in either a mixed-stock or a single-stock fishery.

limnology

The study of the life and phenomena of lakes, ponds and streams.

load shaping

The adjustment of storage releases so that generation and load are continuously in balance.

low-head dam -- A dam at which the water in the reservoir is not high above the turbine units.

Maf (million acre-feet) -- See af.

mainstem

The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the fish and wildlife program, mainstem refers to the Columbia and Snake rivers.

mainstem passage

The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.

mainstem survival

The proportion of anadromous fish that survive passage through the dams and reservoirs while migrating in the Columbia and Snake rivers.

mark-recapture study

A study that estimates population size by marking a segment of the population at one time and later measuring the ratio of marked animals to total animals.

mechanical bypass systems -- See bypass system.

megawatt (MW)

The electrical unit of power that equals one million watts or one thousand kilowatts.

mid-Columbia

The section of the Columbia River between the junction with the Snake River and Chief Joseph Dam.

Mid-Columbia Coordinating Committee

A committee whose primary purpose is to improve fish passage at the mid-Columbia dams. It determines annual operating requirements for fish passage at the dams; schedules research projects; and implements flow and spill requirements of the Mid-Columbia Settlement Agreement. The committee is composed of eight representatives of the fish and wildlife agencies, Indian tribes, the three mid-Columbia Public Utility Districts, and a power purchaser's representative.

mid-Columbia dams

Dams owned by the mid-Columbia Public Utility Districts. They include Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams.

mid-Columbia Public Utility Districts (PUDs)

Public Utility District No. 1 of Grant County, Public Utility District No. 2 of Chelan County and Public Utility District No. 1 of Douglas County.

minimum flow level

The level of stream flow sufficient to support fish and other aquatic life; to minimize pollution; or to maintain other instream uses such as recreation and navigation.

minimum operating pool

The lowest water level of an impoundment at which navigation locks can still operate.

Mitchell Act

The Mitchell Act of 1938 (Public Law No. 75-502, 16 U.S.C. 755), which authorizes federal funds for hatchery construction and operation within the Columbia River Basin.

mixed-stock fishery

A harvest management technique by which different species, strains, races or stocks are harvested together.

morphology

A study of the form and structure of animals and plants.

MSL

Mean Seal Level, a measure of elevation above sea level.

natural production

Spawning, incubating, hatching and rearing fish in rivers, lakes and streams without human intervention.

naturally spawning populations

Populations of fish that have completed their entire life cycle in the natural environment and may be the progeny of wild, hatchery or mixed parentage.

naturalization

The process by which introduced fish successfully establish a naturally spawning population.

Northwest Power Act

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power Planning Council and directed it to develop this program to protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries.

nutrient retention time

The amount of time microscopic food organisms, and nutrients on which they depend, spend in a reservoir. It is these organisms on which fish and the entire food chain depend. Nutrient retention time is measured by the amount of time it takes water to flow through a reservoir. In this program, "water retention time" and "nutrient retention time" mean the same thing.

off-site enhancement

The improvement in conditions for fish or wildlife species away from the site of a hydroelectric project that had detrimental effects on fish and/or wildlife, as part or total compensation for those effects. An example of off-site enhancement is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects caused by mainstem hydroelectric projects.

on-site

Usually refers to projects or activities designed to address harm caused to fish and wildlife at the site of the harm.

outfall

The mouth or outlet of a river, stream, lake, drain or sewer.

outmigration

The migration of fish down the river system to the ocean.

outplanting

Hatchery-reared fish released into streams for rearing and maturing away from the hatchery sites.

Pacific Northwest Coordination Agreement

An agreement between federal and non-federal owners of hydropower generation on the Columbia River system. It governs the seasonal release of stored water to obtain the maximum usable energy subject to other uses.

