

Columbia River Basin Fish and Wildlife Program 2014

 Northwest **Power** and
Conservation Council

nwcouncil.org/fw/program
document 2014-12 / October 2014

Message from the Council

The Columbia River Basin Fish and Wildlife Program of the Northwest Power and Conservation Council is the most comprehensive fish and wildlife mitigation and restoration effort in the world.

Since 1982, the Council's program has directed the investment of more than \$3 billion of electricity revenues to improve fish passage at hydropower dams, acquire and improve fish and wildlife habitat, boost fish production using hatcheries, monitor and evaluate the success of these efforts, and improve scientific knowledge through research.

Early programs focused on mainstem Columbia and Snake river hydropower system improvements for ocean-going fish, including water management and fish passage at dams. Over time as the hydrosystem improvements were implemented, the program began to place a greater emphasis on habitat, including restoration projects throughout the American portion of the [Columbia River Basin](#). Later programs reflected the changing needs and dynamics in the basin, and include expanded restoration and mitigation efforts for losses of resident fish and wildlife and their habitat as a result of the hydropower system. Key stream reaches were protected from hydropower development, and the Council promoted scientific research to guide its decisions, as well as management decisions of the region's fish and wildlife agencies and tribes.

In 2000, the Council adopted a new program framework of goals, objectives, and strategies at different geographic levels, including subbasins. The program also considered habitat, hydropower, hatcheries, and harvest when identifying areas for mitigation and restoration. This framework continues to be the basis of the Council's 2014 Program, with increased emphasis on [adaptive management](#) [see [Program Framework](#)].

The Council's programs have served as a foundation for federal action agencies (Bonneville Power Administration, the Corps of Engineers, and the Bureau of Reclamation) seeking to recover Endangered Species Act-listed species in the basin. The Council's recommendations for dam operations and its strategies for habitat restoration and hatcheries were incorporated into federal biological opinions and recovery plans, and standards developed by the Council's two panels of independent scientists continue to provide the basis for evaluating the success of salmon and steelhead recovery efforts.

The majority of work conducted under the Council's fish and wildlife program is focused directly on protecting, mitigating and enhancing salmon and steelhead affected by the development and operation of the hydroelectric dams in the Columbia River basin. The Council and the region recognize that many other species were adversely affected as well. Therefore in this program the Council

included strategies specific to certain species including sturgeon, lamprey, and eulachon.

While we are pleased that the Council's program has played such an important role in recovering and rebuilding fish and wildlife species, we also note that many of the projects that implement the program are aging and are in need of additional operational and maintenance funding. The Independent Scientific Advisory Board cautions that these investments may also be threatened by outside influences. These circumstances present unique challenges for the Council, and demonstrate the need to be flexible and responsive in a changing world. For example, the Council is aware of the impact, present and future, of non-native species, toxic contaminants, and climate change on fish and wildlife in the Columbia Basin.

The Council's role as a planning, policy-making, and reviewing body continues to evolve. Currently, the Council sees an opportunity to be an information broker and to assist the coordination among fish and wildlife managers. The Council is the logical body to identify and provide regional leadership and coordination on a variety of fish and wildlife issues, including the need to establish a long-term strategy to protect the region's substantial investments and to prioritize future investments.

We are honored to assume that task.

Bill Bradbury, Chair
Jennifer Anders, Vice-Chair
W. Bill Booth
Tom Karier
Henry Lorenzen
Phil Rockefeller
Pat Smith
Jim A. Yost

TABLE OF CONTENTS

Part One: Overview	7
I. The Columbia River Basin	7
II. The Northwest Power and Conservation Council and the Columbia River Basin Fish and Wildlife Program	9
Part Two: Introduction	10
I. The program framework.....	10
A. <i>Geographic structure</i>	11
II. Legal and social context of the program	14
III. Assuring the Pacific Northwest an adequate, efficient, economic and reliable power supply	18
IV. Program progress	20
A. <i>Program successes</i>	20
B. <i>Program challenges</i>	22
V. Tracking the status of the basin’s fish and wildlife resources.....	25
Part Three: Basinwide Vision, Scientific Foundation, Goals, Objectives, and Strategies	26
I. Vision for the Columbia River Basin	26
II. Scientific foundation and principles of the program	27
III. Goals and Objectives - the changes we want to achieve.....	29
A. <i>Program goals and quantitative objectives</i>	29
1. Refining program goals and quantitative objectives.....	31
IV. Strategies - how the program will achieve the changes	37
A. <i>Ecosystem function</i>	38
1. Habitat.....	41
2. Strongholds.....	44
3. Non-native and invasive species.....	46
4. Predator management	49
5. Protected areas and hydroelectric development and licensing	52
6. Water quality	54
7. Climate change	57
8. Mainstem hydrosystem flow and passage operations.....	60
9. Estuary.....	68
10. Plume and nearshore ocean	70
11. Wildlife mitigation	72
B. <i>Fish Propagation Including Hatchery Programs</i>	76
C. <i>Other strategies</i>	80
1. Wild fish	80
2. The use of hatcheries for reintroduction.....	82
3. Anadromous fish mitigation in blocked areas.....	83
4. Resident fish mitigation	87
5. Sturgeon	90
6. Lamprey	94
7. Eulachon	97
8. Public engagement	99
Part Four: Adaptive Management	101

Part Five: Subbasin Plans	108
Part Six: How the Program is Implemented	110
I. Program measures	110
II. Investment strategy	114
III. Implementation procedures	118
A. <i>Project review process</i>	119
1. Elements of project review	119
2. Step review process.....	120
B. <i>Program coordination</i>	121
C. <i>Independent scientific and economic review</i>	123
Part Seven: Appendices	126
A. <i>Glossary</i>	128
B. <i>Estimates of hydropower-related losses</i>	144
C. <i>Wildlife mitigation priorities, construction and inundation loss assessments, and dam licensing considerations</i>	145
1. Mitigation priorities	145
2. Mitigation for wildlife losses due to hydropower construction and inundation	148
3. Mitigation considerations in dam licensing decisions	152
D. <i>Program goals and objectives</i>	153
E. <i>Council high-level indicators</i>	162
F. <i>Future hydropower electric development and licensing, and protected areas</i>	163
G. <i>Climate change impacts in the Columbia River Basin</i>	172
H. <i>Fish Passage Center</i>	175
I. <i>Alternative operations at Grand Coulee</i>	176
J. <i>Wildlife crediting forum</i>	177
K. <i>Resident fish mitigation settlements</i>	178
L. <i>Reporting</i>	180
M. <i>List of subbasin plans and adoption dates</i>	183
N. <i>Species</i>	185
O. <i>Subbasin and basinwide measures</i>	191
1. Subbasin measures	191
2. Basinwide and mainstem measures	197
P. <i>Maintenance of Fish and Wildlife Program Investments</i>	199
Q. <i>Administration and procedures of the Independent Scientific Review Panel, the Scientific Peer Review groups, and the Independent Scientific Advisory Board</i>	201
R. <i>Assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply</i>	204
S. <i>Responses to recommendations and comments, including findings on recommendations not adopted into the 2014 Fish and Wildlife Program</i>	219



Figure 1. Columbia River Basin

Part One: Overview

I. The Columbia River Basin

The Columbia is one of the great rivers of North America. Beginning at Columbia Lake, British Columbia, the main branch of the river travels over 1,200 miles through fourteen dams before reaching the Pacific Ocean a hundred miles downstream from Portland, Oregon. Fed mostly by melting snow, the Columbia River drains an area of about 259,000 square miles in a basin that spans seven U.S. states and a portion of southeastern British Columbia. Major tributaries feeding the Columbia include the Kootenai, Flathead, Clark Fork/Pend Oreille, Kettle, Okanogan, Methow, Spokane, Wenatchee, Yakima, Snake, Clearwater, Salmon, Owyhee, Grande Ronde, Walla Walla, Umatilla, John Day, Deschutes, Hood, Willamette, Klickitat, Lewis, and Cowlitz rivers. The largest tributary, the Snake River, drains an area of nearly 110,000 square miles or almost 50 percent of the U.S. portion of the basin. In all, the Columbia and its tributaries run through climatic conditions and topography as varied as any river in the world -- from alpine to desert to rainforest.

The Columbia River is home to six species of Pacific salmon: Chinook, coho, sockeye, chum, and pink salmon, and steelhead. The basin's salmon and steelhead runs were once among the largest in the world, with an estimated average of between 10-16 million fish returning to the basin annually. For thousands of years, the tribal people of the basin have depended on these salmon runs and other native fish for physical, spiritual, and cultural sustenance. Commercial and sports fishing, and recreational, aesthetic, and cultural considerations endear salmon and steelhead to millions of other residents and visitors. Many animals, including bald eagles, osprey and bears, also rely on fish from the Columbia River and its tributaries to survive and feed their young.

Salmon and steelhead runs, along with other native fish and wildlife in the basin, have declined significantly in the last 150 years. Recent years have seen some improvements in the number of adult salmon and steelhead passing Bonneville Dam; however, many of these are hatchery fish. Many human activities contributed to this decline, including land and water developments across the region that blocked traditional habitats and dramatically changed natural conditions in rivers where fish evolved.

These developments included the construction of dams throughout the basin for such purposes as hydroelectric power, flood control, commercial navigation, irrigation, and recreation. Fourteen of the largest multi-purpose dams are on the mainstem Columbia; the mainstem Snake River adds another dozen major projects. Water storage in the Columbia River totals approximately 30 percent of the average annual runoff, which fluctuates from year-to-year depending on the snowpack. With its many major federal and non-federal hydropower dams, the Columbia and its tributaries comprise one of the most intensively developed river basins for hydroelectric power in the world. Hydroelectric dams in the basin

produce, under normal precipitation, about 41 percent (14,000 average megawatts) of all the electricity generated in the Pacific Northwest.

Dams control how water flows in the modern Columbia River -- storing runoff, reducing flood flows, shifting flows from the natural spring/early summer peak to fall and winter to generate electricity for the region's peak electricity demand, and blocking, inundating, or reconfiguring major river reaches. These river developments support the region's economic prosperity while having substantial adverse effects on the native anadromous and resident fish and wildlife of the basin. To address these effects, and also to provide for coordinated, region-wide planning to meet future demand for electricity in the Pacific Northwest, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act in 1980.

II. The Northwest Power and Conservation Council and the Columbia River Basin Fish and Wildlife Program

The Northwest Power and Conservation Council, an interstate compact agency of Idaho, Montana, Oregon, and Washington, was established under the authority of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act or Act). The Act directs the Council to develop a program to “protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries ... affected by the development, operation, and management of [hydroelectric projects] while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.” The Act also directs the Council to ensure widespread public involvement in the formulation of regional power and fish and wildlife policies.

As a planning, policy-making and reviewing body, the Council develops the program and then monitors its implementation by the Bonneville Power Administration (Bonneville), the U.S. Army Corps of Engineers (the Corps), the Bureau of Reclamation (the Bureau) and the Federal Energy Regulatory Commission (FERC) and its licensees.

The Northwest Power Act directs the Council to develop its 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. The Council also takes comment from designated entities and the public on those recommendations. The Council then issues a draft amended program, initiating an extensive public comment period on the recommendations and proposed program amendments that includes extensive written comments, public hearings in each of the four states, and consultations with interested parties.

After closing the comment period and following a review and deliberation period, the Council adopts the revised program. The Council develops its final program on the basis of the amendment recommendations, information submitted in support of the recommendations, views and information obtained through public comment and participation, and consultation with the fish and wildlife agencies, tribes, Bonneville customers and others. The program amendments are not concluded until the Council adopts written findings as part of the program explaining its basis for adopting or not adopting program amendment recommendations.

Part Two: Introduction


I. The program framework

The framework is an organizing tool to structure actions guided by this program to protect, mitigate, and enhance fish and wildlife affected by hydropower dams in the Columbia River Basin. The framework connects the program vision, the goals and objectives and implementation through a logical structure. The framework elements along with the principles of adaptive management provide a foundation for adjusting the work done under the program to continue to make progress toward the program vision, goals, and objectives. The framework is applied at all levels or scales of the program, which are described under the geographic structure later in this introduction.

The fundamental elements of the program framework are:

- The [vision](#), which describes what the Council hopes to accomplish in the context of desired benefits provided by the river
- The program [goals and objectives](#), consistent with the vision, which describe the changes in the environment and the biological performance that is needed to achieve the vision
- The [strategies](#), which guide and describe the [measures](#) that lead to the desired environmental and biological conditions (program measures are prioritized in the [Investment Strategy](#))
- The [scientific foundation and principles](#), which provide the scientific rationale based on the best available science for why the Council believes certain management strategies and measures will result in particular ecological conditions and why these conditions will affect fish and wildlife populations or communities in a desired way to achieve the vision
- The [adaptive management](#) strategy, which guides what information needs to be gathered and evaluated through research and monitoring to assess progress toward program goals and quantitative objectives (this strategy also provides guidance on the reporting of this information and the [status](#) of the fish, wildlife, and habitat that it aims to mitigate, enhance, and protect)

An ongoing feedback loop for the fish and wildlife program framework is illustrated in Figure 2. This conveys the importance of constantly applying the information learned through adaptively managing the program and its implementation. Currently, there are three main processes used to adaptively manage the program and implementation of its projects:

1. Amending the program at least every five years pursuant to the Northwest Power Act (Act) per recommendations from the region, which are to be based on the best available science
2. Regular reviews of the program and current science conducted by the ISAB [see [ISAB reports](#) .
3. Reviews of program-funded projects by the Independent Scientific Review Panel (ISRP) that inform Council recommendations about project

implementation, [see [ISRP](#), [Council project recommendations](#), and [CBFish.org](#)] providing the opportunity to adjust project implementation over time to better align with new science and continue to implement sound science

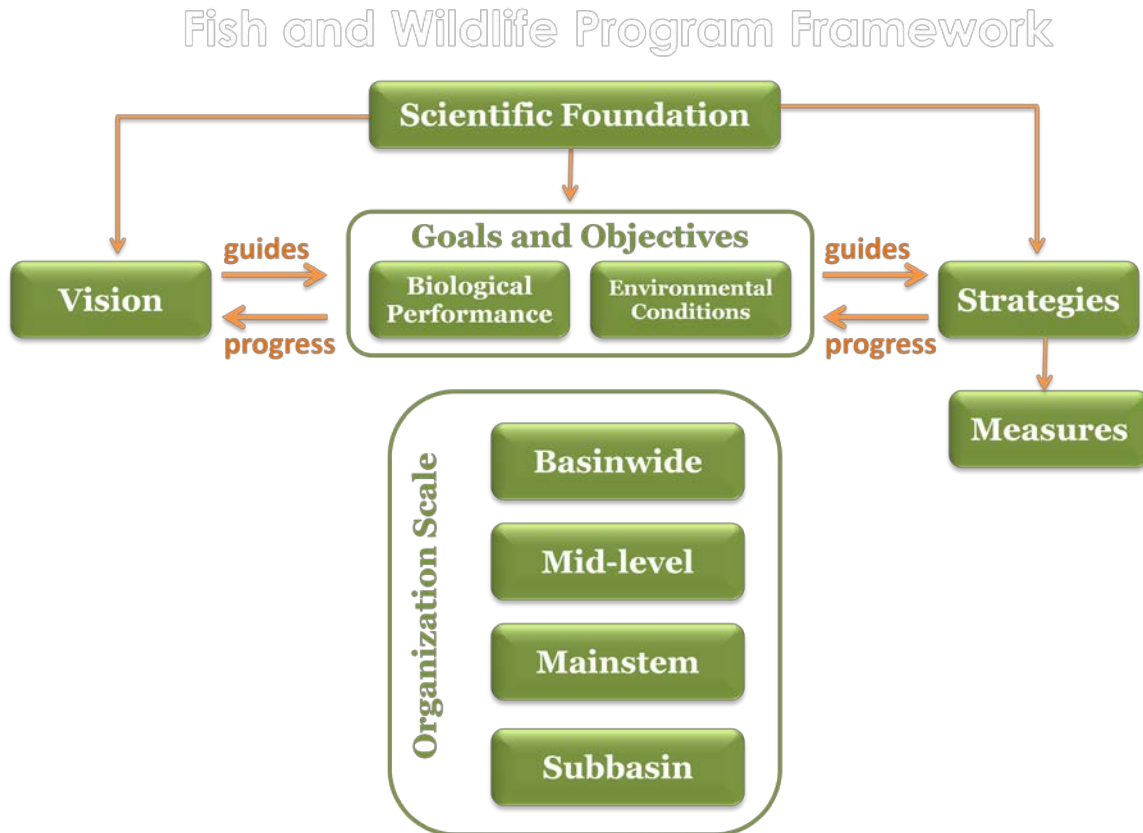


Figure 2. Fish and wildlife program framework

A. Geographic structure

The Council recognizes that the Columbia River Basin is an immense system that encompasses a vast array of physical, biological, and human elements. The program recognizes that because of the size and complexity of this system, the basin usually is managed as a collection of individual components. However, the Act directs the Council to view the river as a single system in its planning. Managing the river as a system means recognizing its structure and how the parts work together. The program also recognizes the Pacific Ocean as an integral component of the Columbia River ecosystem and includes a strategy for the ocean and freshwater plume.

The program is organized into four nested levels that make up its geographic structure and emphasize the relationships among the framework elements. The four levels are:

1. Basinwide: This level addresses the entire Columbia River Basin of about 259,000 square miles, including the plume and nearshore ocean. Basinwide guidance contains the program vision, scientific foundation, biological objectives, strategies, and implementation provisions that apply generally across the program and are implemented throughout the basin. This level represents management occurring at the landscape scale.
2. Mainstem: In this program, “mainstem” refers to the main channels of the Columbia and Snake rivers. The program includes a mainstem strategy with specific objectives and actions for the federal operating agencies and others to implement in the mainstem Columbia and Snake rivers to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric dams.
3. [Subbasins](#): This level represents geographic units of hundreds and in some instances thousands of square miles. Subbasins include tributaries of the main Columbia and Snake rivers and also distinct sections of the mainstem rivers. The program includes 62 subbasins, as shown in Figure 3, 59 of which have [subbasin plans](#) and are a significant portion of the Council’s Columbia River Basin Fish and Wildlife Program. These plans contain specific objectives and measures that guide actions that implement the program.
4. Other geographic scales: Other geographic-scale units comprising adjoining subbasins with similar terrain and biological communities may be used by the Council as geographic organizing tools to reference particular areas of the basin, or to review work occurring specifically in those areas. The Council may continue to use these organizing units as well as Evolutionarily Significant units (ESUs) for listed anadromous fish, or other common geographic reference areas or management units to conduct its work, as appropriate.

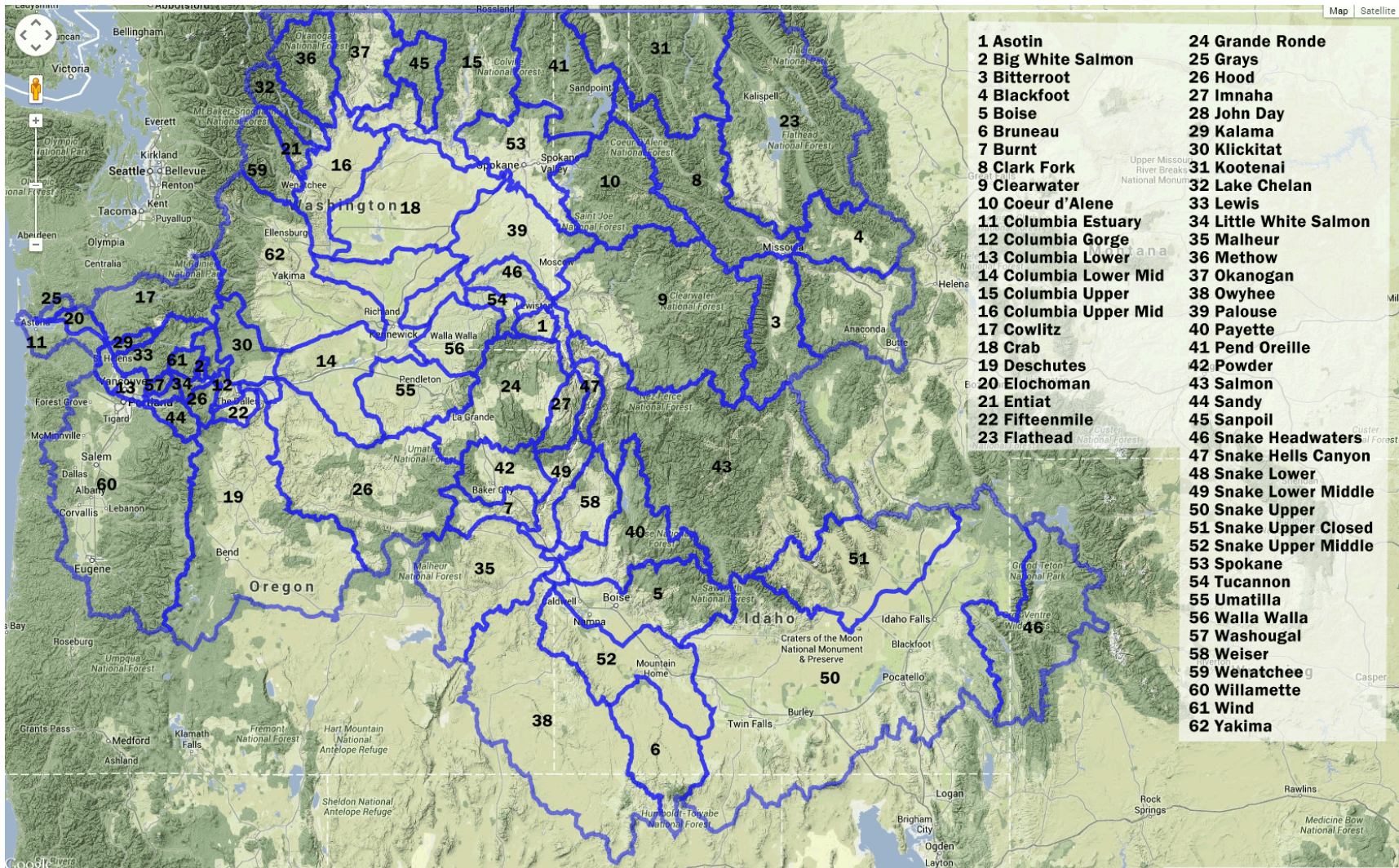


Figure 3. Columbia River Basin Fish and Wildlife Program Subbasins.

II. Legal and social context of the program


This program cannot address all fish and wildlife problems in the Columbia River Basin. Successful protection, mitigation and recovery efforts require the collaborative efforts of many entities and programs on a coordinated strategy for habitat protection and improvement, hydrosystem operations, hatchery production, harvest management, and other actions, some funded under the program and some not. The Council recognizes that a range of legal and social factors influence how the natural resources of the Columbia River Basin are managed, and how the Council shapes the program. These factors, some of which are detailed below, also influence what actions and strategies are feasible to implement to achieve the program vision.

Northwest Power Act general requirements. The Act directs the Council to protect, mitigate, and enhance the fish and wildlife affected by the development and operation of the Columbia River Basin hydropower facilities. The Council is to do so in a way that still assures the Pacific Northwest an [adequate, efficient, economical, and reliable power supply](#), with an expectation in the Act that suitable environmental conditions for fish and wildlife are substantially obtainable from the management and operation of Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries. The Council is to develop this program on the basis of recommended measures and objectives largely from the federal and state fish and wildlife agencies and Indian tribes, recommended measures that the Council can expect to be implemented by the Bonneville Power Administration (Bonneville) and other federal agencies under the Act and other existing laws.


Ratepayer responsibilities. Under the Act, consumers of the electric power from the hydroelectric dams of the Columbia River Basin (that is, the ultimate end users of the power) are to bear the cost of measures designed to deal only with the adverse impacts caused by the development and operation of the electric power facilities. The Council's program includes two types of measures to address these impacts. First, the program contains measures that directly address the impacts that the hydrosystem has on fish and wildlife. Second, the program includes measures that address other limiting factors for fish and wildlife. This is because the Act authorizes the Council to include in the program, in appropriate circumstances, "enhancement measures as a means of achieving offsite protection and mitigation with respect to compensation for losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries as a system." The nexus to the hydrosystem that allows a measure to be an appropriate part of the program is whether the measure will provide protection or mitigation benefits for fish or wildlife adversely affected by the hydrosystem or to compensate for effects not already mitigated.

On this basis, the program has identified a comprehensive set of interrelated fish and wildlife issues and responsive strategies that are within Bonneville's authority to fund as direct and offsite protection and mitigation to satisfy Bonneville's

obligations under the Act. The extent of Bonneville's funding obligation in any particular rate period will be determined through the procedures Bonneville uses to project which activities the agency needs to implement in that period to meet its obligations, estimates of the reasonable cost for these activities (expenditure and capital budget projections), and a determination of rates (in the rate case) necessary to produce the revenue needed to cover these costs. The combined implementation of measures addressing the direct impacts of the hydrosystem and the off-site mitigation measures must be sufficient to mitigate for the impacts of the Columbia hydropower system on fish and wildlife.

Bonneville uses a portion of its revenue from the sale of electricity generated by the Federal Columbia River Power System to satisfy its Power Act responsibilities by directly funding fish and wildlife protection, mitigation, and enhancement activities in a manner consistent with the Council's program and by reimbursing the federal Treasury for expenditures by the Corps, Bureau of Reclamation, and U.S. Fish and Wildlife Service for investments in fish passage and fish production [see the [Council financial reports](#) ]. The Council works with Bonneville and others to develop budgets, implementation plans, and project recommendations that guide Bonneville rate-setting procedures on the level of effort necessary to act in a manner consistent with the program.

Shared responsibility. The development and operation of the hydropower system is only one factor in the loss of fish and wildlife in the Columbia River Basin, albeit a major factor. Improving conditions for fish and wildlife in the Columbia Basin and providing funding is a responsibility that the Council and its program shares with citizens, private entities, and government agencies throughout the region. The Act recognizes that program measures may be more successful if implemented in coordination with the activities of others who are addressing factors other than those caused by the development and operation of electric power facilities and programs. In such a case, program implementation allows for agreements among the appropriate parties providing for the coordinated administration and funding of additional measures.

"In lieu" expenditures by Bonneville. Section [4\(h\)\(10\)\(A\)](#)  of the Act provides, among other things, that Bonneville's fish and wildlife expenditures "shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law." The Council will work with Bonneville and others on an appropriate application of the in-lieu provision. The focus of the provision is on the expenditures themselves, not just on shared responsibility for the underlying problems and actions. The Council expects Bonneville to apply the in-lieu prohibition and withhold Bonneville funding only when the proposed expenditure of Bonneville funds would clearly substitute for and thus be "in lieu of" expenditures authorized or required from another funding source. "In-lieu" determinations by Bonneville must be fair, consistent and equitable for all parties doing mitigation under the Council's fish and wildlife program in the Columbia Basin. Bonneville shall inform the Council of pending in-

lieu determinations and, if requested, discuss the in-lieu determination with the Council's Fish and Wildlife Committee before the in-lieu determination is finalized or implemented. The Fish and Wildlife Committee may recommend the Council review the in-lieu determination and recommend alternatives to Bonneville.

Role of fish and wildlife agencies and tribes. The Act envisions a strong role for the state and federal fish and wildlife agencies and the basin's Indian tribes in developing the provisions of this program. The Council's program is to include measures, mostly recommended by the fish and wildlife agencies and tribes, that the Council determines "complement the existing and future activities of the Federal and the region's State fish and wildlife agencies and appropriate Indian tribes" and that will "be consistent with the legal rights of appropriate Indian tribes in the region."

Rights of Indian tribes. The Council recognizes that Indian tribes in the Columbia River Basin are sovereigns with governmental rights over their lands and people and with rights over natural resources that are reserved and protected in treaties, executive orders, and federal statutes. The United States has a trust obligation toward Indian tribes to preserve and protect these rights and authorities. Nothing in this program is intended to affect or modify any treaty or other right of an Indian tribe. The Act and the fish and wildlife program are intended instead as an effort in part to assist the Indian tribes in realizing their treaty and other rights and responsibilities with regard to fish and wildlife. Thus the Council also recognizes that implementation of this program will require significant interaction and cooperation with the tribes. The Council commits to work with the tribes in a relationship that recognizes the tribes' interests in co-management of affected fish and wildlife resources and respects the sovereignty of tribal governments.

Harvest and harvest management and production agreements. The harvest of salmon, steelhead, and other fish provides significant cultural, economic, and recreational benefits to the region, and so the program seeks to allow for harvest opportunities consistent with sound biological management practices. The Council's program supports tribal and non-tribal harvest of fish and complements regional harvest management agreements, such as the Columbia River Compact, the U.S. v Oregon Management Agreement, and the Pacific Salmon Treaty.

Applicable federal and state laws. The Council recognizes that the agencies that participate in and implement the Council's program under the Act must also comply with and implement a range of federal and state laws. Relevant federal laws include the federal Endangered Species Act, the Clean Water Act, the National Environmental Policy Act, the authorizing legislation for particular projects within the Federal Columbia River Power System, and the Federal Power Act and licenses issued by the Federal Energy Regulatory Commission for non-federal projects. The Council designs the program with the intent to

complement these authorities and legal requirements and even assist other entities in their compliance through opportunities presented under the program.

Natural resources management. The Council is a planning agency that does not have management authority over natural resources, whether lands, waters, or fish and wildlife. These responsibilities lie with the federal, state, and tribal natural resources agencies. The Council's program encourages collaboration and coordination so that program actions work in concert with, and do not conflict with fish and wildlife and other natural resources managers' activities and authority.

Water rights. As provided by the Act, nothing in this program shall affect the rights or jurisdictions of the United States, the states, the Indian tribes, or other entities over waters of any river or stream or any groundwater resources. Nor shall anything in this program be construed to alter or establish the respective rights of the United States, the states, Indian tribes, or any person with respect to any water or water-related right.

III. Assuring the Pacific Northwest an adequate, efficient, economic and reliable power supply

Section [4\(h\)\(5\)](#) of the Northwest Power Act requires that the Council's Fish and Wildlife Program consist of measures that protect, mitigate, and enhance fish and wildlife affected by the development, operation and management of the Columbia River hydroelectric facilities "*while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.*" At the conclusion of a program amendment process, the Council signifies in some manner that (1) it has considered the fish and wildlife measures to be adopted as part of the program and their potential effect on the region's power supply, and (2) has an appropriate level of confidence that the region may implement the revised fish and wildlife program while maintaining an adequate, efficient, economical and reliable power supply. This is known as the "AEERPS" consideration or conclusion. The Council's considerations regarding what it means to approve fish and wildlife program measures while assuring the region an "adequate," "efficient," "economical," and "reliable" power supply are discussed in [Appendix R](#) of the program

The discussion of an "adequate and reliable" power supply relies primarily on information now generated by the Council on an ongoing basis in regular assessments of the adequacy of the Pacific Northwest power supply. The discussion of an "economical" power supply includes information from Bonneville as to how Bonneville reports the costs of the fish and wildlife program, published in the Council's annual report to the governors on fish and wildlife program costs. The discussion on "efficiency" includes not just consideration of the efficiency of the power supply but also includes recommendations by the Council, based in part on a report by the Independent Economic Analysis Board (IEAB), to further improve the efficiency of fish and wildlife program implementation.

Adequacy assessments, Bonneville's costs to implement the program, and Council recommendations based on IEAB reports are important considerations for the program, but this information is not part of the formal conclusions required by the statute regarding the cost-effectiveness and efficiency of the power supply. However, the discussion of what constitutes efficient and cost-effective fish and wildlife measures [see [Appendix R](#)] is a useful place in the program to consider these broader issues of fish and wildlife implementation, efficiency, and cost-effectiveness.

For the reasons given in the longer discussion in Appendix R, the Council concludes that it may adopt the protection, mitigation and enhancement measures in the 2014 Columbia River Basin Fish and Wildlife Program while assuring the region an adequate, efficient, economical and reliable power supply. Under the Act, after the Council completes the fish and wildlife program amendments, the Council begins a separate process under the statute to review and revise the Council's regional electric power and conservation plan. The Council's AEERPS conclusion here assumes that the Council will continue to



follow the requirements of the Power Act in reviewing and revising the power plan, including approving a conservation and generating resource strategy to guide Bonneville and the region in acquiring the least-cost resources necessary to meet the region's demand for electricity and to "assist [Bonneville] in meeting the requirements of section [4\(h\)](#) of this Act," that is, to implement the fish and wildlife program.

IV. Program progress

A. Program successes

The Council, working with regional partners, has made progress in a number of key areas since the Act was enacted in 1980:

- Improved over 2,400 river miles of habitat, supporting hundreds of thousands of natural-origin juvenile salmon. In 2013, almost 1,200 miles were restored, a record year
- In Idaho's Lemhi River, a 15-year effort to install fish screens in irrigation diversions has reduced the stranding of out-migrating smolts from an estimated 71 percent to 1.9 percent, preserving tens of thousands of juvenile salmon
- Supported efforts to increase Snake River fall Chinook from fewer than 1,000 fish in the 1980s to more than 56,000 fish in 2013
- Supported critical funding to help save Snake River sockeye salmon from extinction, and supports efforts to move beyond conservation toward recovery
- Supported state and tribal efforts to acquire more than 400,000 acres for resident fish and wildlife, including conservation of riparian habitat in Montana for sensitive species like bull trout
- Significantly improved salmon and steelhead survival at federal dams
- Increased flows that improve fish production, migration, and survival
- Supported construction of hatcheries to recover species like the endangered Kootenai River sturgeon and mitigate for lost salmon and steelhead with resident species such as rainbow trout and kokanee in Lake Roosevelt above Grand Coulee Dam
- Supported state and tribal efforts to operate Libby and Hungry Horse dams in ways that improve biological benefits to fish and wildlife
- Protected more than 117,000 acres of wildlife habitat in Oregon by supporting restoration projects implemented by the Confederated Tribes of the Warm Springs, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, Burns Paiute Tribe, and Confederated Tribes of Grand Ronde, the Oregon Department of Fish and Wildlife, and many non-governmental organizations
- Protected the Hanford Reach of the Columbia River where the last healthy population of fall Chinook spawn
- Supported new and ongoing efforts that are expected to show results in the near future. For example:
 - Yakama Nation fisheries biologists are working to reintroduce extirpated coho to the Yakima River Basin.
 - The recently completed Chief Joseph Hatchery is expected to reestablish a population of Upper Columbia River spring Chinook in the Okanogan River Basin.
 - Washington Department of Fish and Wildlife is implementing a Memorandum of Agreement to provide habitat improvements in the Columbia River estuary, an area utilized by all fish migrating to and from the ocean.

- For more detail on program successes, please visit the [High-Level Indicators](#)  page on the Council's website and Bonneville's project tracking website, [CBFish.org](#) .

B. Program challenges

The 2014 Fish and Wildlife Program represents a renewed commitment to adaptive management and meeting program objectives through improved monitoring, reporting, and evaluation. As it becomes more evident where these actions are effective and where they are not, the Council will prioritize its project-funding recommendations to Bonneville. The Council also notes the importance of the commitment of federal action agencies to make decisions consistent with program goals, objectives, and measures, in a manner that meets their legal obligations under the Northwest Power Act. Specifically, greater attention to reporting progress of the program will help the Council address discrepancies, contradictions, and deficiencies that develop over time, including for example:

Hydropower system: Mainstem dam [operations](#) for listed species are addressed in the 2014 Supplemental Federal Columbia River Power System Biological Opinion. In the past, the Council's programs have encouraged experimentation with hydrosystem operations including spill, flow augmentation, and reservoir drafting under adaptive management principles. Going forward, the Council takes note that the referenced biological opinion expires in 2018. There is uncertainty as to the future of measures currently included in our program that are derived from that biological opinion. In addition, the Council recognizes the need for careful consideration of experimental operations to test the impacts on listed fish and other aquatic species.

Habitat: Dam construction resulted in a loss of more than half of the fish and wildlife habitat in the Columbia River Basin, and mitigating this loss has been a major focus of the Council's program since its inception in 1982. For at least the last decade, habitat-related projects represented 26-40 percent of total program costs.

As a general policy, consistent with the intent of Section [2\(6\)](#) of the Act, the Council has directed most of its habitat restoration funds for anadromous fish below blocked areas. As well, there has been little or no effort to prioritize funding based on biological performance of a specific area, largely because biological response is unknown. Finally, the Independent Scientific Advisory Board has cautioned the Council that while habitat work to date within each [subbasin](#) has been largely successful, these investments may be threatened by outside influences (for example, climate change, toxic substances in air and water, non-native species, invasive species) and that habitat strategies must be based on an ecosystem approach in order to appreciate all impacts on habitat purchased as mitigation through the program. The Council also anticipates that many habitat projects (i.e., fish screens) will require ongoing maintenance to ensure proper functioning. In each of these instances, improved reporting of project progress will help the Council make better-informed decisions in the future.

Hatcheries: In its 2009 report on salmon and steelhead hatcheries in the Columbia River Basin, the congressionally created Hatchery Scientific Review Group (HSRG) recommended principles for hatchery management based on: 1)

setting clear goals; 2) scientific defensibility; and 3) monitoring, evaluation, and adaptive management. While the Council's program has a primary focus on habitat, hatcheries are closely tied to habitat improvements as the program seeks to rebuild natural-origin fish populations. The HSRG conducted a detailed, thorough and comprehensive review of 178 hatchery programs and 351 salmon and steelhead populations in the Columbia River Basin. The resulting population-specific recommendations were intended to provide scientific guidance for managing each hatchery more effectively in the future. In a [review of the 2009 Program](#), the Independent Scientific Advisory Board recommended that the Council's hatchery strategies be revised to incorporate conclusions from the HSRG review and that supplementation, harvest, and habitat-restoration programs must be well integrated to be effective. According to the February 2009 report of the HSRG:

Hatcheries play an important role in the management of salmon and steelhead populations in the Columbia River Basin. Nevertheless, the traditional practice of replacing natural populations with hatchery fish to mitigate for habitat loss and mortality due to hydroelectric dams is not consistent with today's conservation principles and scientific knowledge. Hatchery fish cannot replace lost habitat or the natural populations that rely on that habitat. Therefore, hatchery programs must be viewed not as surrogates or replacements for lost habitat, but as tools that can be managed as part of a coordinated strategy to meet watershed or regional resource goals, in concert with actions affecting habitat, harvest rates, water allocation and other important components of the human environment.

While the Council recognizes hatcheries as a necessary mitigation tool, at least for the current time until hatchery-supplemented populations rebuild, the Council also recognizes that hatchery actions can have associated risks to natural populations, including demographic, genetic or environmental risks. The challenge for the program is how to balance the need for fish abundance provided by hatchery programs while assuring that hatchery practices are conducted in a manner that will not impede wild fish recovery.

Harvest: The Council is not responsible for harvest management, but the Council encourages harvest practices that are consistent with program goals. The Council's policies for hatcheries and habitat restoration incorporate goals for some programs of restoring anadromous and resident fish species to harvestable levels. However, harvest management decisions can affect how many fish return to areas where populations are being restored with the goal, in some instances, of restoring harvestable populations. Improved monitoring and evaluation of harvest management, habitat actions, and hatcheries would help the Council better understand where these actions are effective and where they are not -- such as, for example, the impacts of harvest on program goals for fish population abundance.

Anadromous biological objectives: Current basinwide biological objectives for anadromous fish have been insufficient to allow for accountability at the population scale. Salmon and steelhead trends are positive in some areas of the Columbia Basin, but not in others. As well, it is not clear whether populations are rebuilding to the point that there will be sufficient numbers of recruits per spawner to achieve self-sustaining populations. The ability of the region to achieve these biological objectives will depend on the coordinated actions of many parties.

Human demands on resources: The population of the Pacific Northwest has nearly doubled in the past 35 years and is expected to steadily increase over the next 20 years. Population growth will result in an increasing demand for resources, which can have a significant impact on fish and wildlife habitat. Climate change may exacerbate these impacts in terms of population shifts, temperature variability affecting power supply and demand, and water availability for human needs. The Council recognizes the need to consider human population and land use trajectories, as well as increasing demands on the hydropower system, in all aspects of its planning. Ultimately, however, human demand for resources without corresponding resource planning and stewardship may undermine the policy objectives set forth in this plan.

V. Tracking the status of the basin's fish and wildlife resources

The Northwest Power Act directs the Council to address the impacts of hydropower dams in the Columbia River Basin on fish and wildlife, but the Council recognizes impacts occur from other causes, too. Accordingly, the Council tracks the status and trends of focal species to provide context to understand the effects of projects funded through the Council's fish and wildlife program.

This status and trends information is annually updated and displayed on the subbasin [dashboards](#) and reported in the [high-level indicators report](#) on the Council's website. The information comes from subbasin plans, projects funded through the program, and information provided by federal and state fish and wildlife agencies, tribes, and other monitoring entities.

This information is organized by subbasin, focal species and their habitat, and by high-level indicator topics. The information available for reporting on the status and trend of focal species and their habitat continues to improve.

Part Three: Basinwide Vision, Scientific Foundation, Goals, Objectives, and Strategies

I. Vision for the Columbia River Basin

The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, supported by mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem. This envisioned ecosystem provides abundant opportunities for tribal trust and treaty-right harvest, non-tribal harvest, and the conditions that allow for restoration of the fish and wildlife affected by the construction and operation of the hydrosystem.

The vision will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. Where this is not feasible, other methods that are compatible with self-sustaining fish and wildlife populations will be used, including certain forms of production of hatchery fish. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance habitat and species assemblages compatible with the altered ecosystem.

II. Scientific foundation and principles of the program

Significant ecological and environmental modifications have occurred in the Columbia River and its tributaries. The Council recognizes that a combination of actions is necessary to protect, mitigate, and enhance the fish, wildlife, and habitat impacted by the hydrosystem. The Council understands that to succeed in achieving its vision, strategies and actions implemented through the program must be founded on the best available scientific understanding of how to protect, mitigate, and enhance the fish, wildlife, and habitat impacted by the development, operation, and management of hydroelectric projects. This scientific foundation and guiding scientific principles are provided below.

The scientific foundation describes our best current understanding of the biological realities that govern how the program's vision will be accomplished. It is summarized in [Return to the River](#) and subsequent reports produced by the [Independent Scientific Advisory Board](#). The Council is directed by Congress, through the [Northwest Power Act](#), to use the best *available* scientific information in its decisions and to continually improve the program's scientific understanding. The Council's Independent Scientific Advisory Board is responsible for developing, reviewing, and recommending modifications to the principles. The ISAB recently recommended [revised principles](#) that focused on enhancing ecosystem resilience and adaptability.

The scientific foundation informs the program's scientific principles, which summarize our current knowledge at a broad level. Program measures and actions should be consistent with those principles.

Guiding scientific principles

Healthy ecosystems sustain abundant, productive, and diverse plants and animals distributed over a wide area

An ecosystem includes all living things in a given area, interacting with each other and with the physical environment. This interaction affects the abundance, productivity, and diversity of plants and animals. Taking into account these interactions and the natural limits of ecosystems is critical for successfully maintaining, restoring, and enhancing ecosystems.

Biological diversity allows ecosystems to adapt to environmental changes

The natural diversity of species, populations, genes, and life history traits contributes to ecosystem stability and adaptability to environmental change. The loss of locally adapted populations can reduce species diversity in an ecosystem. Introducing non-native species can increase diversity but can also disturb the connections between native species and reduce their ability to adapt and survive. Management actions are most meaningful over the long term when they contribute to the diversity of locally adapted populations of native species and also to the habitats needed to support them.

Ecosystem conditions affect the well-being of all species including humans

Humans are integral parts of ecosystems. Our actions have a pervasive impact on the structure, function, and resilience of ecosystems, while at the same time, our health and well-being are tied to ecosystem conditions. Having ecosystems that can respond to change contributes to healthy ecosystems that support healthy species and human populations. A landscape perspective and management approach is necessary to maintain redundancies and diversity that allow ecosystems to be resilient to unexpected changes.

Cultural and biological diversity is the key to surviving changes

Ecosystems change over time, increasing or decreasing benefits to species, including humans. Biological diversity in species and their populations makes this adaptability possible. Similarly, the cultural diversity of people and communities represented by learned behaviors, ideas, values, and institutions allows for society to adapt to these changes.

Ecosystem management should be adaptive and experimental

Ecosystems are complex, they change constantly, and our understanding of them is limited. In response, natural resource managers must strive to improve their knowledge and be adaptable to include information as it is learned. Using a structured process of learning can contribute to new scientific knowledge that informs decisions.

Ecosystem management can only succeed by considering people

People live in ecosystems. Understanding what's important to people about the places they live, sharing scientific information, developing communication networks, and creating partnerships that enhance collaboration can make management actions more sustainable. Aligning policies with the appropriate level of governance can also improve effectiveness. Recognizing that local actions can affect socioeconomic outcomes at regional, national, or international scales will increase the effectiveness and efficiency of management actions.

III. Goals and Objectives - the changes we want to achieve

A. Program goals and quantitative objectives

The program aims to rebuild healthy, naturally producing fish and wildlife populations adversely affected by the construction and operation of hydroelectric dams in the Columbia River Basin. It accomplishes this by protecting, mitigating, and enhancing habitats and biological systems.

Existing reports¹ provide a framework for understanding the magnitude of salmon and steelhead losses. Mitigating for the loss of other anadromous fish, such as lamprey and eulachon, and native resident fish such as bull trout, cutthroat trout, kokanee, and sturgeon, is equally important [see program strategies: [lamprey](#), [eulachon](#), [wild fish](#), [resident fish mitigation](#), mainstem hydrosystem [flow and passage operations](#).] The program also maintains a commitment to mitigate for [wildlife](#) losses.

The program includes [qualitative goal statements and quantitative objectives](#) to prioritize the work. The program continues to include a set of quantitative goals and related timelines for anadromous fish. These include, among others, increasing total adult salmon and steelhead runs to an average of 5 million annually by 2025 in a manner that emphasizes the populations that originate above Bonneville Dam and supports tribal and non-tribal harvest, and achieves smolt-to-adult return rates in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead. As part of an effort to refine objectives, the region should also consider the ISAB's recommendation to redefine the 2 to 6-percent smolt-to-adult ratio (SAR) objective to reflect the survival of populations needed to achieve recovery and harvest goals. The ability of the region to achieve these goals will depend on the coordinated actions of many parties to improve fish habitat and passage, improve hatchery operations, and limit harvest of potential spawners. The qualitative goal statements describe the changes needed to achieve the program's basinwide vision. Progress in achieving these qualitative goal statements is measured using quantitative objectives. The vision and goal statements guide the development of the objectives (see Figure 4 for an overview of this format).

How progress is monitored and evaluated is described in the [adaptive management strategy](#). It's also reported using fish and wildlife indicators on the subbasin [dashboard](#)[🔗] and the high-level indicators in the program's [High-Level Indicator report](#)[🔗]. These program-level goals and objectives also provide guidance for [subbasin](#)-level and other goals and objectives. Achieving these quantitative objectives depends on the coordinated actions of many parties.

¹["Compilation of Salmon and Steelhead Losses in the Columbia River Basin"](#) (Appendix D of the Council's 1987 Fish and Wildlife Program), ["Numerical Estimates of Hydropower-related Losses"](#) (Appendix E of the 1987 Program), and ["Compilation of Information on Salmon and Steelhead Total Run Size, Catch and Hydropower-Related Losses in the Upper Columbia River Basin, Above Grand Coulee Dam"](#)

Principles guiding the program goals and objectives

Program goals and objectives should be:

- Consistent with the program vision statement
- Designed to achieve the ecosystem functions necessary to restore healthy, self-sustaining, and harvestable populations of native fish and wildlife in the Columbia River Basin
- Designed to provide a measurement of program success by achieving the program's fish species and population abundance, productivity, spatial distribution, and diversity objectives.
- Implemented in a manner that allows sufficient monitoring and evaluation, and provisions for adaptive management, to ensure that progress toward objectives can be tracked, and that future management can respond to new information and strategies.

Themes for program goals and objectives²

Theme One: *Protect and enhance habitat to provide a home for species*

Theme Two: *Ensure species survival by promoting abundance, diversity and adaptability*

Theme Three: *Compensate for a wide range of hydrosystem impacts*

Theme Four: *Engage the public*

² The term 'Biological Objectives' is used in the program when referring to the environmental characteristics and biological performance goals and objectives in themes one and two.



Figure 4. Linkages between program vision, goals, objectives, and indicators track how successful program strategies are progressing toward the goals and objectives. This figure is an expansion of a subcomponent of the program framework [see [program framework](#)]

1. Refining program goals and quantitative objectives

Working with others in the region, including the state and federal fish and wildlife agencies and tribes, other federal agencies and the independent science panels, the Council will oversee a regional process to survey, collect, identify, and refine a realistic set of quantitative objectives for program focal species and their habitat related to the four broad themes and program goal statements. Evaluating progress toward program goals and objectives will occur through the [adaptive management](#) strategy and will be reported using program indicators [see Tracking [Status of the Basin](#)'s Fish and Wildlife Resources section].

Where possible, the quantitative objectives identified through this regional process should be specific, measurable, attainable, relevant, time-bound,³ and based on an explicit scientific rationale, as appropriate. These objectives may include various types of measurement such as specific numbers, ranges of numbers, densities, or trend direction. The data needed to assess progress about goals and objectives and inform indicator graphics used in tracking should be based on existing monitoring efforts or other publicly available sources of data. The Council will ask the Independent Scientific Advisory Board (ISAB) to review objectives for scientific quality and usefulness in tracking progress and adaptively managing our efforts.

³ Objectives achieving the five criteria are referred to as SMART objectives.

The process to identify potential quantitative objectives (and program goals) should consider existing relevant Columbia River Basin documents⁴ as they may serve to inform quantitative objectives relevant for tracking program progress. This process will also consider the quantitative objectives recommended through the 2014 Program amendment process.

⁴ Documents include but are not limited to, Northwest Power Act, past versions of the Columbia River Basin Fish and Wildlife program, subbasin plans, ISAB recommendations for objectives, Coordinated Assessment project's indicator tables, NOAA recovery plans, USFWS recovery plans, Hatchery Scientific Review Group documents, the Columbia Basin Fish Accords, the Washington Estuary Agreement, the Willamette Wildlife Agreement, Montana Wildlife Agreement, US V OR settlement, Columbia River Treaty, FCRPS BiOP RPA, NOAA delisting criteria, Wy-Kan-Ush-Mi Wa-Kish-Wit, and the Lower Columbia River Estuary Partnership quantitative habitat protection and restoration targets.

a) Objectives for adult salmon and steelhead

The Program shares in the region's broader vision of natural-origin salmon and steelhead populations across the basin that are diverse, resilient, productive, and sufficiently abundant to allow substantial opportunities for tribal and non-tribal harvest [see [ecosystem function](#) strategy and other strategies].

Objectives that represent different perspectives on healthy and harvestable populations already exist. The Council will work with state and federal agencies and tribes in the region to collect, organize, review, and report on these quantitative objectives by the end of 2015. This effort should include a review of agency and tribal management plans, draft and final federal recovery plans, subbasin plans and other relevant documents and reports. The final report will include, but not be limited to, an inventory of non-ESA listed populations of salmon and steelhead that lack federal recovery objectives. The Council (working cooperatively with the agencies and tribes) will define a process for tracking the region's progress on enhancing salmon and steelhead population status in the context of the quantitative objectives defined in the final report. The Council will rely on the agencies and tribes to identify "best source" locations of population status information to inform this process (including but not limited to the Coordinated Assessment program and NOAA's Salmon Population Summary data base).