Pacific Northwest Utilities Conference Committee (PNUCC)

A group formed by Pacific Northwest utilities officials in order to coordinate policy on Pacific Northwest power supply issues and activities. PNUCC lacks contractual authority, but it plays a major role in regional power planning through its Policy; Steering; Fish and Wildlife; and Lawyers committees, and the Technical Coordination Group. PNUCC publishes the Northwest Regional Forecast, containing information on regional loads and resources.

passage

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

pathogens

Any agent that causes disease, such as a virus, protozoan, bacterium or fungus.

peaking generation -- see power peaking

peaking operations -- see power peaking

PIT tags

Passive Integrated Transponder tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an integrated microchip that is programmed to include specific fish information. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.

plume

The area of the Pacific Ocean that is influenced by discharge from the Columbia River, up to 500 miles beyond the mouth of the river.

population

A group of organisms belonging to the same species that occupy a well-defined locality and exhibit reproductive continuity from generation to generation.

population vulnerability analysis

A systematic process for estimating species, location and time-specific criteria for persistence of a population.

powerhouse

A primary part of a hydroelectric dam where the turbines and generators are housed and where power is produced by falling water rotating turbine blades.

power peaking

The generation of electricity to meet maximum instantaneous power requirements. The term usually refers to daily peaks.

predator

An animal that lives by preying upon others.

Public Utility District (PUD)

A government unit established by voters of a district to supply electric or other utility service.

rearing

The juvenile life stage of anadromous fish spent in freshwater rivers, lakes and streams before they migrate to the ocean.

redd

A spawning nest made in the gravel bed of a river by salmon or steelhead.

reproductive isolating mechanisms

Mechanisms that retain genetic diversity among populations. The primary reproductive isolating mechanism for anadromous fish is accuracy of homing, which can be reduced by improper hatchery operations. Stock transfers also reduce reproductive isolation.

reprogramming

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

reregulating dam

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

reservoir

A body of water collected and stored in an artificial lake behind a dam.

resident fish

Fish that spend their entire life cycle in freshwater. For program purposes, resident fish includes landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

resident fish substitutions

The enhancement of resident fish to address losses of salmon and steelhead in those areas permanently blocked to anadromous (ocean-migrating) fish as a result of hydroelectric dams.

riffle

A shallow extending across the bed of a stream over which water flows swiftly so that the surface of the water is broken in waves.

riparian habitat

Habitat along the banks of streams, lakes or rivers.

riprap

A streambank protection method using large rocks, boulders or debris to reduce erosion.

river miles

Miles from the mouth of a river to a specific destination or, for upstream tributaries, from the confluence with the main river to a specific destination.

rule curves

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

run

A population of fish of the same species consisting of one or more stocks migrating at a distinct time.

runoff

The portion of rain or snowmelt that runs across the land surface or infiltrates the soil and flows through the surface soil to ultimately reach stream channels.

Salmon and Steelhead Conservation and Enhancement Act

The Salmon and Steelhead Conservation and Enhancement Act of 1980 (Public Law 96-561, 16 U.S.C. 3301 et seq.), which authorized the establishment of a cooperative program to conserve and enhance the Pacific Northwest's salmon and steelhead stocks. The law called for the creation of the Salmon and Steelhead Advisory

Commission; the development of a comprehensive salmon and steelhead enhancement plan; and a “buy-back” program for commercial fishing vessels, licenses and gear.

salmonid

A fish of the Salmonidae family, which includes soft-finned fish such as salmon, trout and whitefish.

sinuosity

The amount of bending, winding and curving in a stream or river.

sluiceway

An open channel inside a dam designed to collect and divert ice and trash in the river (e.g., logs) before they get into the turbine units and cause damage. (On several of the Columbia River dams, ice and trash sluiceways are being used as, or converted into, fish bypass systems.)

smolt

A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence.

Southern Oscillation Index

An oceanographic indicator of environmental conditions that allows for the prediction of global climate events such as El Nino.

spawn

The act of fish releasing and fertilizing eggs.

spawning escapement

The total number of adult fish returning to a hatchery or stream to spawn.

spawner trap

A barrier erected in a stream or in a fish ladder intended to divert adult salmon or steelhead for holding prior to taking their eggs or sperm for culturing.

speciation

The natural process by which new species evolve from existing ones.

species

A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring.

spill

Releasing water through the spillway rather than through the turbine units.

spillway

The channel or passageway around or over a dam through which excess water is released or “spilled” past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam, while maintaining the reservoir level below some predetermined maximum level.

spillway crest elevation

The point at which the reservoir behind a dam is level with the top of the dam’s spillway.

squawfish

Refers to the northern squawfish, a native Pacific slope fish that is a major predator of smolts in the mainstem reservoirs.