The Council will work with the states, federal agencies, and tribes to identify specific indicators for Bonneville-funded hatchery programs that could be tracked and reported to inform progress on meeting mitigation objectives (i.e., harvest, supplementation, reintroduction, and conservation). Potential indicators that should be tracked include: contribution to hatchery broodstock, natural spawning, and harvest by hatchery. Potential indicators that could be tracked include: in-hatchery survival (egg to smolt); juvenile production/releases; hatchery smolt-to-adult returns and hatchery recruits per spawner. The Council, agencies, and tribes will work with the Coordinated Assessment (CA) partners, the Fish Passage Center and others as appropriate, to collect existing indicator information. The Council recognizes that the development of a "common data exchange standard" for hatchery indicator information (through the CA effort) is an ongoing process.

b) Other anadromous and resident fish objectives

While hydrosystem-related losses are less well understood for fish species such as lamprey, sturgeon, eulachon, bull trout, cutthroat trout, kokanee, and other focal species, the program nonetheless aims to mitigate for these losses and to track, using indicators, the progress toward meeting program goals and objectives [see program [strategies](#)]. The process for developing objectives for other anadromous and resident focal species includes the following steps:

Step 1

Once the process to produce objectives for hatchery salmon and steelhead is completed, the Council will work with the fish and wildlife agencies and tribes to survey, collect, and organize existing quantitative objectives for focal species including lamprey, bull trout, eulachon, white sturgeon, kokanee, rainbow trout, and cutthroat trout.

Step 2

As soon as practicable, the Council will determine which of these to consider as program objectives, as well as considering needed modifications to existing goal statements, objectives, and indicators. The Council will conduct a program amendment process if it is determined that adopting the objectives should be considered.

c) Ecosystem function, habitat, and hydrosystem objectives

The program is aimed at rebuilding healthy, naturally producing fish and wildlife, habitats, and the biological systems within them [[ecosystem function](#) strategy]. The program requires goals, objectives, and indicators that track the progress of these mitigation efforts, including wildlife mitigation, which relies on acquiring habitat units.

Step 1

The Council will identify measurable objectives in the region. The data needed for these objectives should be available and not require extensive new data-gathering efforts.

The Council will:

- Work with the fish and wildlife agencies and tribes to assess feasibility of hydrosystem survival performance standards for lamprey.
- Support regional efforts to develop ecosystem health indicators as well as efforts by fish and wildlife agencies and tribes to identify quantitative biological objectives.
- Work with the fish and wildlife agencies and tribes and the ISAB to refine existing goals, objectives, and [indicators](#) related to habitat characteristics, including biological diversity.

Step 2

As soon as practicable, the Council will determine which objectives to consider as program objectives. The Council will conduct a program amendment process if it is determined that adopting the objectives should be considered.

d) Public engagement quantitative objectives

The Council will initiate an internal process to identify objectives and indicators for this topic [see program strategies: [public engagement](#)]. Once the process to produce objectives is completed, the Council will seek public input to help identify the most useful objectives. The Council will conduct a program amendment process if it is determined that adopting the objectives should be considered.

IV. Strategies - how the program will achieve the changes

Strategies articulate the long-term approach to achieve changes needed to meet goals, basinwide objectives, and the program's vision. Written with a long-term perspective, these strategies should consider future as well as current environmental conditions. Each of these basinwide strategies consists of a programmatic strategy statement, rationale, guiding principles, general measures to implement that guidance, and, as relevant, specific measures that transcend specific subbasins, such as research, monitoring, and evaluation. The guidance from these basinwide strategies informs planning and implementation at the subbasin and other geographic levels.

The program's fundamental, overarching strategy is the ecosystem function strategy. This overarching strategy responds to the direction in the Act and of the program's independent scientific groups to consider the basin as a system and not as isolated components. The approaches described under this strategy emphasize protecting quality habitat and mitigating the Columbia River Basin ecosystem through regeneration of natural processes, rather than through a primary reliance on technological solutions. Providing ecosystem guidance that can be implemented in a meaningful manner, however, is more easily conveyed when addressing aspects of interest individually. This broad strategy is subdivided into a set of sub-strategies specific to these aspects such as habitat, non-native species, and water quality.

The program acknowledges that the Columbia River Basin is an altered ecosystem that, in its altered state, provides many essential services to society, including flood control, navigation, and agricultural irrigation. Given the reliance on these services, the program accepts that given current needs and available technology, that this altered ecosystem cannot currently be restored to its pre-dam condition. Recognizing this constraint, the Council understands that the program may not achieve its obligations, or meet its objectives and vision, by relying only on an approach focused on mitigating, protecting and enhancing ecosystem function. Thus the program also has a complementary strategy that relies on hatcheries to increase fish abundance and harvest opportunities.

The program also includes a set of strategies that provide specific guidance for topics that address particular policy needs. These consist of guidance for anadromous fish mitigation in blocked areas, wildlife mitigation, resident fish mitigation, sturgeon, and lamprey. These strategies present unique policy considerations and thus are developed strategies, but the principles and general measures presented in the ecosystem strategy also apply to this additional set of strategies for specific policy areas.

Lastly, the program contains a strategy that is focused on the adaptive management elements of research, monitoring, data management, evaluation, and reporting.

A. Ecosystem function

Core strategy

Protect and restore natural ecosystem functions, habitats, and biological diversity wherever feasible consistent with biological objectives in the program.

Rationale

Restoring functioning ecosystems in fish and wildlife habitat is critical to the long-term success of measures supported by this program to mitigate the impacts of hydropower dams in the Columbia River Basin. The extent to which these can be restored is constrained by the reality that the hydroelectric system will continue to provide essential services to people in the Pacific Northwest, and that passage improvements at the dams alone are not likely to fully mitigate these impacts. Recognizing this reality, the Act authorizes “offsite mitigation,” areas outside of the immediate area of the hydrosystem -- in the tributaries and subbasins off the mainstem of the Columbia and Snake rivers, and in the lower Columbia River and estuary. Implementing offsite mitigation provides the greatest opportunities for habitat improvements as a means of offsetting some of the impacts of the hydrosystem. This off-site mitigation does not reduce the need to mitigate in the mainstem of the Columbia and Snake rivers as, historically, these were among the most productive spawning and rearing habitats for salmonids and provided essential resting and feeding habitat for mainstem resident and migrating fish. Thus protection and restoration of mainstem habitat conditions, and offsite mitigation, are critical pieces of this habitat-based program. The program mitigates for hydropower system impacts by restoring ecosystem functions in these habitats in conjunction with passage improvements at the dams.

Guidance on specific habitat mitigation activities are in subbasin plans, which have been developed for most of the subbasins and the mainstem reaches in the Columbia River Basin. These plans include assessments of current physical and biological conditions and also identify factors that limit the productivity and capacity of focal species in priority reaches.

Principles

- Ecosystem function, which means the ability of a river to sustain healthy populations of fish, wildlife, and plants, is enhanced by environmental conditions that support healthy populations.
- The existence of hydropower dams can reduce or degrade ecosystem function by impounding reservoirs, trapping or containing pollutants, raising water temperatures, disconnecting floodplain habitats, providing habitat for non-native invasive species and native and non-native predators, and through other related impacts.
- An adaptive and flexible suite of river and dam operations that can respond to changing environmental conditions, from flow fluctuations to climate-change impacts, can help improve degraded ecosystem function.
- Ecosystem function can be improved in the Columbia and Snake river tributaries by, for example, repairing and restoring riparian habitat in

spawning areas, restoring native vegetation, and changing land-management practices that can degrade water and habitat quality.

General measures

- Identify and protect mainstem habitat areas and ecological functions that are relatively productive for spawning, resting, rearing, and migrating native anadromous and resident focal fish species and manage these areas to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels.
- Restore and enhance habitat areas that connect to productive areas to support expansion of productive populations and to connect weaker and stronger populations so as to restore more natural population structures.
- Protect, enhance, restore, and connect freshwater habitat in the mainstem and tributaries.
- Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains, side channels, and uplands.
- Where feasible, reconnect protected and enhanced tributary habitats, especially in areas with productive populations.
- Identify, protect, enhance, and restore the functions of alluvial river reaches.
- Allow for biological diversity and complexity to increase among and within populations and species to increase ecological resilience to environmental variability and allow for greater life history and species diversity.
- Manage water to provide appropriately timed streamflows that promote productive populations of anadromous fish and resident fish. Where feasible, support seasonal fluctuations in flow and quantity, while reducing large, rapid, short-term fluctuations. Ensure that any changes in water management are premised upon and proportionate to scientifically demonstrated fish and wildlife benefits.
- Frame habitat restoration in the context of measured trends in water quantity and quality.
- Decrease the disparity between water temperatures and the naturally occurring regimes of temperatures throughout the basin, using stored water to the extent feasible to manage water temperatures downstream from storage reservoirs where temperature benefits from releases can be shown to provide improved fish survival.
- Identify, protect, enhance, restore, and connect ecosystem functions in the Columbia River estuary and near-shore ocean discharge plume as affected by actions within the Columbia River mainstem.
- Evaluate flow regulation and changes to estuary-area habitat and biological diversity to better understand the relationship between estuary ecology and near-shore plume characteristics and the productivity, abundance, and diversity of salmon and steelhead populations.
- Understand the status of the Columbia River ecosystem in terms of habitat and other ecosystem features (both natural and human-caused) to better inform Council decisions.

- Develop metrics of juvenile recruits-per-spawner in order to evaluate habitat effectiveness.

The following eleven strategies are sub-strategies of the overarching ecosystem function component of the program.

1. Habitat

Sub-strategy

Protect, enhance, restore and connect aquatic and terrestrial habitat. Protecting existing quality habitat is as important as enhancing degraded habitats.

Rationale

Habitat mitigation activities are important for off-site mitigation success and are guided by subbasin plans, which have been developed for most of the subbasins and the mainstem reaches in the Columbia River Basin. These plans include assessments of current physical and biological conditions and also identify factors that limit the productivity and capacity of focal species in priority reaches. Habitat mitigation also includes large-scale, biologically targeted habitat improvement projects, such as those reflected in the [Columbia Basin Fish Accords](#) and [FCRPS BiOp](#). Habitat actions can help to reduce the migration of toxic contaminants by reducing erosion and sediment transport to waterways.

Principles

- **Build from strength**

Efforts to protect and restore fish and wildlife impacted by hydropower should protect habitat that supports existing populations that are relatively healthy and productive. Adjacent habitats should be expanded if they have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this principle applies to the restoration of weak stocks: Restoration should focus first on habitat where portions of weak populations are doing relatively well and then extend to adjacent habitats [see [strongholds](#) strategy].

- **Restore ecosystems, not just single populations**

Increasing the abundance of single populations may not, by itself, result in long-term recovery. Restoration efforts must focus on restoring habitats and developing ecosystem conditions and functions, including within blocked areas where reintroduction is being considered, that will allow for expanding and maintaining diversity within and among species. This will help sustain a system of robust populations in the face of environmental variation.

- **Use native species wherever feasible**

Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases. Where a species native to a particular habitat cannot be restored, then another species native to the Columbia River Basin should be used. Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species [see [non-natives and invasive species](#) sub-strategy].

- **Address transboundary species**

Because about 15 percent of the Columbia River Basin is in British Columbia, including the headwaters of the Columbia and several of its key tributaries, ecosystem restoration efforts should address transboundary stocks of fish and

wildlife and transboundary habitats. Where mitigation measures are designed to benefit both American and Canadian fish and wildlife populations, American ratepayer funding should be in proportion to anticipated benefits to the American populations.

General measures

- The core measures of this strategy include:
 - Removing fish-passage barriers
 - Screening water diversions
 - Protecting and improving riparian habitats in all areas of the Columbia River Basin to improve water quality, reduce contaminant transport, lower water temperature including creating thermal refugia, and reduce sediments through fencing, vegetation planting, erosion control, best land-management practices, and acquisition of land through conservation easements and other types of acquisition
 - Improving the amount, timing, and duration of instream flows through water rights and acquisitions
 - Reconnecting floodplains through passive and active improvements in channel structure and geomorphology and re-establishing natural river processes
 - Acquiring and enhancing terrestrial uplands for wildlife habitat
 - Continuing Bonneville funding to acquire water and pursue water rights in subbasins where water quantity has been identified in subbasin plans as a primary limiting factor and where flow targets have been identified

Mainstem habitat measures

The program focuses much of its habitat efforts in the Columbia Basin tributaries. Given the importance of mainstem habitat to production of salmon and other key species, the Council supports increased investments in mainstem habitat improvements to increase the extent, diversity, connectivity, and productivity of mainstem habitats for mainstem spawning, rearing, and resting. The Council will consider primary mainstem habitat measures including:

- Coordinating actions with the flow measures intended to improve ecosystem function in the mainstem
- Enhancing the connections between the mainstem sections of the Columbia and Snake rivers and floodplains, side channels, and riparian zones
- Continuing actions to reconnect the river to its floodplains wherever possible in the mainstem, with special emphasis on the estuary and lower Columbia River
- Protecting and enhancing mainstem riparian areas and wetlands to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels

The Council will consider additional mainstem habitat actions including:

- Identifying, protecting, enhancing, and restoring the functions of alluvial river reaches in the mainstem

- Excavating, creating and reconnecting additional backwater sloughs, alcoves, and side channels to the main channel
- Dredging/excavating lateral channels that have silted in
- Creating more shallow-water habitat
- Identifying, protecting, restoring, and managing thermal refugia for salmonid use during high water-temperature periods
- Acquiring and protecting lands adjacent to the mainstem critical to protecting habitat areas and local water quality
- Where feasible, reconnecting protected and enhanced lower tributary habitats to protected and enhanced mainstem habitats, especially in the area of productive mainstem populations
- Increasing the amount of spawning habitat for mainstem core populations of Chinook, coho, chum, sturgeon, and lamprey

2. Strongholds

Sub-strategy

Acknowledge and encourage efforts to designate and conserve stronghold habitats and their populations of native, wild, and natural-origin fish, as well as areas managed for wild fish.

Rationale

Protecting stronghold areas and associated fish populations may require the least amount of risk and investment to provide the greatest benefits to the program and for sustainable, wild, and natural-origin populations of fish. Based on current understanding, establishing reserves may be critically important to protect the remaining viable wild or natural-origin fish populations and to restore habitat with the potential to re-establish core populations at strategic locations in the basin.

Principles

Stronghold areas should have the following characteristics;

- Be designated by the states and tribes, in accordance with state law in the state in which they are located
- Provide the ability to manage for wild or natural-origin fish while minimizing impacts of hatchery fish, except where state and federal fish and wildlife agencies and tribes have determined that populations would decline to the point where supplementation efforts are appropriate to avoid extinction and stabilize native wild or natural-origin stocks
- Contain relatively intact habitat
- Provide the opportunity to create genetic strongholds with adequate buffers to shield them from non-native, invasive species
- Provide a reasonable chance of eradicating non-native, invasive species
- Be characterized by healthy and abundant fish populations or populations that readily could become healthy and abundant, few invasive species, low risk of habitat degradation, and relatively good ecosystem function
- Provide the ability to monitor and evaluate the effect on wild native fish and to provide and map non-hatchery reference watersheds for hatchery-wild stream comparisons, and
- Encompass areas large enough to withstand human disturbances

General measures

The Council will:

- Request states to identify stronghold areas
- Consider for stronghold recognition areas designated by states and tribes in accordance with state law
- Work with fish and wildlife agencies and tribes and others to keep up-to-date maps available for strongholds and other areas in the basin that are managed for wild fish stocks

- Inventory existing actions that have occurred and are occurring within identified stronghold areas as identified by the respective states of the Council
- Support fish habitat improvement actions implemented within strongholds
- Support actions intended to eradicate non-native and invasive species from, or prevent their introduction into, stronghold areas

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to subbasin protections and plans.

Link to other relevant program guidance and sections

Strongholds for native fish populations relate closely to our [wild fish](#), [resident fish](#), [fish propagation](#), and [non-native and invasive species](#) strategies.

3. Non-native and invasive species

Sub-strategy

Prevent the introduction of non-native and invasive species in the Columbia River Basin, and suppress or eradicate non-native and invasive species.

Rationale

Non-native and invasive species imperil native species in the Pacific Northwest's ecosystems through predation, competition for food, interbreeding, disease transmission, food web disruption, and physical habitat alteration. The Council acknowledges invasive and non-native species pose direct threats to the program's fish and wildlife restoration efforts through competition, predation and habitat modification. In addition, aquatic non-native species can invade and significantly threaten infrastructure at hydroelectric dams and fish passage facilities in the Columbia River Basin. Currently, the greatest known threat in the Columbia River Basin from aquatic invasive species is introduction into the basin of zebra or quagga mussels. Other aquatic threats include hydrilla, silver carp, flowering rush, and Eurasian milfoil. Terrestrial invasive species that compromise fish habitat and wildlife mitigation projects include such species as rush skeletonweed, yellow starthistle, poison hemlock, and Japanese knotweed, among others. Once established in other locales, management actions have shown little success in removing or controlling these invasive non-native species.

Principles

- Regional prevention and management efforts for non-native and invasive species should aim to: (1) detect the presence of these species early and respond rapidly, (2) educate the public; and (3) prevent, monitor, control, and stop or minimize the spread of non-native and invasive species where these pose both a direct threat to the hydropower system, to native fish, or to wildlife species.
- Incorporate the most up-to-date environmental risk assessment methodology for non-native and invasive species into on-the-ground fish and wildlife projects, particularly in locations where management of non-native fish and invasive fish species overlaps with native fish conservation efforts and management of ESA-listed species.
- When an introduction of a non-native species is necessary for mitigation, the introduction should be done with a clear understanding of the threats to native species in the Pacific Northwest's ecosystems through predation, competition for food, interbreeding, disease transmission, food web disruption, and physical habitat alteration.

General measures

- **Evaluate potential adverse impacts**
 - The Council, in coordination with the federal action agencies, other federal, state and tribal entities, and regional organizations such as the 100th Meridian Initiative-Columbia Basin Team (hereafter referred to as the Council and federal and other regional entities) should request regional

power producers to evaluate the invasive potential and ecological risks of using non-native bioenergy feedstock species, cultivars, and hybrids.

- **Prevent establishment**

- The Council encourages federal and other regional entities to prevent non-native and invasive species introductions by:
 - Monitoring and managing the various pathways that could introduce additional aquatic nuisance species into the Columbia River Basin
 - Developing and implementing strategies to suppress, reduce, or control non-native invasive fish species where they are identified as a limiting factor and are negatively impacting salmonids and native fish populations
 - Develop strategies and public outreach tools to educate the public about regional prevention and management of invasive species
- BPA and other federal agencies should assist the Northwest states' efforts to prevent the establishment of quagga and zebra mussels.

- **Monitor and control non-native species introduction and dispersal**

- Each of the four Northwest states should continue to implement the preventative strategies in their respective state aquatic nuisance species management plans and coordinate their prevention efforts closely with the other Northwest states and British Columbia
- If non-native fish species are to be used to achieve mitigation for hydropower system impacts, the agencies and tribes shall conduct an environmental risk assessment of potential negative impacts on native fish species prior to introduction. If non-native fish species are introduced, these shall be managed to maximize the use of available existing and improved habitats, consistent with state and local regulations, to provide a subsistence and sport-fishing resource without adversely affecting native fish populations.

- **Removal and eradication of non-native species**

- Agencies and tribes shall apply existing and new scientific research to identify situations (species, times, sizes, and places) where increased removal of non-native fish would be most effective in increasing native fish populations.
- Agencies and tribes shall minimize non-native fish impacts to native fish species by using appropriate invasive fish-removal methods (e.g., gill net, chemical control, electrofishing, changes in fishing regulations, sport reward programs, etc.) and monitor their effectiveness. Lethal take to control non-native predators or competitors, consistent with state and federal law, is appropriate when non-lethal methods of control are not successful and the adverse impacts to salmonids and native fish species or their habitat are significant.
- The agencies and tribes shall prioritize non-native species control actions to ensure program funds are spent to address the most significant threats, including predation, competition, and hybridization.

- If quagga and zebra mussels become established in the Columbia Basin, BPA and other federal agencies, along with FERC-licensed utilities, shall support regional rapid-response efforts.
- **Reduce competition**
 - The federal action agencies, other federal and state agencies, tribes, and the Council should continue to review, evaluate, develop, and implement strategies to reduce competition from non-native fish species with juvenile and adult salmonids.
- **Regional coordination**
 - The Council will continue to coordinate regional stakeholder groups and partnerships on the issue of non-native invasive species, particularly those species that pose the greatest risk to the Columbia Basin ecosystem and the regional hydropower system. The Council will continue to assist with regional communication, coordination and public outreach efforts in the Columbia Basin, and will facilitate regional science/policy forums on non-native invasive species issues, as appropriate.
 - The Council will support the collaborative work of the PSMFC 100th Meridian Initiative-Columbia Basin Team and request regular reports from that group on the following items: current regional efforts for inspection and decontamination; early detection efforts and rapid response protocols; research priorities relative to invasive species control, containment and prevention; and opportunities for regional collaboration and lessons learned.
 - The Council will assist regional entities with legislative efforts to prevent the invasion and control the spread of non-native invasive species in the Columbia Basin.
 - The Council and federal action agencies should coordinate with other federal, state, and tribal entities, and regional organizations such as the 100th Meridian Initiative-Columbia Basin Team, to track and monitor data on existing non-native invasive species distribution and population trend assessments in the Columbia Basin and encourage regional data sharing on rapid response, prevention, containment, control, eradication, enforcement, and education and outreach efforts.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to the effects of non-native species on native fish, wildlife, and habitat.

4. Predator management

Sub-strategy

Improve the survival of salmon and steelhead and other native focal fish species by managing and controlling predation rates.

Rationale

The construction and operation of the Columbia-Snake river hydrosystem, as well as disposal of dredge spoils in the lower Columbia River and estuary, have altered historical habitats and created new, hybrid habitats. These altered habitats support a wide range of predator species including native and non-native predatory fish species, predator birds such as Caspian terns, double-crested cormorants, several gull species, mergansers and pelicans, and marine mammals such as California and Steller sea lions.

Principles

- In the altered habitat of the Columbia Basin, certain predators have expanded their range and adversely affected the focal fish species the program seeks to protect and enhance.
- While predation is a natural, dynamic and complex process within the Columbia Basin ecosystem, predator-management actions, guided by best available science, are necessary to manage the level of predation on, and improve the survival of, salmon and steelhead, sturgeon, lamprey, and other native resident fish species in the basin. The biological opinions contain a number of predator-control actions.

General measures

- The federal action agencies, in cooperation with the Council, state and federal fish and wildlife agencies, tribes, and others, should convene a technical work group to: (a) determine the effectiveness of predator-management actions; and (b) develop a common metric to measure the effects of predation on salmonids, such as salmon adult equivalents, to facilitate comparison and evaluation against other limiting factors. Once developed and agreed upon, future predator-management evaluations funded by the action agencies should include a determination of the effectiveness of such actions and the common predation metric in their reports.
- The federal action agencies shall report to the Council annually on their respective predator-management efforts
- The U.S. Army Corps of Engineers (the Corps) or Bonneville shall evaluate the extent of predation on lamprey at Bonneville and other upstream dams
- **Management of predator fish**
 - Bonneville should continue to annually implement and evaluate the base predator-control program and, where warranted, expand northern pikeminnow removals to other mainstem dams in the lower Columbia River (for example: expand the program to include northern pikeminnow removals at McNary and Bonneville dams). The action agencies should evaluate annually the biological and cost effectiveness of focused

- pikeminnow removals for these expanded dam angling efforts and implement if warranted. Scoping of focused pikeminnow removals at other mainstem dams in the lower Columbia River will be based on evaluations and adaptive management principles with input from NOAA Fisheries and the fish and wildlife agencies and tribes and the Council.
- The federal action agencies should work cooperatively with NOAA Fisheries, U.S. Fish and Wildlife Service, states, tribes, and the Council to develop and implement systemwide strategies to manage and reduce non-native fish species that compete and feed on native fish (both anadromous and resident species) in the basin.
 - **Management of predator birds**
 - The Council will encourage more aggressive efforts by the Corps and others to make the fullest possible use of their existing authority to remove or manage avian predation that is impacting wild fish populations.
 - The federal action agencies should, in collaboration with state and federal agencies, tribes, and other hydropower operators:
 - Continue efforts to reduce the number of Caspian terns on East Sand Island in the lower Columbia River and estuary by implementing the U.S. Fish and Wildlife Service Caspian Tern Management Plan
 - Develop a double-crested cormorant management plan encompassing additional research, development of a conceptual management plan, and implementation of warranted actions in the lower Columbia River and estuary
 - Implement the avian management plans (for double-crested cormorants, Caspian terns, and other bird species) for Corps-owned lands and associated shallow-water habitat areas in the mid-Columbia area that have been developed through the Corps and other processes for predatory bird species in the Columbia River estuary. The action agencies should also develop and implement any management plans developed for double-crested cormorants, Caspian terns, and other bird species in the mid-Columbia area and prioritize actions for implementation.
 - Implement predator-bird management actions in the Columbia River Basin in coordination with state and federal fish and wildlife agencies and tribes.
 - The Corps should continue to implement and improve avian-deterrent programs at all lower Snake and Columbia River dams.
 - **Management of predator seals and sea lions**
 - The Corps should:
 - Take actions to improve the exclusion of sea lions at all main adult fish ladder entrances and navigation locks at Bonneville Dam.
 - Continue to support land- and water-based harassment efforts by NOAA Fisheries, the Oregon and Washington departments of fish and wildlife, and tribes to keep sea lions away from the area immediately downstream of Bonneville Dam.

- The federal action agencies should fund federal, tribal, and state agencies to evaluate the extent of seal and sea lion predation on salmonids, sturgeon, and lamprey in the lower Columbia River from below Bonneville Dam to the mouth of the river.
- The federal action agencies, in collaboration with the region's state and federal fish and wildlife agencies, tribes, and others, should identify opportunities and implement actions to reduce salmon, sturgeon, and lamprey losses through seal and sea lion management in the lower Columbia River and estuary.
- When federal, state, or tribal managers determine that predation by seals and sea lions is causing significant adverse impacts to salmonids or other native fish, state and federal fish agencies employing lethal and non-lethal methods to manage predation shall continue the lethal methods if non-lethal methods are not successful.

Links to the subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to predators.

Links to other parts of the program

Strategies: [non-native and invasive species](#), [strongholds](#), [sturgeon](#), [lamprey](#)

5. Protected areas and hydroelectric development and licensing

Sub-strategy

Protect fish and wildlife from the adverse effects of future hydroelectric project construction and operations. As part of this strategy, the Council supports protecting streams and wildlife habitats from any hydroelectric development where the Council believes such development would have unacceptable risks to fish and wildlife.

Rationale

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 44,000 miles of river reaches 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.

Most of the river reaches designated as protected areas are in the Columbia River Basin. But the designations also include river reaches outside the Columbia River Basin but within the service territory of Bonneville and thus within the scope of the Pacific Northwest’s regional power system. The designations are intended as an expression of the Council’s authority under the Northwest Power Act to protect, mitigate and enhance fish and wildlife in the Columbia River Basin from the adverse effects of the development and operation of the region’s existing hydroelectric facilities *and* as an expression of the Council’s obligations under the same Act to give due consideration in the Council’s regional power plans to the effects of new energy resources (including new hydroelectric resources) on fish and wildlife resources and environmental quality and to internalize the environmental costs and benefits of such new resources to the greatest degree possible in deciding whether to recommend their addition to the region’s power supply.

The complete provisions of this sub-strategy are in [Appendix F](#). What follows below is a summary of key elements of the sub-strategy.

a) [Future Hydroelectric Development and Licensing](#)

This sub-strategy includes a set of fish and wildlife protection [standards](#) for the Federal Energy Regulatory Commission, Bonneville, and other

agencies to apply to the development and licensing of hydroelectric facilities outside of protected areas

b) [Protected areas](#)

Protected areas list: 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 amended. 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 also supply a list of the Protected Areas to any party free of charge.

c) Exemptions, amendments and exceptions:

Hydroelectric development at certain existing structures is [exempt](#) from the protected areas provisions. The program contains procedures and criteria for substantive [amendments](#) and technical corrections to protected areas designations. The program also contains a process and criteria for an [exception](#) to the protected areas provisions for projects that will have exceptional benefits for fish and wildlife.

d) General implementation measures

The Council expects the Federal Energy Regulatory Commission, in the exercise of its licensing authority under the Federal Power Act, to take the Council’s hydroelectric development [standards](#) and [protected areas](#) designations into account to the fullest extent practicable. This includes a Council determination whether favorable or unfavorable on a petition for an exception to a protected area designation for a project proposed to have exceptional benefits for fish and wildlife. The Commission should implement the Council’s decision in the Commission’s licensing and exemption proceedings unless the Commission’s legal responsibilities require otherwise. The Council also expects Bonneville not to acquire power from or provide transmission support for a new hydroelectric development in a manner inconsistent with the Council’s designation of protected areas.

6. Water quality

Sub-strategy

Provide flows and habitat conditions of adequate quality and quantity for improved survival of anadromous and native resident fish populations on the mainstem Columbia and Snake rivers, as well as improving water quality in Basin tributaries, to promote healthy and productive populations of anadromous and native resident fish and wildlife.

Rationale

The mainstems of the Columbia and Snake rivers are affected annually by elevated water temperatures and periodically by total dissolved gas (TDG) levels, while various tributaries are experiencing elevated water temperatures during certain times during the year. In addition, there is a growing concern about toxic contaminants in the mainstem Columbia and Snake rivers and tributaries. Degraded water quality may be having adverse effects on the health of both our native fish and wildlife populations and the ecosystem these populations depend upon, thus impacting mitigation and recovery efforts in the Columbia River Basin.

Principles

- The Council will continue to support and promote public awareness of pertinent water quality and toxic contaminant research information and related effects on the Columbia River Basin ecosystem or program mitigation efforts.
- Monitoring, assessment and reduction actions identified below will best be achieved with sustainable funding resources. The Columbia River Basin has been designated by the federal Environmental Protection Agency (EPA) as a priority Large Aquatic Ecosystem similar to Chesapeake Bay, the Great Lakes, Gulf of Mexico, and Puget Sound. While each of these other ecosystems has designated funding sources to protect and restore the water quality within their defined areas, the Columbia River Basin does not.

General measures to address total dissolved gas and temperature

- Federal and non-federal project operators should:
 - Continue real-time monitoring and reporting of TDG and water temperatures measured at fixed monitoring sites in the Columbia River Basin
 - Continue to develop and implement fish passage strategies that produce less TDG, such as spillway flow deflectors, spillway weirs and surface passage outlets, including updates and improvements to the System Total Dissolved Gas (SYSTDG) model to reflect ongoing modifications to spillways or spill operations
 - Collaborate to complete the water temperature modeling capabilities in the mainstem Columbia River from Grand Coulee to McNary dams to better assess the effect of operations or flow depletions on summer water temperatures

- The Corps should continue to:
 - Develop and use the SYSTDG model for estimating TDG production to assist in real-time decision making for spill operations, including improved wind forecasting capabilities, as appropriate
 - Develop and use the CE-QUAL-W2 model for estimating mainstem Snake River temperatures and cold-water releases from Dworshak Dam on the North Fork Clearwater River to assist in real-time decision-making for Dworshak summer operations
- The federal action agencies, FERC, and the non-federal project operators, in cooperation with the EPA and other federal, tribal, regional, and state agencies, should:
 - Update and implement the Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP)
 - Monitor water quality parameters and implement water quality improvement measures to reduce water temperatures and TDG to meet state, EPA-approved tribal, and federal water quality standards to improve the health, condition, and survival of anadromous and native resident fish, as well as their related spawning and rearing habitat, in the Columbia Basin
- The federal action agencies should incorporate the provisions of various total maximum daily loads (TMDLs) as they are developed and approved into the regional Water Quality Plan, particularly TMDL provisions containing allocations affecting federal hydropower projects in the Columbia River Basin.

General measures to address toxic contaminants

- To support ongoing regional efforts to identify, assess and reduce toxic contaminants in the Columbia River Basin, the Council may initiate and will participate in, support, and coordinate periodic science/policy workshops on characterizing the state of the science related to toxic contaminant issues. The Council will also assist regional parties in advancing public education and information on toxics issues.
- The federal action agencies, in cooperation with the EPA and other federal, tribal, regional, and state agencies, should:
 - Support implementation of the regional 2010 Columbia River Basin Toxics Reduction Action Plan. Both the WQP and the *Toxics Reduction Action Plan* are comprehensive regional documents containing water quality monitoring, research, and improvement measures needed to enhance the survival of anadromous and native resident fish and to meet Northwest Power Act, ESA, and Clean Water Act responsibilities. The Council will continue to encourage preventive and remedial actions such as those identified by the WQP and the Toxics Reduction Action Plan.
 - Monitor water quality parameters and implement water quality improvement measures to reduce toxic contaminants, as appropriate, to meet state, EPA-approved tribal, and federal water quality standards to improve the health, condition, and survival of anadromous and native

resident fish, as well as their related spawning and rearing habitat, in the Columbia Basin

- The federal action agencies should partner with and support ongoing federal, state, tribal, and regional agencies' efforts to:
 - Monitor, assess and map high priority toxic contaminant hot spots in the Columbia River Basin and evaluate their relationship, if any, to the development and operation of the hydrosystem
 - Identify and assess the effects of toxic contaminants, alone or in combination with other stressors, on native fish, including sturgeon and lamprey, wildlife, and food webs in toxic hot spots in the Columbia River Basin
- The federal action agencies should partner with and support federal, state, tribal and regional agencies' efforts to conduct targeted monitoring in the Columbia River Basin of vulnerable native fish and wildlife species for specific, high-priority toxic contaminants and other priority contaminants of emerging concern, including in the middle and upper Columbia reaches and in the Snake River, and evaluate if toxic contaminants limit the reproductive success of native fish.
- At each hydropower project, federal and non-federal project operators in the Columbia River Basin should: (a) monitor and report oil spills and leakages; (b) replace all lubricating oils and fluids containing PCBs with non-PCB oils and fluids; and (c) develop and implement best practices for reducing spills and leakages of oils and lubricating fluids
- Using all available water quality data, Bonneville and the other federal action agencies should continue to identify areas where aquatic habitat restoration projects implemented under the program may be affected by toxic contaminants and incorporate pollution reduction and mitigation techniques into restoration projects when toxic contamination is a concern.
- The Council urges Congress to provide funding, similar to the funding provided to other Large Aquatic Ecosystems, to protect and restore water quality in the Columbia River Basin, including efforts to:
 - Develop sensitive diagnostic indicators of chemical exposure and salmon health, such as biomarkers, for use in field studies in the Columbia Basin
 - Determine the extent to which toxics limit prey quality and abundance in degraded habitats and otherwise affect the food web
 - Improve understanding of contaminants of emerging concern, such as endocrine-disrupting pharmaceuticals and chemicals in personal care products, and their effects on salmonids, sturgeon, and lamprey.

Link to the subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to toxics and water quality.

7. Climate change

Sub-strategy

Better understand how the effects of climate change may impact fish and wildlife populations and mitigation and restoration efforts implemented under the Columbia River Basin Fish and Wildlife Program. Evaluate fish and wildlife investments and their ability to perform in the face of future climate conditions.

Rationale

Climate records show that the Pacific Northwest has warmed about 1 °C since 1900, or about 50 percent more than the global average warming over the same period. The warming rate for the Pacific Northwest over the next half century is projected to be in the range of +0.2-0.9° C per decade. Projected annual precipitation changes for the region over the next few decades are relatively modest and unlikely to be distinguishable from natural variability. Projected future changes in temperature and precipitation will alter the snow pack, stream flow, and water quality in the Columbia Basin with the following anticipated impacts:

- Warmer temperatures will result in more precipitation falling as rain rather than snow
- Snowpack will diminish, particularly in lower-elevation watersheds, and stream flow timing will be altered
- Peak river flows will likely shift to earlier in the spring
- Water temperatures will continue to rise

These temperature and hydrologic changes are expected to have a variety of interrelated impacts on aquatic and terrestrial ecosystems in the Columbia River Basin. The Council recognizes the need to assess and, where necessary, respond to the [impacts of climate change](#), which could threaten the program's past and ongoing investments in habitat improvements in the Columbia River Basin.

Principles

- Future planning and implementation should include explicit consideration of the possible effects of climate change on the focal habitats and fish and wildlife populations, using adaptive management principles.
- It is uncertain whether climate change will alter the suite of habitat actions the program implements; however, adaptive management is the appropriate way to respond to changes in climate.

General measures

The federal action agencies, in coordination and collaboration with others, shall:

- Support the development of improved runoff forecasting methods and techniques for Columbia River Basin watersheds
- Work to provide early (e.g., late fall or early winter) runoff forecasts for the Columbia River Basin

- Continue to encourage, monitor, and promote public awareness of pertinent climate change research and information and assess how it should influence program mitigation efforts
- Assess whether climate change effects are altering or are likely to alter critical river flows, water temperatures or other habitat attributes in a way that could significantly affect fish or wildlife important to this program, either directly or by affecting the success of current mitigation efforts and if so, evaluate whether alternative water management scenarios, including changes in flood control operations, could minimize the potential effects of climate change on mainstem hydrology and water temperatures
- Evaluate the effectiveness and feasibility of possible actions to mitigate effects of climate change, including selective withdrawal from cool/cold water storage reservoirs to reduce water temperatures or other actions to create or protect cool water refugia in mainstem reaches or reservoirs
- Identify and evaluate management and mitigation options for fish and wildlife under various climate-change scenarios
- Assess and revise, if necessary, ongoing monitoring efforts to ensure collection of necessary data on key species responses, interactions, and productivity under future climate scenarios
- Implement long-term habitat protections for resident fish and wildlife in the basin
- Identify and implement a strategic expansion of the network of stations for surface weather and streamflow observations in high-altitude mountainous areas of the Columbia Basin
- Investigate the feasibility of mitigating climate change impacts in the estuary and plume through changes in hydrosystem operations, including changes in flood-control operations

Other general measures

- Variations in regional climate and ocean conditions play a large role in the survival of anadromous fish and other native species in the Columbia River Basin. Management actions shall strive to help those species accommodate a variety of climate and ocean conditions by providing a wide range of life history strategies. The Council supports the federal action agencies, in coordination and collaboration with others, monitoring salmon returns and climate-change impacts on ocean conditions in order to identify factors affecting survival in the near-ocean and plume environments.
- The Council supports ongoing studies and development of assessment methods by the federal action agencies and others. Further, the Council requests other entities to collaborate with the federal action agencies on this work.
- The Council, in collaboration with the federal action agencies, shall convene one or more science/policy workshops on climate change effects in the Columbia Basin, including panels of climate change scientists, to inform an overarching climate change strategy for the Columbia Basin.

- The Council continues to encourage, monitor, and promote public awareness of pertinent climate change research and information and assess how it should influence program mitigation efforts.
- The Council continues to require project sponsors to consider and plan for different climate change scenarios that could affect their work.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to climate change and its effects.

8. Mainstem hydrosystem flow and passage operations

Sub-Strategy

Manage dams and reservoir operations to protect and restore ecosystem function and habitat, and to improve fish passage and survival through the hydrosystem. Analyze the power system effects of operations for fish, and recommend adaptations to the power system so that these operations may be delivered in a reliable manner while the region continues to have an adequate, economic and reliable power supply.

Rationale

The mainstem of the Columbia and Snake rivers is that central portion of the Columbia River Basin linked by systemwide water management from the headwaters into the estuary and plume and by the large structural changes related to that systemwide water management. All Columbia River Basin anadromous fish use some portion of the mainstem for juvenile migration, rearing, resting, the biophysical transition from freshwater to saltwater and adult migration. Significant populations also spawn in the mainstem, while some of the system's most productive core populations used to spawn and rear in the mainstem but have been extirpated by the inundation and blockage of more than half of the habitat area by the development of the hydrosystem. This loss of capacity is a major consideration in the Act's mitigation obligation. Most of the other native fish important to the program also have been affected by the mainstem hydrosystem development and systemwide water management, including sturgeon in both the upper and lower Columbia River Basin, lamprey, and bull trout. The program's mainstem measures also benefit these species.

System operations for multiple purposes have a direct impact on fish habitat and overall fish survival, compromising habitat conditions for spawning, rearing, resting, and migration. For more than 30 years, the program measures have altered system operations for the benefit of improved habitat conditions and fish passage survival. As relevant to listed species, these measures have largely been incorporated into FCRPS biological opinions. The Council's program also adds important consideration to the benefit of non-listed anadromous and resident species affected by hydrosystem operations. The region is also looking to the Council's program to investigate the potential for additional gains in ecosystem function and floodplain connectivity.

Principles

- Native fish benefit from flow, passage and habitat conditions that best fit natural behavior patterns of these fish and the physical and biological conditions they need to thrive.
- Where there are demonstrated benefits for fish, manage water to more closely approximate natural flow patterns in terms of quantity, quality, and timing to promote productive populations of anadromous and resident fish.
- Biological diversity is promoted by managing hydrosystem operations to minimize the artificial selection or limitation of life history traits.

- As a starting point, in-river passage and water quality conditions should be improved consistent with the biological objectives of this program, the performance standards of the FCRPS biological opinions, and state and federal water quality standards under the Clean Water Act.
- The program is broader than the Endangered Species Act both in terms of species affected by the hydrosystem and the ultimate objective of the program that goes beyond just delisting endangered species. This strategy is thus designed to protect a broader range of species and their habitat, potentially utilizing different biological objectives.
- The Council assumes that, in the near term, the breaching of dams in the mainstem Columbia and Snake rivers will not occur.
- When recommending operational changes for fish and wildlife, the Council must consider the adequacy, efficiency, economics, and reliability of the power system.
- The Council's intent is to ensure more resilient and healthy ecosystem-based function throughout the mainstem Columbia and Snake rivers while: (a) maintaining an acceptable level of flood risk; (b) assuring adequate, reliable, and economic hydropower benefits and; (c) recognizing and implementing the other authorized purposes of the individual dams of the Columbia River system.

General measures

- The federal action agencies shall provide streamflows with appropriate timing, quantity, and water quality to promote productive populations of anadromous and resident fish, provide reservoir conditions to promote productive populations of native fish and wildlife, and manage water to protect and improve habitat conditions for all fish affected by the hydrosystem, not just listed species.
- The federal action agencies, in collaboration with state, federal, and tribal fish agencies, shall (1) design mainstem fish passage actions to protect biological diversity by benefitting a broad range of species, stocks, and life-history types, not just listed species and not just salmon and steelhead, and (2) favor solutions that best fit natural behavior patterns and river processes and increase the likelihood of adult returns. To meet the diverse needs of multiple species and allow for uncertainty, multiple passage methods are necessary at individual projects.
- The water management and fish passage actions, flow objectives, and passage standards in the current biological opinions under Section 7 of the

Endangered Species Act and in the Columbia Basin Fish Accords are the baseline flow and passage measures for the Council's program.⁵

- The federal action agencies should collaborate with the Council, state, federal, and tribal fish agencies and the utilities before implementing flow and passage measures to protect habitat and improve survival of species not covered in the biological opinions including, for example, upper Columbia River summer and fall Chinook, upper Columbia sockeye, [sturgeon](#), [lamprey](#), and [resident fish](#). The Council may convene a science/policy forum to investigate whether the baseline flow and passage operations in the FCRPS biological opinions are optimum for the needs of the non-listed fish important to the Council's program.
- Following the principles of adaptive management, the federal action agencies, in collaboration with the Council, state, federal, and tribal fish agencies and the utilities, shall continue to investigate, develop, and implement flow and passage measures that improve fish life-cycle survival.
- The [Fish Passage Center](#) provides technical assistance and information to the region's fish and wildlife agencies and tribes, and the public, on matters relating to the program's flow and passage measures. NOAA Fisheries and its Northwest Fisheries Science Center, the Corps, the Columbia River Data Access in Real Time (DART) Center at the University of Washington, the Pacific States Marine Fisheries Commission, and other entities also contribute and house information relevant to the implementation of the program's mainstem measures.

⁵ The relevant biological opinions are:

- NOAA Fisheries, *Consultation on Remand and Biological Opinion for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program* (May 2008) and two supplemental FCRPS biological opinions ([May 2010](#) and [January 2014](#)).
- NOAA Fisheries, *Consultation and Biological Opinion for the Operation and Maintenance of 10 U.S. Bureau of Reclamation Projects and 2 Related Actions in the Upper Snake River Basin above Brownlee Reservoir* (May 2008)
- [U.S. Fish and Wildlife Service, Biological Opinion regarding the effects of Libby Dam operations on the Kootenai River White Sturgeon, Bull Trout and Kootenai Sturgeon Critical Habitat](#) (February 2006)
- [U.S. Fish and Wildlife Service, Biological Opinion: Effects to Listed Species from Operations of the Federal Columbia River Power System](#) (December 2000)
- [NOAA Fisheries, Biological Opinion: Consultation on the "Willamette River Basin Flood Control Project"](#) (July 2008)
- [U.S. Fish and Wildlife Service, Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act](#) (July 2008).

The Columbia Basin Fish Accords are at <http://www.salmonrecovery.gov/Partners/FishAccords.aspx>.

The FPC Oversight Board will annually review the FPC's performance and help assure regional accountability, data management compatibility, and program consistency. The Fish Passage Center functions include:

- Assemble, organize, make publicly available, and maintain the primary archive of the smolt monitoring program data
- Participate in the development of the annual smolt monitoring program implementation plan, and assist in the implementation of the program
- Assemble, organize and make publicly accessible, data from other primary sources, and conduct analyses as requested to meet the information needs of the fish and wildlife agencies, tribes, and public with respect to water management, spill, and fish passage
- Provide technical information necessary to assist the agencies and tribes in formulating in-season flow and spill requests that implement the measures in the Council's program, while also assisting the agencies and tribes in making sure that operating criteria for storage reservoirs are satisfied
- Provide the technical assistance necessary to coordinate recommendations for storage reservoir and river operations that, to the extent possible, avoid potential conflicts between anadromous and resident fish
- Archive and make publicly accessible the data used in developing all analytical results, associating the specific data with the respective analyses

Specific flow measures

- **Hanford Reach fall Chinook.** The federal action agencies, in collaboration with the state, federal, and tribal agencies and the Mid-Columbia Public Utility Districts (PUDs), shall continue to reliably implement operations to protect spawning and emergence of fall Chinook in the Hanford Reach, consistent with the 2004 Hanford Reach Fall Chinook Protection Program Agreement. The parties to the agreement should report to the Council periodically to assure flow measures continue to be effective in protecting fall Chinook redds and juveniles from flow and river elevation fluctuations.
- **Libby and Hungry Horse operations.** The Council continues to support the federal action agencies' current reservoir operations at Libby and Hungry Horse dams as set forth in the relevant biological opinions. These include VARQ as well as spring and summer operations developed as part of the [2003 Mainstem Amendments](#). The Council encourages the action agencies to remove any reference to these operations as "experimental" in future biological opinions. The Council supports continued investigations to refine operations at Libby and Hungry Horse dams that improve conditions for fish near those reservoirs and do not adversely affect fish in the lower river, e.g., actions that help reservoir refill, reduce the potential for uncontrolled spill, reduce downstream flooding, and make operations mutually beneficial for the United States and Canada. Montana Fish, Wildlife & Parks should continue working with the pertinent parties to discuss proposals for adjustments to

winter and spring operations at Libby and Hungry Horse dams including consideration of the potential impacts of winter operations at Libby Dam (including winter power peaking) on the recovery of native fish species, the food web, and fish and wildlife habitat restoration efforts, and mitigate for those impacts if necessary. The Council will assist in these discussions as necessary. Any significant findings or proposed changes should be reported to the Council.

- **Albeni Falls Dam.** To benefit native fish, the Corps shall investigate infrastructure changes at Albeni Falls Dam and habitat enhancements in areas impacted by the dam.
- **Grand Coulee Dam operations.** The Council calls on the Bureau and NOAA Fisheries to work with the relevant federal and state fish and wildlife agencies and tribes to evaluate [alternative operations](#) and report back to the Council. The following principles should guide this evaluation:
 - Explore the optimum operations at Grand Coulee to provide improved conditions and survival for all the fish important to the program, including salmon and steelhead migration and rearing needs in the lower Columbia River, Hanford Reach fall Chinook spawning and emergence, and resident species in the reservoir that are critical to mitigation needs of the Spokane Tribe and others, including operations in the fall and winter that protect kokanee access and spawning.
 - Refilling the reservoirs by the end of June remains a high priority.
 - As much as possible within current operating constraints, manage the reservoir and dam discharges to minimize fluctuations and ramping rates and produce steady flows across each season and each day.
- **Hells Canyon Complex project operations.** Idaho Power Company's Hells Canyon hydropower complex, consisting of three hydroelectric projects on the mainstem Snake River, is currently undergoing Federal Energy Regulatory Commission (FERC) re-licensing and ESA Section 7 consultation. The Council will review the outcome of the FERC proceeding and, as appropriate, include in the program relevant provisions recognizing the operations to benefit fish below the Hells Canyon Complex as part of the baseline flow measures of the program.
- **Investigate the potential to further improve ecosystem function and floodplain connectivity.** The federal action agencies, in collaboration with state, federal, tribal agencies, and others, should continue to investigate and adjust system water management to improve ecosystem functions in the mainstem, estuary, and plume, with an emphasis on improvements in the following areas:
 - Reconnected floodplains related to river flows
 - Enhanced Columbia River plume and near-shore ocean habitat
 - Reduced salt water intrusion during summer and fall
 - Fewer and shorter hypoxia and acidification events in the estuary
 - Lower summer water temperatures

Elements of a coordinated approach should include:

- Continued investigations into how to best regulate river flows to enhance floodplain connections
- Further develop the methods to assess the extent of physical and biological benefits that could be gained from changes in flows, floodplain connections, and flood-risk management
- Improvements in hydrodynamic modeling, mapping and investigations into sediment transport and budgets
- Periodic assessment of how flow operations might be modified to capitalize on what is learned from the investigations recommended above
- Continued search for alternative methods of flood risk management in high-value areas to reduce the demands on upriver storage and better balance the allocation of risk, costs, impacts, and benefits

Specific fish passage measures

- **Passage at Mid-Columbia PUD dams.** The program's baseline passage measures and objectives include the passage actions and performance standards identified and agreed to by the operators of the Mid-Columbia PUD projects in FERC licenses and associated agreements.
- **Juvenile fish passage.** To maintain and improve juvenile fish passage survival, the Corps, in collaboration with state, federal, and tribal fish agencies shall select the most biologically effective combination of passage routes at each mainstem dam (including a spill level that does not exceed interim TDG standards or variances) which, when combined with other passage routes, maximizes juvenile fish survival and minimizes adult fish migration and fallback problems. In this effort, the Corps and its partners should:
 - Continue to refine the operation of surface bypass systems at all federal mainstem dams. The focus should be on developing the most effective training-spill patterns at mainstem dams to improve juvenile fish passage and survival while not affecting adult passage. Surface passage structures and outlets are important tools to achieve the dual goals of safe juvenile fish passage and long-term compliance with Clean Water Act total dissolved gas standards.
 - Relocate juvenile fish bypass outfalls in those circumstances where there are problems with predation, tailrace egress, or other factors contributing to juvenile fish injury or mortality.
 - Install new, fish-friendly turbines or optimize turbine operations to improve juvenile fish survival.
 - Continue to investigate ways to reduce descaling of juvenile sockeye.
- **Spill.** When making decisions regarding the timing and amount of spill, the federal action agencies should give priority to actions that (1) minimize impacts on returning adult fish; and (2) optimize in-river passage survival benefits for focal species, with particular emphasis on those species that cannot be or are not effectively transported.
- **Spill and other passage experiments.** The Council continues to recognize the value of an experimental approach to salmon recovery in the Northwest.