stock

A population of fish spawning in a particular stream during a particular season. They generally do not interbreed with fish spawning in a different stream or at a different time.

state water management agencies

State government agencies regulate water resources. They include the Idaho Department of Water Resources; the Montana Department of Natural Resources and Conservation; the Oregon Water Resources Department; and the Washington Department of Ecology.

stochastic

Involving chance or randomness.

storage

The volume of water in a reservoir at a given time.

stream morphology

The study of the form and structure of streams.

subbasin

Major tributaries to and segments of the Columbia and Snake rivers.

subbasin planning -- See system planning.

subimpoundment

An isolated body of water created by a dike within a reservoir or lake.

supersaturation -- See dissolved gas concentrations.

supplementation

The release of hatchery fry and juvenile fish in the natural environment to quickly increase or establish naturally spawning fish populations.

system planning

A coordinated systemwide approach to planning in which each subbasin in the Columbia system will be evaluated for its potential to produce fish in order to contribute to the goal of the overall system. The planning will emphasize the

integration of fish passage, harvest management and production.

tailrace

The canal or channel that carries water away from the dam.

terrestrial furbearers

Furbearing animals that dwell primarily on land.

test fish

Fish used for research purposes.

thermal plants

A power plant that generates electricity by burning coal, oil or other fuel, or by nuclear fission.

transboundary

Refers to U.S. and Canadian border, transboundary pollution refers to pollution originating in Canada.

transportation

Collecting migrating juvenile fish and transporting them around the dams using barges or trucks.

travel corridors

Paths animals use during their migrations.

tribes

In this program, these include the Burns-Paiute Indian Colony; the Coeur d'Alene Tribes; the Confederated Tribes of the Colville Reservation; the Confederated Salish-Kootenai Tribes of the Flathead Reservation; the Confederated Tribes of the Umatilla Reservation of Oregon; the Confederated Tribes of the Warm Springs Reservation of Oregon; the Confederated Tribes and Bands of the Yakama Indian Nation; the Kalispel Indian Community; the Kootenai Tribe of Idaho; the Nez Perce Tribe of Idaho; the Shoshone-Paiutes of the Duck Valley Reservation;

the Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Spokane Tribe of Indians.

turbine intake screens

Large screens, which may have moving or non-moving parts, designed to be placed in a dam's turbine intake at an angle to deflect juvenile fish from the intakes into a bypass system.

uncontracted water

A volume of water in a storage reservoir that is not assigned for other purposes, such as irrigation.

upriver stocks

Salmon and steelhead stocks that spawn in the Columbia River or its tributaries above Bonneville Dam.

upwelling

Near the continental shelf, the movement to the surface of ocean bottom waters that are rich in nutrients.

U.S./Canada Pacific Salmon Treaty

Signed in 1984 and ratified by Congress in 1985 as the Salmon Treaty Act, this treaty governs the harvest and rebuilding of certain salmon stocks in Alaskan, Canadian and the continental United States.

velocity

In this concept, the speed of water flowing in a watercourse, such as a river.

velocity barrier

A physical structure, such as a barrier dam or floating weir, built in the tailrace of a hydroelectric powerhouse, which blocks the tailrace from further adult salmon or steelhead migration to prevent physical injury or migration delay.

wasteway

An open ditch or canal that discharges excess irrigation water or power plant effluent into the river channel.

water banking

An administrative system for renting surplus water.

water budget

A means of increasing survival of downstream migrating juvenile fish by increasing Columbia and Snake river flows during the spring migration period. The water budget was developed by the Council, which oversees its use in conjunction with the fish and wildlife agencies and Indian tribes, the U.S. Army Corps of Engineers, the Bonneville Power Administration and the Bureau of Reclamation.

watershed

The area that drains into a stream or river.

weak stock

Listed in the Integrated System Plan's list of stocks of high or highest concern; listed in the American Fisheries Society report as at high or moderate risk of extinction; or stocks the National Marine Fisheries Service has listed. "Weak stock" is an evolving concept; the Council does not purport to establish a fixed definition. Nor does the Council imply that any particular change in management is required because of this definition.

wild populations

Fish that have maintained successful natural reproduction with little or no supplementation from hatcheries.

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