The Council supports the development of adaptive management experiments that address critical uncertainties related to species survival.

Proposals for such experiments must be based on the best available science, have appropriate study designs, be subject to review by the independent science panels, and address issues raised by independent scientific review and peer review. Proposed experiments will also need the necessary regulatory approvals consistent with all federal and state laws. This includes approval by the agencies with jurisdiction over the Endangered Species Act (as spill affects listed species) and the Clean Water Act. Experiments should not pose unnecessary risks to salmonids or other aquatic life in the Columbia River. And finally, the Council will take into account the compatibility of an experiment with other research taking place and future fish passage improvements at the dams in the Columbia Basin as well as the effect on the adequacy, efficiency, economics, and reliability of the power system.

Further work on proposals for mainstem spill experiments should fully engage the technical expertise in the region, including scientists from NOAA Fisheries, state fish and wildlife agencies, tribes, U.S. Fish and Wildlife Service, other federal agencies, the independent science panels, and others. The Council is interested in seeing future proposals for improving spill and other mainstem operations that meet these criteria and contain all the elements of a viable experiment as identified by the ISAB in [report 2014-2](#).

- **Juvenile fish transportation.** The Council recognizes the need to transport migrating juvenile salmon and steelhead under certain river conditions. The Council accepts this strategy as a means to achieve its biological objectives, where there are demonstrated benefits for fish. Implement juvenile fish transportation following adaptive management principles that consider and respond to new evidence regarding the relative life-cycle survival benefits when compared to in-river migration. Evaluation should include transportation effects on adult stray rates and the impacts of straying.
- **Adult fish passage.** The Corps, in collaboration with the state, federal agencies and tribes, should continue to implement improvements to the adult fish passage facilities at mainstem dams to benefit salmon and steelhead, Pacific lamprey, white sturgeon, and bull trout. In particular, cool water releases from storage reservoirs should continue to be used to facilitate adult migration. Emphasis should also be placed on research, monitoring, and evaluation; increased accuracy of fish counts; assessment of conversion rates of all adult fish species of interest, including lamprey, through key mainstem reaches; installation of PIT-tag and radio-tag detectors; evaluation of escapement numbers to spawning grounds and hatcheries; research into water temperature and spill effects on fish passage; and the connection between fish passage design and fish behavior. In particular:
 - As a priority for the Corps' capital construction program, implement structural improvements to correct adult fish-passage problems or improve reliability of adult passage facilities and report to the Council on progress

- Install adult PIT-tag detectors at key mainstem projects or near the mouths of major tributaries that do not have them
- Improve fish-counting accuracy and utilize known-origin PIT-tagged fish to evaluate adult survival (conversion rates) through key reaches of the mainstem Snake and Columbia rivers
- Investigate the use of, or need for, surface flow outlets during the winter months to provide a safer fallback route for over-wintering steelhead and kelts

Power system considerations

- The Council will work with federal and non-federal operating agencies, federal and state fish and wildlife agencies and tribes to review, update, and implement procedures that accommodate power system and dam operation emergencies with the least impact on listed and non-listed fish and with consideration of protection, mitigation, and recovery objectives.
- Fish survival emergencies may require operations that temporarily reduce or curtail power production, which should be implemented in the most cost-effective manner possible by the federal action agencies and non-federal project operators.
- The Council will investigate cost-effective power system strategies that improve ecosystem conditions for fish and wildlife, relax operational constraints adverse to fish and wildlife, and ensure the regional power system remains adequate, reliable, and economical

9. Estuary

Sub-strategy

Restore ecosystem function to protect and enhance critical habitat and spawning and rearing grounds in the estuary and lower Columbia River.

Rationale

The Columbia River estuary is an important ecological area that stretches from the mouth of the Columbia River to the Bonneville Dam tailrace including tidally influenced mouths of tributaries. Ecological functions in the estuary have been altered by upriver actions including the construction and operation of the hydropower system and local habitat change. The storage, release, and impoundment of water changes the pattern of flows and water temperatures downstream from hydroelectric dams and changes the characteristics of the estuary. Scientific research suggests that habitat-improvement actions in the estuary have the potential to improve survival benefits for fall and spring Chinook salmon, sockeye, and steelhead.

Principles

- A functioning ecosystem sustains abundant, productive, and diverse communities of fish and wildlife.
- Habitat restoration supports and enhances ecosystem functions and species survival.
- Long-term monitoring helps ensure that (1) habitat-restoration projects remain effective, and (2) fish populations affected by the hydropower system including salmon, steelhead, and lamprey, respond to mitigation projects designed to improve survival in estuary habitat, the lower Columbia River, and the near-shore plume marine environment.
- In an environment as diverse as the lower Columbia River and estuary, partnerships are essential in planning, monitoring, evaluating, and implementing mitigation activities.

General measures

The Council incorporates as program measures estuary actions in the Federal Columbia River Power System Biological Opinion (BiOp). The program, however, is broader than the Endangered Species Act both in terms of species affected by the hydrosystem and the ultimate objective of the program that goes beyond just delisting endangered species. Today, the Columbia Estuary Ecosystem Restoration Program (CEERP) developed by the federal BiOp action agencies directs implementation of BiOp actions in the estuary. The CEERP, along with the Council's estuary and Lower Columbia subbasin plans and locally developed recovery plans, will guide implementation, monitoring, and evaluation of habitat actions in the estuary.

The Corps and Bonneville shall implement in partnership with fish and wildlife agencies and tribes and other organizations:

- Assessments of opportunities for floodplain reconnection and removal or lowering of dikes and levees that block access to habitat, or installing fish-friendly tide gates for habitat reconnection, protection, and restoration of riparian areas and off-channel habitat
- Effectiveness monitoring of habitat-restoration actions using a programmatic approach to mirror effectiveness monitoring elsewhere in the Columbia Basin
- A long-term, continuous, status and trend monitoring and evaluation program for salmon, steelhead, and Pacific lamprey migration and survival that shall include monitoring habitat in the lower Columbia River, estuary, and the near-shore plume environment
- Research and evaluation on the effects of flow regulation, dredging, and water quality (Including toxics) on estuary habitat and food webs to better understand the relationship between estuary ecology and salmon and steelhead productivity, abundance, and diversity

The Council will:

- Work with partners in the estuary to establish biological objectives and estuary [indicators](#) for habitat restoration and ecosystem function that will serve to prioritize future actions.
- Receive from Bonneville and the Corps, a summary report on the results of action-effectiveness, status, and trend monitoring and research uncertainties in March 2015. The report must provide information to help improve and substantiate the effectiveness of habitat actions implemented in the estuary by parties that do not monitor their own habitat actions.

Link to subbasin plans

See the Council's [subbasin plans](#) for information pertaining to the estuary and lower Columbia.

10. Plume and nearshore ocean

Sub-strategy

Monitor ocean conditions and related salmon survival and endorses mitigation and management actions that improve the survival, growth, and viability of Columbia River fish in varying ocean conditions.

Rationale

The ocean environment, in particular the plume, is treated as an integral component of the Columbia River ecosystem. The survival, growth, and viability of anadromous populations in the Columbia River Basin is affected by physical, biological, and ecological conditions in the ocean. The ocean is not a static environment. As a result of the varying ocean conditions, salmon populations are constantly fluctuating and may pass through cycles of abundance, followed by cycles of scarcity. The storage, release, and impoundment of water changes the pattern of flows and water temperatures downstream from hydroelectric dams and changes the characteristics of the plume.

Understanding the conditions Columbia River anadromous fish face in the ocean will help identify which factors are most critical to survival, growth, and viability and also suggest which mitigation actions will provide the greatest benefit.

Principles

- **Identify the effects of ocean conditions and distinguish from other effects:** Baseline and real time data is needed to identify and isolate the effects of ocean conditions on the survival, growth, and viability of Columbia River anadromous fish.
- **Manage for variability:** Variations in ocean conditions play a large role in the survival of anadromous fish and other species in the Columbia River Basin. The Council supports management actions that help anadromous species accommodate a variety of ocean conditions by providing a wide range of life history strategies.

General measures

- The Council supports monitoring plume and nearshore ocean conditions and in-river restoration actions to determine those actions of greatest benefit and to separate the effects of ocean-related mortality from that caused in the freshwater part of the life cycle.
- The federal action agencies shall evaluate the effects of flow regulation on near-shore plume characteristics and salmon and steelhead productivity, abundance, and diversity.
- The Council supports continued monitoring of the Columbia River plume and ocean conditions, assessment of impacts on salmonid survival, and evaluation of the limits of restoration potential in the basin given variable ocean conditions. Predicting future ocean conditions and anadromous fish returns allows for adjustments to inland actions and may lead to increased survival benefits.

- The Council supports coordination between ocean scientists and state fish and wildlife agencies and tribes to identify key uncertainties and opportunities to improve river management activities based on current ocean conditions.
- The Council supports efforts by the Ocean and Plume Science and Management Forum and science/policy exchanges to encourage coordination and communication between ocean researchers and fish and wildlife agencies and tribes. The Council will consider recommendations from the forum when making recommendations to Bonneville regarding implementation of this strategy.
- The Council encourages scientists to develop an annual index of ocean survival from Bonneville Dam back to Bonneville Dam.

11. Wildlife mitigation

Sub-strategy

Mitigate wildlife losses caused by the development and operation of hydropower dams in the Columbia River Basin.

Rationale

Development and operation of the hydrosystem resulted in wildlife losses, operational losses, and secondary losses. The program includes measures and implements projects to acquire and protect the habitat units identified in the loss assessments [see [Appendix C, Table C-4](#)], as mitigation for construction and inundation losses. The program maintains a commitment to mitigate for operational and secondary losses that have not been estimated or addressed. However, where operational or secondary losses already have been addressed in an existing wildlife mitigation agreement, the terms of that agreement will apply.

Principles

- The extent of wildlife mitigation is of particular importance to agencies and tribes in blocked areas, where anadromous fish runs have been extirpated by development of the hydrosystem, and where full mitigation cannot be accomplished through resident fish substitution alone. Given the vision of this program, the strong scientific case for a more comprehensive, ecosystem-based approach, and the shift in focus to implementation through subbasin plans, the Council believes that wildlife mitigation projects should be integrated with fish mitigation projects as much as possible. In some cases, where resident fish goals cannot be accomplished, wildlife mitigation may substitute for resident fish mitigation.
- Wildlife mitigation should replace habitat units lost to hydropower dam development and operation. Beginning in the 2000 Program, the Council called for these mitigation agreements to equal 200 percent of the remaining habitat units (2:1 ratio). The Council chose the 2:1 crediting ratio to address the inability to precisely determine the habitat units resulting from acquiring an interest in property that already has wildlife value or the additional losses represented by annualization of the losses.
- The Council adopted and continues to endorse the 2:1 crediting ratio for the remaining habitat units. However, when loss estimates appear inaccurate due to habitat unit stacking and those inaccuracies cannot be resolved through use of a different, cost-effective tool or approach recommended by the [Wildlife Crediting Forum](#) and approved by the Council, then the 2:1 ratio will not apply to the remaining stacked habitat units.
- Mitigation agreements should be considered to settle operational losses in lieu of precise assessments of impacts.

General measures

- Bonneville shall work with the agencies and tribes on the following measures:

- Where appropriate prioritization exists and agreements exist on the methodology, complete wildlife loss assessments for losses caused by operation of the hydropower projects
- Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses
- Coordinate habitat restoration and acquisition activities throughout the basin with fish mitigation and restoration efforts to promote terrestrial and aquatic area connectivity
- Maintain the values and characteristics of existing, restored, and created habitat
- The Council encourages wildlife agencies and tribes to monitor and evaluate habitat and species responses to mitigation actions and develop a more standardized approach to wildlife monitoring.
- Bonneville and the fish and wildlife agencies and tribes will complete wildlife loss mitigation agreements for at least the remaining construction and inundation losses by 2016. In addition, for each wildlife agreement that does not already provide for long-term maintenance of the habitat, Bonneville and the applicable management agency shall propose a management plan adequate to sustain the minimum credited habitat values for the life of the project.
- Fish and wildlife agencies and tribes and Bonneville will reach agreement on how wildlife mitigation projects and fish mitigation projects should be credited toward identified losses.

Specific measures for habitat units

- **Habitat units and the habitat evaluation procedure (HEP) methodology.** The Council will continue to endorse habitat units as the preferred unit of measurement for mitigation accounting and the HEP methodology as the preferred method for estimating habitat units lost and acquired. Parties to a wildlife mitigation agreement may develop and use another method for evaluating potential mitigation actions if, in the Council's opinion, that alternative method adequately takes into account both habitat quantity and quality adequate to mitigate for the identified losses.
- **Allocation of habitat units.** Bonneville shall work with the agencies and tribes for habitat acquired as mitigation for lost habitat units identified in Table C-4, which shall be acquired in the subbasin in which the lost units were located unless otherwise agreed by the fish and wildlife agencies and tribes in that subbasin.
- **Habitat enhancement credits.** Habitat enhancement credits should be provided to Bonneville when habitat management activities funded by Bonneville lead to a net increase in habitat value when compared to the level identified in the baseline habitat inventory and subsequent habitat inventories. This determination shall be made through the periodic monitoring of the project site using the HEP methodology. Bonneville shall

be credited for habitat enhancement efforts at a ratio of one habitat unit credited for every habitat unit gained.

Long-term agreements

Whenever possible, Bonneville shall work with the agencies and tribes to ensure that wildlife mitigation shall take place through long-term agreements that have clear objectives, a plan for action over time, a committed level of funding that provides a substantial likelihood of achieving and sustaining the stated wildlife mitigation objectives, and provisions to ensure effective implementation with periodic monitoring and evaluation. Thus, wildlife mitigation agreements shall include the following elements:

- Measurable objectives, including acres of habitat types and number of habitat units by species to be acquired, and a statement estimating the contribution to addressing the wildlife losses identified in Table C-4 in the Appendix
- Demonstration of consistency with the wildlife policies, objectives, and strategies in the Council's program, including with the implementation priorities described in Tables C-1, C-2, and C-3 in the Appendix
- Adherence to the open and public process language found in the Northwest Power Act including measures to address concerns over additions to public land ownership and impacts on local communities, such as a reduction or loss of local government tax base or the local economic base and consistency with local governments' comprehensive plans
- When possible, protection for riparian habitat that can benefit both fish and wildlife, and protect high-quality native habitat and species of special concern, including endangered, threatened, or sensitive species
- Incentives to ensure effective implementation of the agreement, plan or action, with periodic monitoring and evaluation (including a periodic audit) and reporting of results. At a minimum, annual reports to Pisces must continue in order for the Council to evaluate the mitigation benefits.
- Provisions for funding long-term maintenance of the habitat adequate to sustain the minimum credited habitat values for the life of the project to achieve and sustain the wildlife mitigation objectives
- For a project to be credited against construction and inundation losses it must be consistent with the fish and wildlife program. Criteria include:
 - Covenants, easements, fee title acquisitions or other appropriate agreements for the life of the hydroelectric project to ensure project areas are permanently protected and dedicated to wildlife benefits
 - A demonstration that projects will benefit priority wildlife habitat, species, or populations as defined by federal, state, or tribal wildlife management plans or subbasin plans
 - A completed project-area management plan
 - A long-term funding agreement adequate to support implementation of the management plan

Wildlife Advisory Committee

The Council recognizes the ongoing difficulties in addressing wildlife operational losses. At the same time the Council recognizes the progress that has been made in addressing this issue as the result of pilot projects on the Kootenai River. To address this issue the Council has directed its Wildlife Advisory Committee to examine the existing options and alternatives for providing mitigation for wildlife operational losses and to provide a recommendation to the Council for resolving the issue by October 1, 2015. In addition, the committee has been charged to make recommendations on the following issues:

- The need for additional HEP reports and future HEP Team funding
- The diminishing need for HEP on new acquisitions as Bonneville completes construction and inundation mitigation
- Current regional need for follow-up HEP capacity to track project agreement compliance on many properties. That need may be influenced by (1) long-term settlements for operation and maintenance, (2) technology advances that may allow the region to more cost effectively track changes in habitat conditions using remote sensing or other techniques, and (3) species responses.
- The need for new methods to assess operational losses that incorporate the results of ongoing pilot projects. This could include technical testing and evaluation of operational loss models and methodologies, or other alternative habitat evaluation methods.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to wildlife focal species and management strategies that help guide project selection.

B. Fish Propagation Including Hatchery Programs Strategy

Use hatchery programs as tools to help meet the mitigation requirements of the Northwest Power Act.

Rationale

Hatcheries and other propagation measures are operated for multiple purposes: to provide mitigation, species protection, population conservation, research, and frequently some combination of these purposes. The majority of hatchery propagation facilities in the Columbia Basin are authorized and operated to mitigate for the construction and operation of the hydropower system. The Council also acknowledges the commitments made by federal, state, and tribal governments to implement propagation actions consistent with the Northwest Power Act, Endangered Species, Indian treaty rights and other laws, including commitments associated with on-going court cases such as [United States v Oregon](#).

Since habitat restoration actions cannot, by themselves, meet protection and mitigation requirements of the Northwest Power Act, the Council supports propagation to help meet program objectives including replacement of wild fish loss as a result of habitat degradation and dam construction. Over the last 25 years, salmon propagation practices have undergone extensive [reviews](#) by the Council, state and federal agencies, Indian tribes, and independent science panels, with particular attention following the listing of several salmon and steelhead species in the basin.

In addition, the body of scientific literature concerning hatchery programs has grown tremendously in the last 10 years. The literature and the reviews mentioned above indicate the risks and benefits of hatchery programs need to be considered on a case-by-case basis. Furthermore, these reviews have laid a scientific foundation to guide hatchery strategies to address the specific population mitigation and other management objectives in each watershed in the basin.

In 2009, the Hatchery Scientific Review Group (HSRG) conducted a detailed, thorough, and comprehensive review of hatchery programs in the Columbia River Basin. The HSRG Report was updated in 2014. The resulting population-specific recommendations were intended to provide scientific guidance for managing each hatchery more effectively in the future. The HSRG review did not end with the aforementioned recommendations because it went on to say that these were not the only options for operating hatchery programs more effectively. In its 2014 report the HSRG stated:

The central message of the HSRG is that the impacts of hatchery fish on naturally spawning populations must be carefully considered when planning and operating harvest augmentation and mitigation hatcheries

and that the best available science should be used when informing decision makers about the tradeoffs involved.

The Council understands the hatchery operators have considered the HSRG review as guidance in developing hatchery and genetic management plans (HGMPs) for each hatchery program. In addition, the Council relies on Bonneville and the Coordinated Assessment partners to provide the hatchery performance data needed to monitor the effectiveness of hatcheries funded by Bonneville.

There are several propagation strategies that are implemented in the basin including segregated programs to maintain fish abundance for harvest, integrated programs to complement wild fish restoration and provide harvest benefits, supplementation and captive rearing programs to bolster weak wild populations, and reintroduction programs to replace fish populations that have been lost completely. The Council defers to the agencies and tribes to define the scope and purpose(s) of the hatchery and fish propagation methods, as well as the appropriate management techniques, consistent with current and evolving scientific principles. The Council will ensure that research, data collection, and reporting methods allow for meaningful evaluation of hatcheries and fish propagation measures at both the local and landscape level, to assure consistency with program goals and objectives.

Principles

Hatcheries should:

- Follow an adaptive management approach that uses research and monitoring data to understand, at multiple scales, how hatcheries are performing
- Operate according to sound scientific principles for fish recovery and to fully meet federal and other legal obligations for fish protection, mitigation and enhancement within the altered Columbia River ecosystem
- Support viable salmonid population (VSP) characteristics to enhance wild populations, including abundance, productivity, spatial distribution, and diversity
- Use an adaptive-management process that address variability in environmental conditions and in fish productivity and escapement levels, and includes aggressive monitoring to evaluate risks, benefits, and address scientific uncertainties
- Operate within the broader basin, regional, and global systems
- Restore, maintain, or minimize impacts upon species diversity to help ensure their resiliency
- Where appropriate, use locally adapted fish as the model for successful rebuilding and restoration of depleted populations in their native habitat
- Use appropriate marking strategies for hatchery-produced salmon and steelhead that enable effective management of the population-specific strategies in the basin and provide for appropriate harvest opportunities
- Externally mark hatchery produced Chinook, coho, and steelhead that are intended to be used for directed harvest consistent with any applicable state

policy, or for conservation or research needs. External mark use will require state-tribal agreement in some cases (e.g. United States v Oregon) to fully meet federal and other legal obligations for fish protection and recovery, mitigation, and enhancement.

- Set clear goals and identify specific criteria for evaluating hatchery performance
- Mitigate for losses in fish survival and in fish production. Agencies and tribes are encouraged to investigate new locations and opportunities to expand treaty and non-treaty harvest, including the reprogramming or expansion of hatchery production and selective harvest.
- Operate in consideration of other factors that influence species abundance, productivity, spatial structure, and diversity, and relative to legal principles, including but not limited to tribal treaty rights
- Operate based on conditions that are unique to every location. Agencies and tribes and operators will tailor hatchery program goals and objectives, performance criteria, and corresponding hatchery management practices in consideration of several local factors, including but not limited to, the status and recovery goals for local fish aggregations, the quantity and quality of fish habitat, environmental conditions, and relevant land use and other regulations.

General measures for comprehensive research, monitoring, assessment and reporting on hatchery effectiveness

- For Bonneville-funded hatchery programs, Bonneville shall locate and operate propagation actions to complement the present and future management activities of the region's agencies and appropriate Indian tribes, including complements to habitat improvements by supplementing native fish populations.
- The Council's research plan will identify critical uncertainties related to hatchery performance in the Northwest. This includes determining the effectiveness of hatchery programs in meeting their intended purposes and minimizing adverse impacts to natural-origin fish.
- Bonneville should support the use of standardized performance measures by the agencies and tribes to inform effectiveness of various propagation strategies in meeting intended hatchery goals.
- The Council intends to use available reporting mechanisms where possible.
- The Council requests that NOAA Fisheries annually update the Council on the status of ESA reviews for state and tribal HGMPs.
- Where feasible, trends in abundance, productivity, distribution and, diversity of supplemented populations shall be compared to non-supplemented populations in "reference streams" before, during, and after implementation of the production effort.
- The Council requests that NOAA advise the Council on the utility of updating the list of reference streams first identified by the Ad Hoc Supplementation

Workgroup that are linked to distinct population segments (DPSs), and populations within evolutionarily significant units (ESUs).

- The Council also requests NOAA share with the Council the results of NOAA status reviews of Columbia Basin salmon and steelhead ESUs and DPSs as the reviews are completed.
- Recovery plans have been or are in the process of being developed for each of the listed salmon ESUs and steelhead DPSs in the Columbia River Basin. Each recovery plan includes or will include viability criteria, or targets that are based on the biological parameters of abundance, productivity, spatial structure, and diversity. Viability criteria, together with threats criteria, are considered when determining whether a species warrants delisting.
- Hatchery program implementation, monitoring, and evaluation results for all hatchery programs in the Columbia River Basin should be made electronically available and hatchery operators and funders should coordinate annual summary presentations to the Council.
- Hatchery summary presentations should include adaptive management actions implemented or planned to improve effectiveness in meeting intended hatchery goals or changes in goals to meet broader basin management strategies.
- To promote a diversified approach to hatchery management, hatchery operators will aspire to improve hatchery program performance and, in coordination with agencies and tribes, will seek-out opportunities to test and monitor alternative hatchery strategies and approaches and alternative hatchery practices.
- To facilitate compliance monitoring, agencies and tribes will monitor their hatchery programs for compliance with federal, state, and other relevant requirements and will make this information readily available.
- The Council continues to support PIT tagging and detection, coded wire tagging and recovery, acoustic and radio tagging and tracking, and genetic tagging and recovery. These all work together to help assure adequate effectiveness monitoring, and other monitoring as necessary, throughout fish life cycles and across various fish environments.
- In consideration of best available scientific information the Council will rely on information provided by the independent science panels and the agencies and tribes regarding hatchery science. The agencies and tribes will continue and expand their investments in research, monitoring and evaluation for the purpose of reducing uncertainties and improving hatchery performance, including developing a better understanding of the benefits and risks of hatchery programs.

Link to subbasin plans

See the Council's [subbasin plans](#) for information pertaining to hatcheries within the subbasins.

C. Other strategies

1. Wild fish

Strategy

Native wild fish and the ecosystems they rely on must be protected, mitigated, enhanced, and recovered, as they constitute an important, genetically diverse, biological resource for the Basin (in the context of the Council's mitigation responsibility). Wild fish also provide important opportunities to rebuild and reintroduce populations where donor populations may support this. The Council also recognizes that hatcheries are an important tool for mitigating the hydrosystem's impact on wild fish and to assist in the rebuilding of certain wild fish populations.

Rationale

Because habitat restoration is a key strategy in the program, it is essential to maintain and rebuild healthy, self-sustaining fish and wildlife populations by protecting, mitigating, and restoring ecosystem conditions on which the fish depend through their entire life cycle. This wild fish strategy will help ensure that adequate attention is also given to protecting, mitigating, and enhancing populations of wild fish. The Council's program encourages collaboration and coordination to implement these measures while respecting the management role of the federal, state, and tribal natural resource agencies.

Principles

- Where native habitat is largely intact, and the fish population has good potential to rebuild, manage for wild fish except where fish and wildlife managers determine supplementation efforts are appropriate, after applying existing review procedures.
- All aspects of the life cycles of wild fish populations are important to their abundance, productivity, diversity, and distribution and all sources of mortality must be addressed in protecting, mitigating and enhancing wild fish.
- Freshwater survival of wild fish spawning, rearing, and migrating in tributary and mainstem rivers is key to maintaining healthy population conditions.
- Habitat and hydrosystem actions should be managed to address the conservation needs of wild fish.
- Ecological and genetic risks to wild fish should be managed by operating hatchery programs to address potential competition between hatchery-reared and wild fish for food resources, space, and exposure to disease, and gene flow between wild and hatchery populations.
- Impacts to wild populations in fisheries should be managed consistently with harvest biological opinions and with other conservation-based management agreements.

General measures

- The Council will consider the needs of wild fish in all facets of its fish and wildlife program including: hydrosystem passage, fish propagation facilities, climate change, predation, strongholds, research, carrying capacity, and habitat actions.
- Consistent with the Council's quantitative objectives for adult salmon and steelhead, the Council will collect, organize, and review biological objectives for wild fish.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to wild populations of focal species.

Links within the program

[Objectives](#), [strongholds](#), [fish propagation](#), [habitat](#), and [adaptive management](#)

2. The use of hatcheries for reintroduction

Strategy

The purpose of reintroduction is to return lost salmon and steelhead into blocked areas, or to re-establish populations in watersheds accessible for anadromy but where the native population had been extirpated or the risk of extirpation is very high. A successful reintroduction approach would result over time in anadromous fish that are viable in areas where they were previously located and that meet harvest and habitat goals and objectives identified by the agencies and tribes.

Strategies to initiate a reintroduction may involve live trapping and translocation of fish, or introduction of hatchery-reared juveniles. Reintroduction would use fish of local origin, if available. Initial reintroduction may be followed by hatchery supplementation with progeny of adults returning in-basin used as broodstock. In areas where anadromous fish have been extirpated due to the construction and operation of hydropower facilities and it is not yet possible to reintroduce anadromous fish successfully, hatchery supplementation of a substitute species may be part of the mitigation strategy, along with habitat improvements to support natural production of native resident species.

Principles

- Ecological and genetic interactions such as competition for food and space, straying, predation, and disease that have the potential to adversely affect existing native fish must be considered as part of an anadromous fish reintroduction program. If substitute non-anadromous fish are to be introduced, then ecological interactions must be consistent with native fish goals.
- The use of hatchery fish for replacement or substitution purposes must occur within the context of the program's anadromous fish mitigation in the blocked areas strategy. All ongoing or new substitution projects that involve or might involve a non-native species should follow the program's non-native fish strategy.
- Standards that apply to either segregated or integrated programs may also apply to reintroduction and replacement programs as circumstances and ultimate purposes require.
- Feasibility to re-establish salmon and steelhead populations in all areas within the basin where they have been extirpated should be assessed and programs for re-establishment considered where deemed feasible.

General measures

- Bonneville shall locate and operate hatcheries to re-establish salmon and steelhead where they have been extirpated, and substitute for extirpated salmon and steelhead in blocked areas.
- The goals, objectives, timelines, benchmarks and experimental framework for reintroduced populations will be developed by the agencies and tribes and submitted to the Council.

3. Anadromous fish mitigation in blocked areas

Strategy

Mitigate through implementation of a variety of actions that may include passage investigation, reintroduction of anadromous fish, habitat improvements, and harvest opportunities for the loss of salmon and in blocked areas of the Columbia Basin that historically had runs of anadromous fish. Flexibility in approach is needed to develop a program that addresses anadromous fish losses.

Rationale

Anadromous fish losses are identified in “Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin” and the “Numerical Estimates of Hydropower-related Losses,” first adopted in the Council’s 1987 Fish and Wildlife Program [see [Appendix B](#)].

For some time, the fish and wildlife program has included a provision calling for investigations into the passage and reintroduction of anadromous fish above Chief Joseph and Grand Coulee dams if, when, and where feasible. The huge loss of salmon capacity and productivity in the upper Columbia has been one of the key drivers of mitigation activities under the Northwest Power Act, and a number of agencies and tribes recommended for this 2014 Program that the region intensify its efforts to explore the possibilities of reintroducing anadromous fish above Chief Joseph and Grand Coulee dams.

Principles

The following principles should guide decisions on mitigation strategies to address anadromous fish losses in blocked areas:

- Restoration of anadromous fish to blocked areas should be investigated as mitigation for the impacts of hydropower dams that blocked historic passage of adult and juvenile fish. The abundance of native fish species should be restored throughout blocked areas where original habitat conditions exist or can be feasibly restored or improved.
- Mitigation for fish and wildlife losses attributable to the hydropower system generally should occur in the vicinity of the losses.
- Mitigation may include the use of resident fish, anadromous fish reintroductions, wildlife, habitat, and projects to identify or resolve data gaps.
- Mitigate according to the following ordered priorities:
 - Weak, but recoverable, native populations affected by the hydropower system, as such populations are identified for the Council by the state and federal fish and wildlife agencies and tribes (agencies and tribes)
 - Actions that investigate reintroductions of anadromous fish into blocked areas, where feasible
 - Areas of the basin where anadromous fish are not present
 - Resident fish projects that also provide benefits for wildlife or anadromous fish

- Populations that support important fisheries including both introduced and native species such as trout, sturgeon, kokanee, burbot, bass, perch, and others.
- Subsistence and sport fishing resources that meet state and local regulations should be provided when full mitigation by improving the abundance of native fish species is not feasible.
- Non-native fish should be managed to maximize use of available existing and improved habitats without adversely affecting native fish populations.
- Efforts to increase the abundance of anadromous fish should be done in a manner that is compatible with the continued persistence of native resident fish species and their restoration to near historic abundance.
- Hatcheries should be operated in a manner consistent with the hatchery strategy in this program.

General measures

All blocked areas

- The action agencies, in collaboration with state agencies and tribes, shall fund mitigation of anadromous fish losses, including strategies relying on habitat improvements, reintroductions, hatcheries, harvest opportunities, and other mitigation.
- Bonneville shall provide funding to:
 - Develop and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance
 - Consider passage projects to benefit native species
 - Expand and rebuild native fish numbers in blocked areas where habitat exists or can feasibly be restored or improved
 - Address anadromous fish losses with resident fish and wildlife, as appropriate, where full mitigation cannot be accomplished with resident fish alone
 - Protect and improve degraded fish habitat consistent with the habitat sub-strategy

Reintroduction of anadromous fish above Chief Joseph and Grand Coulee dams to mainstem reaches and tributaries in the United States

- **Phased approach.** Pursue a science-based, phased approach to investigating the reintroduction of anadromous fish above Chief Joseph and Grand Coulee dams including juvenile and adult passage at the dams. The phases shall include:
 - Phase 1 (to be completed no later than the end of 2016):
 - Evaluate information from passage studies at other blockages and from previous assessments of passage at Grand Coulee and Chief Joseph dams

- Investigate habitat availability, suitability and salmon survival potential in habitats above Grand Coulee. This might include selective releases of salmon and steelhead. Investigate the scientific feasibility and possible cost of upstream and downstream passage options for salmon and steelhead. Before funding new investigations, provide the Council with a report for consideration of subsequent work to advance the fish passage planning process.
- As part of Phase 1, the Council will engage in discussions with tribal, state, and federal agencies and others regarding the purpose, scope and progress of reintroduction efforts above Chief Joseph and Grand Coulee dams.
- Phase 2:
 - Based on the results in the first phase, the Council in collaboration with the other relevant entities will decide how to proceed. Phase 2 activities may include one or more of the following:
 - design and test salmon and steelhead reintroduction strategies and interim fish passage facilities at Chief Joseph and Grand Coulee Dams
 - investigate alternative approaches to passage
 - identify additional studies necessary to advance the fish passage planning process
 - reintroduction pilot projects
 - monitoring, evaluation, and adaptive management of the Phase 2 activities
- Phase 3:
 - Based on the results of Phase 2, the Council in collaboration with the other relevant entities will decide whether and how to proceed to implement and fund reintroduction measures as a permanent part of the program, including construction and operation of passage facilities.
 - Monitor, evaluate, and adaptively manage the reintroduction efforts.
- **Transboundary reintroduction.** The United States should pursue a joint program with Canada, with shared costs, to investigate and, if warranted, implement the reintroduction of anadromous fish on the mainstem Columbia River to Canadian spawning grounds. This joint program would proceed on an incremental basis, comparable to the phased approach described above.
- **Reintroductions above Grand Coulee to mainstem reaches and tributaries in the United States.** Bonneville and the relevant federal action agencies, working in collaboration with state and federal fish and wildlife agencies and tribes, shall investigate and, if warranted, implement passage and reintroduction of anadromous fish into suitable habitats within the United States. This shall include:
 - Funding research associated with critical uncertainties at Chief Joseph and Grand Coulee dams required to inform Phase 1
 - Funding work required for Phases 2 and 3 based on Council recommendations

Reintroductions above projects in the Willamette River Basin

The Corps and Bonneville should support and implement anadromous fish passage measures prioritized through the Willamette River Basin Flood Control Project Biological Opinion.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information that provides historical context, strategies and objectives that will continue to help guide mitigation work for lost anadromous stocks.

4. Resident fish mitigation

Strategy

For resident fish and other aquatic species impacted by the hydrosystem, protect and mitigate freshwater and associated terrestrial habitat, and native fish populations.

Rationale

Mitigation is required for native resident fish and other freshwater species impacted by the construction and operation of the hydropower system. Native resident fish and other freshwater species addressed in this strategy include freshwater mussels, threatened bull trout, burbot, westslope cutthroat trout, mountain whitefish, endangered Kootenai white sturgeon, and resident life histories of the native anadromous species, such as Columbia River white sturgeon and kokanee. Impacts have resulted in losses to abundance, genetic diversity, life history diversity, spatial diversity and movements of these species, as well as modification of their habitat resulting from inundation. The program recognizes the importance of all native resident fish and other freshwater species, in maintaining ecosystem diversity and function, and contributing to cultural aspects in the basin. It relies on a diversity of strategies to address those losses, including habitat mitigation, hatcheries, harvest augmentation, and modifying hydrosystem operations.

Principles

- Apply a diversified approach for mitigating losses, including hatcheries, harvest augmentation, modifying hydrosystem operations, and habitat mitigation that involves habitat protection to protect habitat for native fish in perpetuity and as a tool to mitigate for lost habitat
- Conduct research to identify and determine how to resolve limiting factors, and apply a prioritized approach for addressing limiting factors within a watershed.
 - In areas of the Columbia River Basin that have quantitative native resident fish loss assessments in terms of acres or stream miles of key habitat inundated or blocked, these losses may be most effectively mitigated by acquiring interests in real property for the purpose of preserving and enhancing fish habitat equal to the quality of habitat lost. In such cases, acquire and maintain land in perpetuity for purposes of fish habitat, at a minimum ratio of 1:1 mitigation to lost distance or area. Focus land acquisitions on parcels with connectivity and intact healthy riparian and stream habitat as these will improve fish habitat resiliency [see [guidance for resident fish settlements](#) for details]. Whenever possible, resident fish mitigation via habitat acquisitions should take place through long-term settlement agreements similar to those described above for wildlife mitigation agreements. Currently resident fish loss assessments exist for Libby and Hungry Horse dams.
- Consider the following guidance when addressing resident fish losses related to the development and operation of the hydropower system:

- Address weak, but recoverable, native populations injured by the hydropower system, as such populations are identified for the Council by the fishery agencies and tribes.
- Address areas of the basin where anadromous fish are not present.
- Implement resident fish projects that also provide benefits for wildlife.
- Enhance populations that support important fisheries.

General measures

- Where feasible, Bonneville shall preserve, enhance, and restore native fish in native habitats.
- Bonneville shall develop interim fisheries where native fisheries have been lost, or where native populations and habitats are actively being recovered, and need protection.
- In areas where losses may be most effectively mitigated by acquiring interests in real property, Bonneville shall acquire fish habitat equal to the quality of habitat lost through the acquisition of appropriate interests in real property at a minimum ratio of 1:1 mitigation to lost distance or area [see [guidance for resident fish settlements](#)].
- The Council will convene a work group of fish and wildlife agencies and tribes, and Bonneville, to develop a standardized methodology for habitat loss assessments to assist areas that currently do not have the capacity to complete this assessment and do not have a mitigation settlement agreement, and to ensure a consistent level of accuracy across the basin. This task force shall consider past efforts⁶ and will report to the Council quarterly on its progress toward developing a methodology.
- Once loss assessments are completed and adopted by the Council, the Council encourages Bonneville to negotiate settlement agreements, as described in Appendix K.
- Bonneville shall continue to support projects directed at other native freshwater species and the progression of these projects from a research and assessment phase into a restoration and monitoring phase
- Bonneville shall support efforts to address all limiting factors affecting resident fish. This might include efforts to eradicate and suppress non-native species, research on critical uncertainties, impacts from ongoing operation of the hydrosystem, and other impacts.
- Bonneville shall support evaluating the size of non-native fish populations to determine the potential effect of predation and implement a predator management program where appropriate in the Columbia Basin, for example Lake Roosevelt.

⁶ Consider building from the 2009 draft [inundation methodology](#) developed by the CBFWA Resident Fish Advisory Committee. [Additional draft technical documents](#).

- Bonneville, the Corps, and the Bureau shall restore passage for native resident fish where feasible, including at Albeni Falls Dam.

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to resident fish mitigation.

Links within the program

Strategies: [habitat](#), [ecosystem function](#), [non-native and invasive species](#), [climate change](#).

5. Sturgeon

Strategy

Implement actions that result in increased abundance and survival for Columbia River Basin green and white sturgeon, including habitat actions, dam operations and passage, hatchery considerations, monitoring populations, and research to improve understanding of how the development and operation of the Federal Columbia River Power System affect survival and growth of sturgeon.

Rationale

Columbia River Basin sturgeon distribution, abundance, and productivity are severely limited by habitat changes, particularly those associated with hydropower system construction and operation. Large areas of suitable sturgeon habitat remain throughout most of the historical range upstream from Bonneville Dam but use is currently limited by widespread passage limitations and natural recruitment problems that are the direct or indirect result of the development and operation of the Columbia River hydrosystem.

Food web issues, water quality (sedimentation, flow, temperature, and toxic contaminants), adequate prey for juveniles, and predators (sea lions) may have impacts on sturgeon. It is not fully understood how other factors exacerbated by the hydrosystem affect sturgeon. Research and monitoring will be key to determine impacts, population status, and mitigation actions necessary to rebuild sturgeon to sustainable numbers throughout the basin.

The Council recognizes and supports implementation efforts to restore, research and monitor white sturgeon populations in the basin consistent with the [2013 White Sturgeon Planning Framework](#) and the [Kootenai White Sturgeon Biological Opinion](#).

Principles

- A viable Columbia River Basin sturgeon mitigation program should include a combination of monitoring, research, habitat actions, dam operations and passage, adaptive management, natural production, potential use of hatcheries, collaboration, coordination, and evaluation.
- The Council supports opportunities to incorporate sturgeon-friendly features in existing fish ladders during future ladder designs and planned modification where consistent with sturgeon population goals and objectives.
- Continue to identify, protect and restore habitat areas and ecological functions that are associated with productive spawning, resting, rearing, and migrating sturgeon.
- Continue to support interim measures to avoid extirpation of unique sturgeon populations.
- Continue to research what hydrosystem effects limit growth and survival of sturgeon throughout the basin in an effort to better define mitigation needs.

General measures

Hydropower dam operations and fish passage

- The action agencies shall:
 - Seek opportunities to operate the FCRPS to provide flow consistent with the needs of productive sturgeon populations including increased spring and summer flows, reduced flow fluctuations during spawning season, and spill where feasible. Recruitment in many lower Columbia River impounded areas has been positively correlated with high annual discharge during April through July.
 - Operate the hydropower system in a manner that balances needs of anadromous fish, Columbia River Basin sturgeon, and other native fish species in a way that improves the abundance and productivity of sturgeon.
 - Study the effects on downstream passage of sturgeon with and without removable spillway weirs.
 - Estimate mortality by size for fish that pass over spillways and removable spillway weirs and those that pass downstream through turbines; if significant mortality is occurring, identify and evaluate the feasibility of mitigation measures.
 - In general, evaluate the importance of connectivity among sturgeon populations; assess whether the mainstem dams isolate sturgeon populations; and if so, evaluate the feasibility of mitigation.
 - Evaluate costs, benefits, and risks of passage improvements for sturgeon relative to other potential strategies.
 - Evaluate opportunities for non-volitional passage by taking advantage of fish trapped in dewatered draft tubes or fish ladders during maintenance.
 - Continue to develop, refine, and implement protocols to prevent sturgeon entrainment, dewatering, and mortality during planned maintenance activities at passage facilities.
 - Develop an operational protocol to block access by sturgeon to turbine draft tubes during turbine dewatering and start-up.


Mainstem habitat

- The action agencies, in coordination with the agencies and tribes, shall:
 - Investigate the use of site-specific habitat measures such as substrate enhancement and channel restoration as viable alternatives for improving natural recruitment in some areas.
 - Continue to identify, protect and restore habitat areas and ecological functions that are associated with productive spawning, resting, rearing, and migrating sturgeon.
 - Identify the specific aspects of hydrosystem operations, such as duration of fluctuations in water releases and of water levels, which affect natural spawning, reproduction, growth, and survival of larval and juvenile fishes, and overall recruitment success of sturgeon.
 - Conduct dredging operations in a manner minimizing operation-related mortality on sturgeon and their primary prey.

Predation – See [predator management](#) strategy

Research – See research section of the [adaptive management](#) strategy

Monitoring

- The action agencies, in coordination with the agencies and tribes, shall:
 - Monitor and evaluate white sturgeon restoration actions and population responses to environmental conditions consistent with the Columbia Basin White Sturgeon Planning Framework and the Lower Columbia River and Oregon Coast White Sturgeon Conservation Plan
 - Report on the [status of sturgeon](#)  throughout the basin on a regular basis
 - Assess the effects of climate change on Columbia River Basin sturgeon populations and develop adaptation strategies to address these impacts
 - Support fishery monitoring and management in combination with the suite of other restoration options to mitigate for lost productivity and contribute to population rebuilding efforts in areas where harvest is warranted but where natural recruitment is currently limited and the subpopulation does not represent a unique component of the historical diversity
 - Develop a sturgeon spawning and rearing habitat model in the basin to quantify habitat throughout the year in conjunction with FCRPS operations
 - Continue to evaluate project operations on sturgeon reproductive success in each of the pools behind FCRPS and Mid-Columbia River dams.

Hatchery

- The action agencies shall:
 - Continue to support the Kootenai Tribe Integrated Fish and Wildlife Program as interim measures to avoid extinction of endangered Kootenai white sturgeon
- The action agencies, in coordination with the agencies and tribes, shall:
 - Consider hatcheries for sturgeon as a mitigation strategy to supplement populations where natural recruitment is currently severely limited. When the strategy is implemented through the Council's step-review process for hatchery proposals, this strategy shall:
 - Be conservative and responsible in establishing protocols for source populations and numbers of hatchery fish released
 - Build on knowledge gained from ongoing hatchery efforts in other areas
 - Develop larval collection techniques for use in artificial propagation
 - Develop and implement improvements in rearing and release strategies
 - Utilize experimental hatchery releases and monitoring to assess ecological factors and population productivity limitations
 - Optimize hatchery production and practices consistent with monitoring natural production and environmental carrying capacity, which will

most effectively be identified using an experimentally adaptive approach

Upper-Columbia specific

- The action agencies, in coordination with the agencies and tribes, shall:
 - Conduct baseline population assessments to monitor hatchery and natural-origin sturgeon populations (size, abundance of age classes, age/length frequency, recruitment rate, mortality, distribution, and migration patterns, life history, habitat use, etc.); environmental factors limiting sturgeon abundance; and effectiveness of recovery measures in Lake Roosevelt from Grand Coulee Dam to the international border, including the Spokane arm of Lake Roosevelt
 - Implement measures based on knowledge gained through assessments, limiting factors workshops, Upper Columbia White Sturgeon Recovery Initiative plans and Lake Roosevelt sturgeon recovery plans
 - Continue interim hatchery production, including 100-percent PIT-tagging of hatchery sturgeon and 100-percent PIT-tagging and sonic tagging of broodstock collected in the upper Columbia River

Link to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to the history of sturgeon and their associated actions.

Link to other relevant program areas

Strategies: [mainstem hydrosystem flow and passage operations](#), [predator control](#), [water quality](#), [habitat](#), and [adaptive management](#).

6. Lamprey

Strategy

Implement actions that result in increased abundance and survival for lamprey, including habitat actions, dam operations and passage, monitoring populations, and research to improve understanding of how the development and operation of the Federal Columbia River Power System affect migration success, survival and growth of lamprey.

Rationale

Three species of lamprey are native to the Columbia River Basin, which historically supported productive populations: Pacific lamprey, river lamprey, and brook lamprey. Most of the information and effort in the basin for lamprey is focused on the anadromous Pacific lamprey.

Recent data indicate that distribution of lamprey has been reduced in many river drainages. Knowledge about the effects of hydropower dams on lamprey is improving, and the need for substantial additional effort addressing lamprey has become an emerging issue. Food web issues, water quality (flow, temperature, and toxic contaminants), passage, and predators all may have impacts on lamprey. It is not fully understood how other factors exacerbated by the hydropower system affect lamprey. Research and monitoring will be key to better understand impacts, population status and mitigation actions necessary to rebuild lamprey to self-sustaining numbers throughout the basin.

The Council recognizes and supports efforts to restore Pacific lamprey consistent with:

- The [Tribal Pacific Lamprey Restoration Plan](#) for the Columbia River Basin and
- The [Conservation Agreement for Pacific Lamprey](#)

Lamprey translocation efforts have been successful at increasing adult spawning activity, larval recruitment, and larval distribution and have provided important lamprey life history information. The Council recognizes progress in the development of a framework for Pacific lamprey supplementation research in the Columbia River Basin. Current and future translocation actions should be guided by the lessons learned from ongoing efforts.

Principles


- Juvenile and adult lamprey should be able to safely pass dams in the basin.
- The population size, distribution, and other limiting factors for lamprey related to the hydropower system need improved understanding
- Lamprey throughout their historic range should be self-sustaining and harvestable.

General measures

Hydropower system

- The action agencies shall:
 - Identify and seek opportunities to address effects of hydrosystem operations, including reservoir elevation fluctuations and an altered hydrograph on adult and juvenile lamprey
 - Monitor adult and juvenile lamprey passage at mainstem Columbia and Snake river and Willamette Basin hydropower dams to identify operations and lighting that delay, promote fall-back, obstruct, or kill migrating adult and juvenile lamprey (e.g. ramping rates, water elevation changes)
 - Establish an interim passage standard for adult Pacific lamprey.
 - Evaluate dam passage, assess passage efficiency and direct mortality, and other metrics relating to migratory success of lamprey above dams with poor passage
 - Install lamprey-friendly passage structures for adult and juvenile lamprey
 - Monitor and report predation on adult and juvenile lamprey during passage at mainstem dams.
 - Assess the impacts of dredging on lamprey around hydropower dams and navigation facilities.

Mainstem and tributary habitat

- The action agencies, in coordination with agencies and tribes, shall:
 - Implement instream habitat projects in a manner that minimizes mortality to lamprey by consulting the [Best Management Practices for Pacific Lamprey](#) 
 - Continue to identify, protect, and restore habitat areas and ecological functions, such as stream channel complexity and function, that are associated with productive spawning, resting, rearing, and migrating lamprey
 - Install appropriate and effective juvenile lamprey screening for tributary water diversions

Predation – See [predator management](#) strategy

Research – See research section of the [adaptive management](#) strategy

Monitoring

- The action agencies, in coordination with agencies and tribes, shall:
 - Develop a regional strategy for monitoring passage into tributaries to better understand differences in counts of adult lamprey between dams
 - Create a monitoring framework to report on the status of lamprey in the basin on a regular basis
 - Report passage counts at dams annually and map lamprey distribution every five years
 - Conduct occupancy and distribution surveys where lamprey abundance is unknown

- Develop tags suitable for adult and juvenile lamprey monitoring and evaluation needs

Propagation

- The action agencies, in coordination with the agencies and tribes, shall evaluate the potential role of lamprey propagation and translocation as a way to mitigate for lost lamprey production when passage and habitat improvements alone are insufficient to restore lamprey populations

Other

- The action agencies, in coordination with agencies and tribes, shall:
 - Complete a loss assessment for lamprey
 - Determine the potential effects of climate change on lamprey, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetics and performance
 - Consider vulnerability of lampreys to toxin accumulation in water and sediment and to chemical spills, and the exacerbation of such risks in the vicinity of mainstem hydroelectric dams
 - Include Pacific lamprey in the tables of measures associated with the Upper Willamette Conservation and Recovery Plan for Chinook Salmon in [Appendix O](#).

Links to subbasin plans

See the Council's [subbasin plans](#) for subbasin-level information pertaining to the history of lamprey and their associated actions.

Links to other relevant program areas

Strategies: [mainstem hydrosystem flow and passage operations](#), [predator management](#), [water quality](#), [habitat](#), [adaptive management](#)

7. Eulachon

Strategy

Increase understanding, protection, and required restoration of eulachon for the Columbia Basin, estuary, and ocean ecosystems. Better understand how the development and operation of the Federal Columbia River Power System (FCRPS) affects eulachon spawning, survival of eggs and larvae, and migration patterns.

Rationale

Also known as Pacific smelt or candlefish, the eulachon run of the lower Columbia River has historically been a very important forage fish and food source for the Indian tribes. While the reasons for eulachon decline are not fully understood, NOAA Fisheries has determined the FCRPS has affected the ecosystem in which eulachon have evolved. Eulachon are listed as a threatened species under the Endangered Species Act. NOAA Fisheries is developing a recovery plan for eulachon and has prepared a Federal Recovery Outline that includes recovery tasks as part of a preliminary recovery strategy. Eulachon measures in the program should be consistent with NOAA Fisheries' recovery plan for eulachon, once the recovery plan is developed.

Principles

- Eulachon have been impacted by changes to the lower mainstem and estuary caused by construction and operation of the hydropower system.
- There is a need to understand the importance of eulachon within the ecosystem and to initiate appropriate mitigation efforts.

General measures

- The Council supports measures to implement the two eulachon conservation recommendations found in the 2014 Supplemental FCRPS Biological Opinion.
- Upon completion of a recovery plan for eulachon, the Council will incorporate appropriate information regarding eulachon into the program and reflect the importance of this species and the need for protection and mitigation to the extent affected by the hydrosystem. The Council will consider developing the following:
 - Biological objectives for eulachon population characteristics and habitat needs
 - A high-level indicator for eulachon abundance
 - Monitoring and evaluation of the status of eulachon and evaluation of the characteristics affecting their survival
- If NOAA Fisheries identifies actions for eulachon restoration, the Council will consider those as potential measures that may be implemented through proposed projects after science review and a Council recommendation to Bonneville.
- Mainstem and hydrograph:

- The Council, in collaboration with Bonneville, the Corps, NOAA Fisheries, and agencies and tribes, will help organize and facilitate a science/policy forum in 2015 to address the biological requirements of eulachon, combined with related inquiries into the relationship between flow, current hydropower dam operations, and the biological requirements of lamprey and sturgeon. The goal would be to report to the Council, NOAA Fisheries, and interested others on the state of the science, the reasonable next steps in the assessment process, and a recommendation for how to incorporate those steps into the recovery plan.
- Monitor and report eulachon abundance at Bonneville Dam.
- Study the role of eulachon as an alternative prey for sea lions.
- Ocean and estuary:
 - Monitor and evaluate the importance of the tidal freshwater, estuary, plume and nearshore ocean environment to the recovery of eulachon in the Columbia River Basin.

8. Public engagement

Strategy

On an ongoing basis, the Council will educate and involve Northwest citizens to develop, implement, and improve understanding of the fish and wildlife program and the Council, and to promote successful ecosystem management.

Rationale

The Act requires the Council to provide for the participation and consultation of the Pacific Northwest states; local governments; electricity consumers; customers of Bonneville; users of the Columbia River System including federal and state fish and wildlife agencies and appropriate Indian tribes; and the public in formulating regional power policies that are reflected in the Council's Northwest Power Plan and the fish and wildlife program, which is part of the power plan. Public involvement and understanding will ensure that management decisions are more sustainable.

Principles

The public outreach and involvement strategy, actions, and anticipated outcomes are based on the following principles articulated by the Council's Independent Scientific Advisory Board [see the ISAB's [Review of the 2009 Columbia River Basin Fish and Wildlife Program](#)]:

- Actively engage the general public, landowners, county planners, traditional stakeholders, and other groups early in the program-planning process.
- Strengthen outreach to citizens, landowners, and other groups with diverse and non-traditional interests to engage in the implementation of the resulting program.
- Enhance the use of social media and other emerging social connectivity tools and measure the effectiveness of this social engagement as part of an evaluation of program success within the limits of the Council's Public Affairs budget and personnel.
- Create incentives for the general public to engage through narratives and stories linking personal well-being and personal commitment to landscapes and emphasizing benefits that come from ecological goods and services beyond simple numbers of fish.
- Develop incentives to support restoration and conservation (i.e., provide tangible support for efforts that help achieve the program vision).
- Support and champion organizations that effectively support productive partnerships among the relevant sciences, between science, management, and the public, and across social and ecological boundaries, facilitating and supporting non-traditional organizations and approaches that can bring new capacity and vision to landscape and ecosystem approaches.

General measures

- The Council will inform and involve the public including elected officials through print, electronic, and social media; documents posted on the Council website and made available through public websites and libraries; updates of

subbasin dashboards on the Council's website; comment periods on draft fish and wildlife programs (and reports on these hearings and comments); general and specific comment periods with our subbasin partners at Council meetings, including leveraging other opportunities in addition to regular Council meetings.

- The Council, in partnership with Bonneville and other interested parties, will publicly recognize and acknowledge entities that provide good examples of productive partnerships across social and ecological boundaries.
- The Council will monitor the success of its outreach and involvement efforts.

Link to subbasin plans

See the Council's [subbasin plans](#) for information pertaining to program-funded work at a subbasin level and the local planning groups.

Part Four: Adaptive Management

The Council is committed to an [adaptive management](#) approach that uses research and monitoring data to understand, at multiple scales, how program projects and measures are performing, and to assess the status of focal species and their habitat. This information is evaluated to determine if projects and measures are having the intended measurable benefits to fish, wildlife and their habitat, within the context of their status and trend, which are mitigated, enhanced and protected through the program. This information enables the Council to determine whether or not progress is being made toward program goals and objectives.

Rationale

The Council has recognized the need to apply an adaptive management approach since its 1982 Program. Applying an adaptive management approach to program implementation provides a systematic process to learn and improve the strategies and measures used to mitigate, protect and enhance for the impacts of the hydrosystem on the Columbia River Basin's fish, wildlife, and their habitat.

Monitoring, research, data management, evaluation and reporting are essential tools of adaptive management for assessing successes and failures of measures that implement the program. Monitoring and evaluation expenditures comprise a large proportion of the direct program budget -- 27.4 percent in Fiscal Year 2013, for example -- yet significant gaps in knowledge exist. Addressing these knowledge gaps will assist in adapting the program and its implementation.

The application of adaptive management at the program scale continues to be improved. Ongoing efforts include (1) the Council's work on refining its goals and objectives, (2) reporting on the program's approved high-level indicator categories and [fish and wildlife indicators](#) and tracking [status](#) of fish and wildlife resources; and (3) regional efforts to improve data collection and sharing. The Council supports collaborative efforts to advance development of reporting indicators. This on-going effort to improve program goals, objectives, and indicators is critical to better understand the successes or failures of measures that implement the program, and thus affect progress toward program goals and its vision.

Monitoring Principles

- Monitoring of program-funded projects and measures ensures they are implemented properly, comply with established standards, perform for the intended duration, and are completed as planned.
- Status and trend monitoring of fish, wildlife, and habitat with particular attention to tracking quantitative biological objectives, reporting on indicators, and informing statistical models such as life-cycle models, informs baseline information needed to track progress toward program goals and objectives

- Project level monitoring should inform high-level indicators; however, not all monitoring data will necessarily be useful at higher levels.
- The likelihood of success of a measure should determine the appropriate level of monitoring required for each measure proposed. This should be considered by the project sponsor when submitting a proposal for review, and evaluated by the ISRP and the Council when reviewing a project for its consistency with the program. This assessment should be guided by the [risk uncertainty matrix](#) that considers the risk and uncertainty associated with a measure.

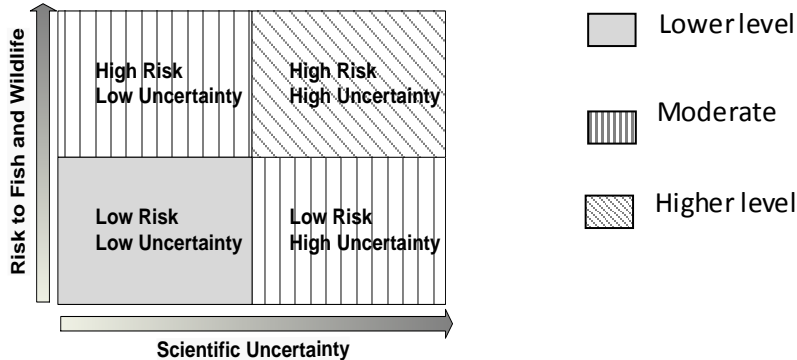


Figure 5. Risk-uncertainty matrix guiding level of monitoring efforts for a given action (hatchery, hydrosystem, habitat), and biological status. This guidance also applies to effectiveness assessments and research.

- Project sponsors must report the level of accuracy and precision of their data. The Council will accept a reasonable level of confidence, guided by the risk uncertainty matrix.
- Monitoring efforts should be coordinated geographically and topically.
- Monitoring data should be collected in a way that allows results to be applicable at multiple scales and provide results on timeframes that can inform comprehensive evaluations needed for decision-making processes.

General measures

- The ISRP will use the [risk uncertainty matrix](#) to assess whether the level of monitoring is appropriate for the proposed project and measures.
- Bonneville will ensure that all monitoring projects report the accuracy and precision of their data.
- Bonneville should continue to support and require the use of [Monitoring Resources](#), which is sponsored by the Pacific Northwest Aquatic Monitoring Partnership, to share information about how data are collected.
- Consistent with the [goals and objectives section](#) of this program, Bonneville should report annually on the number of juvenile fish released each year; the number of adults that contribute to harvest, are used for broodstock, and are present on the spawning grounds for all hatchery programs that receive Bonneville funding. Bonneville also should provide support to ensure that all managers have the capacity to collect this data and should support regional

processes that standardize the data, facilitate reporting, and make this data publicly accessible.

- Bonneville should require project sponsors to ensure data are secured in appropriate regional data bases if those data contribute to program and regional reporting needs.
- Bonneville should identify preferred methods to guide future data collection and report back to the Council annually. The Council will request the ISAB or ISRP to review the methods identified by Bonneville, and based on its review, the Council will adopt methods into the program.
- Funding entities such as Bonneville, NOAA Fisheries, and Oregon Watershed Enhancement Board should align their implementation metrics to share information about what, and where, actions are funded in the basin. This will improve their ability to work together to achieve cost savings.
- Bonneville and its partners should continue to explore whether a programmatic approach for monitoring would be more cost-effective and efficient.
- For projects assessing species and habitat conditions in intensively monitored watersheds, Bonneville will require the project sponsors to provide information on the condition of these watersheds at least every three years in a format that can be used by the Council.

Effectiveness

Principles

- Effectiveness projects will address hypotheses relevant to management decisions.
- For action effectiveness, assess whether types of actions implemented by projects are resulting in the intended biological benefit
- Effectiveness will be determined through both monitoring and research to reach a scientifically defensible conclusion about the success of an action.

General measure

- Bonneville and its partners should continue to transform the effort to evaluate action effectiveness from monitoring individual projects into a cost-effective, independent third-party, standardized, and statistically valid method for habitat projects and water transactions projects.

Research

Principles

- Research seeks to resolve critical uncertainties identified in the Council's research plan and assesses new methods and technologies to improve the program.
- All research projects must be consistent with the scientific method and appear likely to produce an outcome within a designated time frame. The research plan should prioritize critical uncertainties for the program and guide funding recommendations. The following criteria are to be used when prioritizing research uncertainties:

- Program relevance — address hypotheses relevant to management decisions, an underlying assumption of the program, and include expected effectiveness outcomes
- Legal relevance — address the program’s mandate to mitigate, protect, and enhance fish and wildlife affected by the hydrosystem
- Broad applicability —result is likely to have widespread application
- Time required — likely to generate conclusions in a reasonable amount of time that is generally considered to be three to five years
- Statistical validity—yields statistically reliable results
- Focal species —activities directed to focal species will be ranked higher
- Cost – cost is commensurate with the value of the research. In the case of competing proposals, the least costly research that intends to produce the same information will receive priority. The cost of the proposal to the hydropower system may also be considered.
- Research projects will address hypotheses relevant to management decisions, with the results published in peer-reviewed scientific journals.
- Research efforts should consider potential impacts on and effects from other activities occurring in the same geographical area as the proposed research activity.

General measures

- The Council will, with federal and state fish and wildlife agencies and tribes review and update its research plan every three years beginning in 2014. The review will begin with an update of how previous research funds were allocated to particular categories and critical uncertainties. The Independent Scientific Review Panel and the Independent Scientific Advisory Board will assist with updating the critical uncertainties, taking into account evolving topics and reporting on the results of past research. Each step of this update will include opportunities for public input. This process will give consideration to [critical uncertainties](#) submitted during the program amendment process.
- To assist with updating its research plan, the Council will co-sponsor Columbia River science/policy conferences to discuss scientific and technical developments in key policy areas. The Council will work with the Independent Scientific Advisory Board and others to develop the agendas.
- Bonneville should ensure that all contracts for research projects, including those covered by funding agreements, identify an end date.
- Bonneville will report annually to the Council on the publications resulting from program research.
- The Council will review the accomplishments of intensively monitored watersheds and the Integrated Status and Effectiveness Monitoring Project to ensure that it is cost-effective and produces useful results.

Data management

Principles

- Public accessibility, search-ability, and usability of data are important. All monitoring and research data collected under the program must be readily

accessible in regionally consistent formats to all interested parties in a timely manner, and these should be preserved beyond the longevity of a project.

- Program reporting relies on coordinated data sharing that is facilitated using regional data systems that provide access to data from federal and state agencies and tribes, and other data gathering entities in the Columbia Basin.
- Refinement of coordinated data management systems should be guided by program evaluation and reporting needs.
- Collaboration among agencies, tribes, and other monitoring entities in the Basin is essential to prioritize regional data coordination efforts to support program indicators and objectives, and this prioritization should be informed by the goals and objectives identification and refinement process and program guidance.
- The region should work collaboratively through established forums to continue to refine metrics, methods, and indicators which can be used consistently to evaluate and report on program progress, focal species, and their habitats.

General measures

- Bonneville should ensure that data associated with broad categories of information (fish abundance, productivity, genetic diversity, geographic distribution, habitat conditions) are identified and accessible from a single, centralized website. Data users should be able to find references, data descriptions, and links to all the data collected in the program on fish abundance in such a website.
- Bonneville should ensure that all information about anadromous fish is summarized by specific life-cycle stages and made accessible from a single gateway location.
- Bonneville should contract for complete data products (e.g., annual population estimates for adult and juvenile spring Chinook in the Entiat) and not only collaborative processes and preliminary data collection (e.g., redd counts or weir counts of fish). And when Bonneville pays for the development of standards or protocols the contracts should include a viable strategy for adoption.

Reporting Principles

- Information acquired under the program will be organized, summarized, and reported to the public.
- Subbasin dashboards report on species-specific trends in the subbasin, which are a good sub-metric for much broader HLI.

General measures

- Bonneville should require all research, monitoring, and evaluation projects, including hatchery programs, to report annually, providing an electronic summary of their results and interim findings, as well as the benefits to fish and wildlife. A high priority is to separate research reports from monitoring

reports. The former should address hypotheses and critical uncertainties and the latter should provide important data about implementation, status, and trends. As appropriate, action effectiveness should be reported as part of research and monitoring reports.

- Bonneville should continue working with the Council to implement a concise, useful template for annual reports for research and monitoring projects that can replace other more cumbersome, more costly, and less useful reports for individual projects. The Council will continue to work with Bonneville and the ISRP to identify and assemble the information needed to produce an annual summary of results for Council review.
- The Council, with the assistance of agencies, tribes and others, will periodically review and update the high-level indicators report to communicate accomplishments to Congress, the region's governors, legislators, and citizens of the Northwest. When the Council completes its work on biological objectives, it will update its high-level indicators to ensure they are consistent with these objectives.
- The Council, with the assistance of agencies, tribes and others, will maintain the program's dashboard and the HLI website report, and also will produce other reports as appropriate, such as one that tracks annual anadromous fish forecasts and actual run sizes. The Council expects others to provide data and reports to the Council on a regular basis and make them available to the public [see [Reporting Appendix L](#) for a list of Council-requested reports]. This will provide easy access for the public and allow the Council to review the accuracy of the pre-season run-size estimates.

Evaluation Principles

- Adapting to new information is an intrinsic part of the program. The research, monitoring, and evaluation process will ensure that this happens.

General measures

- Working with the region, the Council will develop an evaluation process that considers new information to verify or adjust assumptions, hypotheses, goals, biological objectives, strategies, measures, and indicators. This adaptive management approach will ensure program accountability.
- The Council, with input from the ISAB and ISRP, will request evaluation of data gathered over several years, with the evaluation approach overseen by those that gathered the data, to inform decisions and advance understanding supported by these data.
- The Council supports continued research and life cycle modeling to inform decision makers of the biological benefits they could expect from implementing or synchronizing different suites of measures across the life cycle.
- Bonneville, agencies, tribes, and other entities receiving Bonneville funding will assist the Council in compiling data in the appropriate format to inform the reports described in the reporting section.

Background

The Risk-Uncertainty Matrix

The risk uncertainty matrix should be used to assess whether the level of effort is appropriate for the proposed project and measures. This assessment should be completed by both the project sponsor when submitting a proposal for review and by the Independent Scientific Review Panel and the Council when reviewing a project for its consistency with the program. This assessment should be guided by the risk uncertainty matrix, which states that the level of effort used to gather data should be commensurate with the risk and uncertainty associated with a given species, habitat, and action (Figure 6). In this approach the intensity of monitoring associated with an action, environmental condition, or population characteristic align with the perceived risk⁷ of the activity to fish, wildlife and habitat and the level of certainty⁸ associated with the impact of the actions, environmental conditions, and population characteristics. This can also serve to guide the level of effort for effectiveness assessments and research. The risk-uncertainty matrix does not apply to baseline status and trend monitoring.

⁷ Risk for the purpose of the risk-uncertainty matrix is defined as the likelihood that an unintended, undesirable, outcome may occur. For *status and trend* monitoring of species and their habitat, an increase in the perceived risk of having an undesirable change in the biological status with decreased certainty of a biological outcome results in a higher level of monitoring. Actions associated as being riskier and less certain in their outcome are assigned a higher level of *effectiveness assessments and research* (more intense or longer in duration).

⁸ The uncertainty level pertains to the certainty of outcome associated with a given action or a biological status based on the scientific support as described in Council Document 2000-12 with number (1) being the highest level of certainty (thoroughly established, generally accepted, good peer-reviewed empirical evidence in its favor); (2) having a strong weight of evidence in support but not fully conclusive; (3) having theoretical support with some evidence from experiments or observations; (4) being speculative, little empirical support; and, (5) being misleading or demonstrably wrong, based on good evidence to the contrary.

Part Five: Subbasin Plans

In 2004-05 and 2010-11, the Council adopted into the program 59 subbasin management plans developed by subbasin planning entities consisting of state and federal fish and wildlife agencies and tribes (agencies and tribes) and other regional and local organizations. The key elements of a subbasin plan are a 10-15 year management plan, an assessment of the subbasin's historical and existing conditions, and an inventory of past accomplishments. Each management plan contains a vision and biological objectives for that subbasin, and identifies specific actions necessary to protect, mitigate, and enhance fish and wildlife in that subbasin. The subbasin plans thus reflect local policies and priorities while remaining consistent with the basinwide vision, biological objectives, and strategies. The [subbasin plans](#) remain a fundamental part of the program.

As core elements of the Council's fish and wildlife program, subbasin plans provide historical perspective for the project review process for Bonneville Power Administration (Bonneville) funding, a process that involves the fish and wildlife agencies and tribes, the Independent Scientific Review Panel (ISRP) and the Council. However, where other planning efforts have superseded the subbasin plans, those plans may be used to inform project review and funding. Examples of such plans are the Endangered Species Act (ESA) recovery plans or state-specific management plans. The Council expects that projects implemented through the program will be consistent with the goals, limiting factors, and actions identified in the subbasin plans or other relevant planning documents.

The ISRP uses subbasin plans to determine if projects support, and are consistent with, the plans and other program elements. Subbasin plans also provide an opportunity to integrate and coordinate projects and programs funded by entities other than Bonneville, including Canadian entities in transboundary areas of subbasins.

In the 10 years since subbasin management plans were adopted, continued restoration, recovery, implementation, and planning work has occurred. The Council recognizes that physical conditions and priorities may have changed, such as in areas where dams have been removed or where substantial restoration work has occurred. Subbasin plans provided the foundation for many ESA recovery plans and state management plans. For the Council, subbasin plans remain the primary planning documents to guide implementation; however, in some areas of the basin, these other plans are more current than subbasin plans.

Because subbasin plans are integral to the fish and wildlife program, the Council will identify subbasin plans most in need of an update. The primary purpose of an update will be to incorporate important aspects of the further planning work that have occurred since the first adoption of the subbasin plans into the program, including consideration of relevant portions of recovery plans, additional or

revised population or environmental objectives, summary tables, and implementation action plans.

Updated management plans will undergo scientific review and follow all [guidelines](#) set forth by the Council. Along with current related plans that can be found on the [subbasin dashboards](#), existing management plans will continue to be used to guide project review and funding recommendations. If no updates are submitted, the Council will continue to use the existing subbasin management plans, and other related plans, to implement its program.

The Council's [subbasin dashboards](#) are a central platform for gathering, retaining, tracking, and reporting critical elements of the subbasin plans, such as objectives, measures, limiting factors, and focal species information. Also found on the subbasin dashboards are links to the latest tribal, state and federal planning efforts. The subbasin dashboards will be kept up to date based on current subbasin and recovery plans and input from regional fish and wildlife agencies and tribes.

Part Six: How the Program is Implemented

I. Program measures

The Council's fish and wildlife program consists of a number of different types of "measures." The Northwest Power Act (and thus the program, too) uses the term "measures" [see Sections [4\(h\)\(2\)](#), [\(5\)](#), and [\(6\)](#)] in a way that means the actions or things to be done to benefit fish and wildlife affected by the Columbia River hydroelectric facilities.

Basinwide measures

Some of the program measures are broad strategies that apply basinwide or program-wide. Examples include the ecosystem function and hatchery strategies, with broad overarching principles and strategies to guide the development and implementation of more specific measures across the program to boost natural spawning and allow for hatcheries. These broad program-wide or basinwide strategies are found primarily in Part Three, Section IV (strategies).

Specific measures

More specific measures are also found in the program. These are found in various strategies organized by topic and species in Part Three, Section IV (strategies) and in Part Four – Subbasin Plans.

Mainstem

Specific measures for implementation in the mainstem Columbia and Snake rivers are found in the Mainstem Hydrosystem Flow and Passage Operations strategy in Section IV.

The details of most of these measures are found in other documents, including the mainstem actions in five biological opinions, or Columbia Basin Fish Accords that have been incorporated by reference at the appropriate places in the program. Many of these actions are built on the mainstem protection and mitigation foundations developed in the Council's program over the past 30+ years, beginning with the water management and passage measures in the original 1982 Program. The Council recognizes these actions as measures that the Bonneville Power Administration (Bonneville) and the other federal agencies have committed to fund and implement under Sections [4\(h\)\(10\)\(A\)](#) and [4\(h\)\(11\)](#) of the Act, even as these measures also address needs under other federal laws as well, such as the Endangered Species Act (ESA). Note that the Council is *not* adopting these biological opinions into the program in their entirety, and the Council expresses no opinion as to their sufficiency for satisfying the requirements of other laws, such as the ESA. What they are for the program are a catalog of actions that will be implemented as part of the program's specific measures, along with the other specific measures directly described in the program.

Subbasins

Specific measures can be found in the management plan sections of the 59 subbasin plans adopted into the program in 2004-05 and 2010-11. These are specific to the relevant subbasin, estuary or mainstem reach, but are often general, long-term strategies rather than specific near-term actions. Examples include the habitat and production strategies for the Yakima, Umatilla, and Clearwater tributaries in the respective Yakima, Umatilla, and Clearwater subbasin plans; the habitat strategies for the estuary in the Columbia River Estuary subbasin plan; or the habitat and production strategies in the subbasins in the Grand Coulee/Lake Roosevelt area collected into the Intermountain plan. The [subbasin plans](#) are referenced in Part Four of the program.

The Council also received recommendations containing extensive lists of specific action measures for implementation in the next 5-10 years in these tributary subbasins, specific mainstem reaches, and the estuary. These specific measures cover an extensive array of habitat, production, and monitoring, evaluation and research activities. A few examples include specific habitat actions across the program's dozens of tributary subbasins and the estuary, the ongoing production programs in the Hood, Yakima, Klickitat, Umatilla, Walla Walla, and Clearwater subbasins, and the estuary habitat actions [see the 2014 and 2009 measures in [Appendix O](#)].

As with the specific mainstem measures, some of these measures are distinct to the program; others are collected in other plans and programs, including biological opinions, Columbia Basin Fish Accords, and ESA and watershed recovery plans. The Council has recognized that the actions in these other plans and documents are built on the offsite-mitigation planning and implementation foundations developed in the Council's program over the past 30+ years and are consistent with the subbasin plans and broader elements of the program. Thus the Council includes the actions as program measures under Section [4\(h\)](#) of the Northwest Power Act, even as they may also address needs under other laws as well. The Council has not adopted these other plans and documents in their entirety into the program.

These specific action measures are referenced in the Estuary and Subbasin sections in Part Three and Part Four. The measures are associated with specific subbasins (or mainstem reach or the estuary). [Subbasin dashboards](#) list each specific measure and, when possible, link to the relevant limiting factor(s) from the subbasin plan assessments.

Many of these specific measures are already being implemented. Some are part of ongoing projects that have been implemented for years. Recent implementation commitments have occurred through multi-year commitments made by the federal agencies in the biological opinions and Columbia Basin Fish Accords and through recent project review processes at the end of which the Council has recommended sets of projects (both from the biological opinions and

accords and from outside of those commitments) for multi-year funding and implementation by Bonneville and the other federal agencies. Other measures have not yet been implemented, and stand as a pool of possible measures for implementation in future years.

Even so, the program is not a vehicle to guarantee funding for a particular project, entity, or individual. The fact that a specific measure is included in the program, even as referenced in a biological opinion or accord, does not by itself constitute a funding obligation for the associated project without further definition for implementation and review under Section [4\(h\)\(10\)\(D\)](#) of the Act. Final project funding recommendations for projects in any particular year or multi-year period still depend on the outcome of independent scientific review, a program consistency review, public comment, and a Council recommendation to Bonneville. This process converts the priority measures in the program into detailed project recommendations for implementation that provide specific guidance for Bonneville to ensure that its actions are consistent with the program. The program's implementation provisions describe the conditions under which all such measures will be implemented, including:

- All measures must be developed into detailed project proposals subject to review under Section [4\(h\)\(10\)\(D\)](#) of the Act. All projects at some point receive an independent scientific review of proposed work and, if ongoing, of past performance. Projects and the scientific review report are subject to public review. The Council then develops funding recommendations for Bonneville based on the proposed projects, the program, the scientific review and the public review. The Council will review the project proposals carefully to ensure consistency with the program's basinwide, mainstem, estuary, and subbasin plans and provisions, and to ensure that projects show demonstrable results for the program measures to receive continued support.
- Those responsible for implementing these projects must regularly report the results of implementation. Reporting must be sufficient for the purpose of evaluating the success of the projects, facilitating the science and performance review, and contributing appropriately to the program's broader monitoring and evaluation framework and reporting of program results. Reporting requirements must be included in the Bonneville contracts, and must include reporting in terms of performance metrics required by the Council.
- Implementation of these measures must allow for an ongoing adaptive management approach and for future program amendment processes in which measures are modified or discontinued if not performing or no longer identified as a priority.
- The Council recognizes that Bonneville and the other federal agencies have already made funding commitments to certain measures. Those commitments must not come at the expense of sufficient funding for other program priorities.

Tracking measures

It is important to track progress of measures that implement the program to understand whether they are having the desired outcomes. To help track progress of program implementation:

- Bonneville, the Corps, and the Bureau, in collaboration with federal and state agencies and tribes, shall report annually to the Council and the region on the implementation of program measures.

II. Investment strategy

Strategy

Assure funding to identified program priorities to maximize the biological response resulting from ratepayer and cost-shared investments.

Rationale

The Council's program contains hundreds of measures at the basinwide, mainstem and subbasin levels. Program measures are funded and implemented not just by Bonneville, but also through programs under the authority of the U.S. Army Corps of Engineers (the Corps), the Bureau of Reclamation (the Bureau) and the Federal Energy Regulatory Commission as its licensed non-federal hydroproject operators.

Bonneville has chosen to implement many of its Northwest Power Act requirements through a series of long-term commitments that it believes help address its legal obligations through at least 2018 and beyond in some cases. Bonneville continues to prioritize ESA responsibilities in its investment plan, although it also funds elements of the Council's program that address the other, non-listed fish and wildlife affected by the hydrosystem.

The program represents a substantial investment by the ratepayers of the Northwest and the nation's citizens. For example, over the last three decades Bonneville and the other program implementers have made substantial investments in a wide variety of physical structures and land acquisitions to benefit fish and wildlife. There is a growing need throughout the Columbia River Basin to protect or upgrade these investments as facilities age or become obsolete, structural standards change, and extreme-event damages accumulate.

The Council recognizes that ratepayer funding requires some basic controls and that there is not unlimited funding to address every need for fish and wildlife affected by the development of the federal hydrosystem, all at once. At the same time, the Council received recommendations to continue the ongoing work under the program along with recommendations for new or expanded work. Bonneville's existing budget commitments limit its flexibility for funding new work, constrain expansion of ongoing work, may leave unfunded some of the state and federal fish and wildlife agencies' and tribes' priorities, and provide for only limited capacity for maintenance of past investments.

To assure thoughtful use of Bonneville funding to maximize benefits to fish and wildlife, the Council has identified the following principles and priorities to guide the funding and implementation of program priorities by Bonneville, the Corps, the Bureau, project sponsors, and their partners.

Principles

- Bonneville will fulfill its commitment to meet all of its fish and wildlife obligations.

- Program funding levels should take into account the level of impact caused by the federally operated hydropower system and the off-site protection and mitigation provisions of the Northwest Power Act enabling program investments in related spawning grounds and habitat.
- Wildlife mitigation should emphasize addressing areas of the basin with the highest proportion of unmitigated losses.
- The Council will continue to evaluate the distribution of funding to provide fair and adequate treatment across the program. Meanwhile, the Council maintains the current funding allocation for anadromous fish (70 percent), resident fish (15 percent), and wildlife (15 percent).
- Hydropower facility site-specific invasive species prevention actions and toxics reduction activities are ongoing maintenance issues. Funding for these efforts should be derived primarily from the Corps and the Bureau operations and maintenance budgets rather than from Bonneville's fish and wildlife budget to implement the program.
- The Council believes that final determination of a yearly direct program budget should occur no later than one year before the relevant projects are to be funded. Generally these projects' budgets are difficult to forecast more than three years in advance of initiation; so the budget is expected to be a rolling three-year spending plan, developed by Bonneville, that will have a current spending estimate replaced by a new three-year estimate every year.
- Priority work funded through the Columbia River Fish Mitigation Program (CRFM) should not go unfunded because of competing priorities between districts of the Corps (e.g., between the Columbia/Snake hydropower projects and the Willamette Basin projects). The Council urges the action agencies to meet their Willamette and FCRPS Biological Opinion implementation and mitigation obligations.
- Provide for timely ongoing operation and maintenance costs associated with existing investments. Some existing projects are aging and need repair. Long term maintenance for existing projects including fish screens, hatchery structures, wildlife acquisitions, and other long term needs must be supported to meet project and program objectives.
- Bonneville and the action agencies should allocate and assure adequate funding for the application and recovery or detection of PIT tags, coded wire tags, acoustic and radio tags, and genetic tags.
- Bonneville will continue to provide adequate support for terminal fisheries in the estuary and other basin locations.

Emerging program priorities

The Northwest Power Act establishes Bonneville's obligation to protect and mitigate for fish and wildlife impacts from the development and operation of the hydropower system. The Council recognizes its obligation, in turn, to construct a program that guides Bonneville's protection and mitigation efforts. Work necessary to satisfy Bonneville's mitigation obligation must be sized appropriately during Bonneville's rate cases and as it projects its capital and expenditure budgets, so as to provide equitable treatment to high-priority fish and

wildlife projects, regardless of whether or not they are identified in a biological opinion or in an accord, while also accommodating yearly budget limitations.

Many of the program's current measures represent ongoing activities that already have multi-year funding and implementation commitments from Bonneville and the other federal agencies for the foreseeable future. These ongoing activities and existing program areas represent a set of priorities from earlier programs and largely continue into the new program.

At the same time, the Council received recommendations for many new measures for inclusion into the 2014 Program. All measures are subject to the same legal obligation on the part of the federal agencies with responsibilities toward the Council's program under the Northwest Power Act. Some of the new measures recommended for inclusion in the 2014 Program expand existing work in new or additional directions; others represent new directions for the program.

The Council is providing the following guidance to Bonneville, the other federal agencies, and the region in general as to which of these new measures are emerging priorities for implementation in the next five years. During the course of the next five years, the Council anticipates that Bonneville will take the necessary steps to integrate these priorities into the program and will report annually to the Council on its progress. The Council may adjust the following ordered program priorities:

1. Provide for funding [long-term maintenance](#) of the assets that have been created by prior program investments
2. Implement [adaptive management](#) (including prioritized research on critical uncertainties) throughout the program by assessing the effectiveness of ongoing projects, developing program objectives when appropriate and taking into account the effects of [climate change](#)
3. Preserve program effectiveness by supporting: (1) expanded management of [predators](#); (2) mapping and determining hotspots for [toxic contaminants](#); and (3) aggressively addressing [non-native and invasive species](#)
4. Investigate [blocked area mitigation](#) options through reintroduction, passage and habitat improvement, and implement if warranted
5. Implement additional [sturgeon](#) and [lamprey](#) measures (passage and research)
6. Update the [subbasin plans](#) most in need of updates
7. Continue efforts to [improve floodplain habitats](#)

Bonneville funding for emerging program priorities

Bonneville should fund any new fish and wildlife obligations from identifying savings within the current program and as necessary, from additional expenditures. Savings from the current program should not compromise productive projects that are addressing needs identified in this program. For example, additional funding can be obtained when projects complete their goals,

such as a research project, or when a project is no longer reporting useful results. Funding should also be sought in general overhead budgets including Bonneville's overhead for its Fish and Wildlife Division. To the extent that targeted savings are insufficient to meet Bonneville's financial obligations in this program, Bonneville should consider increasing expenditures. Prior to every rate case Bonneville should report to the Council how it plans to budget for implementation of the fish and wildlife program. [see [cost-effectiveness recommendations](#) from the IEAB].

III. Implementation procedures

At any point in time, this program is implemented through the collective work of hundreds of projects, funded by ratepayers. For the program to be effective and accountable, reporting and tracking processes are necessary to ensure scientific soundness of projects, track program results to guide future decision making, coordinate with other projects and programs, and to prioritize new work as funds become available. The Council will rely on the procedures in this section to coordinate project review and implementation.

The procedures for implementing this program will ensure that planning results in on-the-ground actions and that those actions be reported to guide future decisions. The Council will use the procedures in this section to integrate Bonneville funding for this program with ESA requirements and the collaborating programs of the states, tribes, and federal and local governments. This section incorporates advances made in recent years to improve project selection and management practices for fiscal accountability and improved reporting.

A. Project review process

The 1996 amendments to the Northwest Power Act, which added Section [4\(h\)\(10\)\(D\)](#), directed the Council to oversee, with the assistance of the Independent Scientific Review Panel, a process to review projects proposed for funding by Bonneville, and to appoint additional peer review groups. The panel comprises 11 independent scientists. The ISRP will review proposed projects and make recommendations to the Council as to whether these proposals are based on sound scientific principles, benefit fish and wildlife, have a clearly defined objective and outcome with provisions for monitoring and evaluation of results, and are consistent with the priorities in the program [see the [risk uncertainty matrix](#)]. As part of this review, the ISRP considers the projects' prior-year results, and accomplishments. The Council allows for and encourages public review and comment on the ISRP's recommendations. The Council will then make final recommendations to Bonneville on projects to be funded. In doing so, the Council fully considers the ISRP's recommendations, explains in writing its reasons for not accepting ISRP recommendations, considers the impact of ocean conditions on fish and wildlife populations, and determines whether the projects employ [cost-effective measures](#) to achieve program objectives. Section [4\(h\)\(6\)\(C\)](#) of the Northwest Power Act requires the Council to adopt program measures that "utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost."

The project review process is a required and critical component to implementing Bonneville's portion of the Council's fish and wildlife program for anadromous fish, resident fish, and wildlife, including subbasin plans and other planning documents associated with the program. The reports and recommendations from project reviews increase transparency and accountability of project deliverables, durations, reporting requirements, performance metrics, and expectations. Whether the project is new or ongoing, project review results in a stronger project to benefit fish and wildlife and the region in most cases.

1. Elements of project review

- Recognize differences in project types; for example: projects with long-term funding commitments; shorter-term implementation projects (e.g. habitat); and core program-support projects that focus on basinwide data and reporting. Each type may be set on different, but integrated, funding and review paths.
- The Council will work with Bonneville and project sponsors to develop appropriate end dates or review schedules for currently funded projects, based on milestones and deliverables.
- Allow the flexibility to incorporate Bonneville's ESA requirements and relevant agreements including those identified in the biological opinions and accords as consistent with the Northwest Power Act, section [4\(h\)\(10\)\(D\)](#)
- Utilize existing subregional organizations and their frameworks and annual science workshops to assist with project reviews

- Streamline review process as appropriate and communicate timelines, processes, and expectations as they are developed. The Council will prioritize reviews based on prior findings and oversight including follow through on projects with qualified or conditional Council recommendations. Work with interested parties in the basin to assist in the development of review processes.
- For the program areas that do not yet carry Bonneville funding commitments, the Council will work with Bonneville and the sponsors to develop targeted solicitations for new work.
- Solicitations for new work should take into account the priorities described in the investment strategy.
- To properly scale monitoring and evaluation efforts, the Council expects project sponsors and the ISRP to use the [risk uncertainty matrix](#).

2. Step review process

As one element of project review, the Council developed a [step review process](#) for review of major investments, including new fish hatchery programs and facilities. Step review allows for review of scientific soundness, possible fish or wildlife benefits, environmental impacts, and design and fiscal considerations at appropriate stages in project development.

Step review includes a thorough review by the ISRP and the Council at three different phases: (1) master or conceptual planning; (2) preliminary design; and (3) final design. Projects may move to the next phase based on a favorable review and a Council recommendation to move to the next phase. The Council intends the step review process to be flexible and cost efficient. Depending on the nature and status of the proposed project, the Council may allow for a review that combines two or more of the steps in a single submission and review, or for a submission and review that addresses just part of a step in the review process.

B. Program coordination

The Council will continue to identify and provide regional leadership and coordination on a variety of fish and wildlife issues by bringing the appropriate expertise together and helping to craft strategic approaches to address these issues. When appropriate, the Council may convene participants and interested parties to discuss and address relevant issues pertaining to program implementation in the absence of an existing and ongoing forum.

The Council has benefited and will continue to benefit from the individual and coordinated efforts of groups, committees and organizations in implementing the program. Continued coordination of various program elements is expected, supported, and in some cases financed by the Bonneville Power Administration. Annually, the Council will convene a forum of regional coordination representatives and other interested parties to discuss the upcoming years' issues of regional significance that may include:

- Council-sponsored/requested topical science and policy forums, workgroups, and special panels to aid in program development and implementation
- Ongoing work to improve program reporting, evaluation, and assessment
- Key program-related regional forums where policies, programs, and actions affecting fish and wildlife are planned and implemented
- Coordination of subbasin or other level program activities

The Council will factor in the implementation priorities and its fish and wildlife program work plan into this annual discussion forum.

Program coordination funding

Entities receiving program coordination funding must participate in the annual forum and a subset of the resulting priority activities identified by the group, as appropriate for the particular entity. All related work should focus on activities that inform the Council on policy, program performance evaluation, and implementation decisions and are beneficial at a basinwide or regional scale.

All entities receiving funding for coordination of program activities must develop a work plan detailing the coordination elements, objectives, deliverables, and budget, as well as submit annual reports on this work, based on the upcoming year's priorities as outlined in the annual forum.

Coordination with other regional programs

The Council will continue to pursue opportunities to implement the program in coordination with other federal, state, tribal, Canadian, and volunteer fish and wildlife restoration programs. The Council will continue to work with national programs that influence our work in the basin.

The Council will coordinate with organizations that track and monitor data on non-native species distribution, climate change, and human population change at the Northwest regional scale. There are also ongoing efforts to monitor trends in Northwest habitat quality, ocean conditions, and fish and wildlife that the Council

will continue to track and participate in on an ongoing basis as it affects our program work. Continued coordination with these larger efforts is important as their products and reports can directly influence our work in the basin and help to guide decision-making.

C. Independent scientific and economic review

Independent scientific review is a critical part of fish and wildlife project implementation, research, and development in the Columbia River Basin. Independent scientific review can help decision-makers separate scientific variables from other considerations (political, economic, cultural, etc.) and help ensure environmental decision-making reflects the best scientific knowledge. Independent scientific review for the fish and wildlife program is implemented by two groups: the [Independent Scientific Review Panel](#) and the [Independent Scientific Advisory Board](#). Review of economic issues is the responsibility of the Independent Economic Analysis Board. All three groups were created by the Council in 1996, and each provides distinct services to the program:

- **The Independent Scientific Review Panel (ISRP)** - The ISRP reviews individual projects in the context of the program and makes recommendations on matters related to those projects. Over the past two decades, the ISRP has reviewed all projects proposed for funding through the fish and wildlife program, amounting to several thousand proposals. These reviews help ensure program accountability and improve project design, documentation, and implementation.
- **The Independent Scientific Advisory Board (ISAB)** - The 11-member ISAB was established by the Council and NOAA Fisheries, and its administration is overseen by the Council, NOAA Fisheries, and the Columbia River Indian tribes. The ISAB provides advice to the region on key scientific issues affecting Columbia River Basin fish and wildlife with the intent to avoid gridlock over scientific uncertainty, circumvent unnecessary additional research, and resolve conflicting advice and opinions on recovery issues and measures. ISAB reviews have covered the traditional aspects of fish and wildlife mitigation and recovery including hatcheries, harvest, hydrosystem, and habitat issues (the 4 Hs). In addition, the ISAB evaluates topics that expand the region's perspectives on recovery including non-native species and climate change impacts; food web relationships; and landscape-scale restoration principles. [ISAB](#) and [ISRP](#) reports are publicly available on the Council's website.
- **The Independent Economic Analysis Board (IEAB)** – The Independent Economic Advisory Board advises the Council on the economics of issues within the Council's statutory responsibilities. The IEAB helps to satisfy the Council's obligation under the Act to establish a scientific and statistical advisory committee.

The responsibilities of all groups are provided below. Both science groups, and the economic group, have guidelines for conflicts of interest, appointment processes, review protocols, and [administrative procedures](#) that ensure their independence and effectiveness.

The ISRP and peer review groups have responsibilities in three areas:

- Review projects proposed for Bonneville funding to implement the Council's program: The 1996 amendment directs the ISRP to review annually projects that are proposed for Bonneville funding to implement the Council's program. The Act specifies the review standards that the ISRP is to use and the kinds of recommendations to make to the Council. The Council must fully consider the ISRP's reports prior to making funding recommendations to Bonneville, and must explain in writing wherever the Council's recommendations differ from the ISRP's.
- Review program results: The 1996 amendment also directs the ISRP to annually review the results of prior-year expenditures based on the project review criteria and submit its findings to the Council. The retrospective review should focus on the measurable benefits to fish and wildlife made through projects funded by Bonneville and previously reviewed. The ISRP's findings should provide biological information for the Council's ongoing accounting and evaluation of Bonneville's expenditures and the level of success in meeting the objectives of the program, as described in the monitoring and evaluation section of the program. Also as part of the ISRP's annual retrospective report, the panel should summarize major basinwide programmatic issues identified during project reviews.
- Review projects funded through Bonneville's reimbursable program: In 1998, the U.S. Congress' Senate-House conference report on the Fiscal Year 1999 Energy and Water Development Appropriations bill directed the ISRP to review the fish and wildlife projects, programs, or measures included in federal agency budgets that are reimbursed by Bonneville, using the same standards and making recommendations as in its review of the projects proposed to implement the Council's program. These programs include the Corps' Columbia River Fish Mitigation Program and the Lower Snake River Compensation Plan. Further details of the ISRP's project review responsibilities are described above, in the section on project selection.

The ISAB's review responsibilities include:

- Evaluate the fish and wildlife program on its scientific merits in time to inform amendments to the program and before the Council requests recommendations from the region
- Evaluate NOAA Fisheries' recovery plans for Columbia River Basin stocks and aspects of the recovery process when requested
- Provide scientific advice and review of topics identified as critical to fish recovery and conservation in the Columbia River Basin
- Evaluate the scientific merits of plans and measures proposed to ensure satisfaction and continuation of tribal treaty fishing rights in the Columbia River Basin and other tribal efforts to restore and manage fish and wildlife resources
- Provide specific scientific advice on topics and questions requested from the region or the ISAB and approved by majority vote of the Council's, NOAA

Fisheries', and the tribes' representatives overseeing the ISAB's administration.

The IEAB's responsibilities include:

- Advising the Council on the appropriate methods of economic analysis for proposed fish protection and mitigation measures and projects as well as other issues within the Council's statutory responsibilities. This advice will include the appropriate role and limits of economic analysis in making policy decisions and, where applicable, the associated economic costs and benefits of those decisions. The Independent Economic Analysis Board will fulfill this role by:
 - Interacting as an advisory committee with the Council regarding methods of economic analysis for alternative fish recovery measures and other issues, including economic costs and benefits, within the Council's statutory responsibilities
 - Assisting the Council to evaluate new analytical tools, and advising on the most appropriate study designs
 - Helping to identify sources of information and data
 - Performing specific tasks assigned by the Council on a cost reimbursement basis
 - Assisting in the review and interpretation of study results

Part Seven: Appendices

The appendices that follow in this volume are legally part of the fish and wildlife program. The provisions of the appendices have been formally adopted by the Council, and changes to the appendices require formal amendment of the fish and wildlife program.

The contents of the appendices are:

[Appendix A.](#)

Glossary

[Appendix B.](#)

Estimates of hydropower-related losses: “Compilation of Information on Salmon and Steelhead Losses” and “Numerical Estimates of Hydropower-Related Losses”

[Appendix C.](#)

Wildlife mitigation priorities, construction and inundation loss assessments, and dam licensing considerations

[Appendix D.](#)

Program goals and objectives

[Appendix E.](#)

Council high-level indicators

[Appendix F.](#)

Future hydroelectric development and licensing, and protected areas

[Appendix G.](#)

Climate change impacts in the Columbia River Basin

[Appendix H.](#)

Fish Passage Center

[Appendix I.](#)

Grand Coulee operations

[Appendix J.](#)

Wildlife Crediting Forum

[Appendix K.](#)

Resident fish mitigation settlement agreements

[Appendix L.](#)

Reporting

[Appendix M.](#)

List of subbasin plans and adoption dates

[Appendix N.](#)

Species

[Appendix O.](#)

Subbasin and basinwide measures

[Appendix P.](#)

Maintenance of fish and wildlife program investments

[Appendix Q.](#)

Administration and procedures of the Independent Scientific Review Panel, scientific peer review groups, and the Independent Scientific Advisory Board

[Appendix R.](#)

Assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply

[Appendix S.](#)

Responses to recommendations and comments, including findings on recommendations not adopted into the 2014 Fish and Wildlife Program

A. Glossary

Accuracy - The accuracy of a measurement is the degree of closeness of measurements of a quantity to that quantity's actual (true) value, i.e., how close a measurement is to the “true value.”

Action agencies - U. S. Army Corps of Engineers, the Bonneville Power Administration and the U.S. Bureau of Reclamation that own, operate, or manage the Federal Columbia River Power System dams and related infrastructure.

Adaptive management - A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing fish and wildlife program actions (projects) as vehicles for learning. Projects that implement the program 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 is better understood.

Alluvial - Detrital material, such as clay, sand, and gravel that is deposited along the river or stream channel.

Anadromous fish - Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn; for example, Chinook salmon, Pacific lamprey, and steelhead salmon.

Anadromous fish substitution - The protection, mitigation, or enhancement of resident fish and wildlife to address losses of salmon and steelhead in those areas currently blocked to anadromous fish as a result of hydroelectric dams.

Baseline - Historical or current conditions against which change can be measured. When referring to a baseline passage or flow measure in the mainstem, the baseline indicates the starting point as described in the Federal Columbia River Power System Biological Opinion.

Basinwide - An activity or an issue that extends over the entire Columbia River watershed.

Biological diversity - Biological diversity within and among populations of salmonids is generally considered important for three reasons. First, diversity of life history patterns is associated with a use of a wider array of habitats. Second, diversity protects a species against short-term spatial and temporal changes in the environment. And third, genetic diversity is the so-called raw material for adapting to long-term environmental change. The latter two are often described as nature’s way of hedging its bets – a mechanism for dealing with the inevitable fluctuations in environmental conditions – long and short term. With respect to diversity, more is better from an extinction-risk perspective.

Biological indicators - The general measures of success for the regional effort that in some cases will extend beyond the narrow responsibility of the federal hydropower system. These indicators will focus on fish populations, productivity, fish survival, hatcheries, predation, harvest, and wildlife habitat.

Biological objectives - Biological objectives should clearly describe physical and biological changes needed to achieve the vision in a quantifiable fashion. They will serve as a benchmark to evaluate progress toward the subbasin vision and should have measurable outcomes. Biological objectives should 1) describe and quantify the degree to which the limiting factors will be improved, and 2) describe and quantify changes in biological performance of populations that will result from actions taken to address the limiting factors.

Biological opinion - A document that is the product of formal consultation under Section 7 of the Endangered Species Act (ESA), stating the opinion of the U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration on whether or not a federal action is likely to jeopardize the continued existence of ESA-listed species or result in the destruction or adverse modification of critical habitat.

Biological performance - The responses of populations to habitat conditions, described in terms of capacity, abundance, productivity, and life history diversity.

Biological potential - The biological potential of a species means the potential capacity, productivity, and life history diversity of a population in its habitat at each life stage.

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, generating resource acquisition, and fish and wildlife.

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, Hungry Horse, and several projects on the Yakima River.

Bypass system - A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.

Carrying capacity - The number of individuals of one species that the resources of a habitat can support. That is, the upper limit on the steady-state population size that an environment can support. Carrying capacity is a function of both the populations and their environments.

Clean Water Act - A federal law, the Act employs a variety of regulatory and non-regulatory tools to regulate direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The goal is to restore and maintain the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Climate - The average weather (usually taken over a 30-year time period) for a particular region and time period. Climate is not the same as weather, but rather it is the average pattern of weather for a particular region. Weather describes the short-term state of the atmosphere. Climatic elements include precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost, and hail storms, and other measures of the weather.

Climate change (also referred to as "global climate change") - The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the Earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. In some cases, climate change has been used synonymously with the term, "global warming;" scientists, however, tend to use the term in the wider sense to also include natural changes in climate.

Columbia River Basin - The Columbia River and its tributaries.

Columbia Basin Fish Accords - The accords are agreements between the action agencies, several tribes, and some states that are 10-year action-agency commitments for projects to benefit fish affected by the FCRPS. The focus is on ESA-listed anadromous fish and actions to support the FCRPS Biological Opinion. The accords also include some other actions for non-listed fish.

Columbia River Treaty - The *Treaty between the United States of America and Canada Relating to Cooperative Development of the Water Resources of the Columbia River Basin*, 1964. The Canadian Entity (B.C. Hydro) and the U.S. Entity (represented by the U.S. Army Corps of Engineers and Bonneville Power Administration) are responsible for ensuring the provisions of the Columbia River Treaty are fulfilled. It became effective on September 16, 1964. The treaty also

authorized the construction of Libby Dam on the Kootenai River in Montana, which creates a reservoir that extends into British Columbia.

Conservation easement - A deed in which a property owner (grantor) grants a real-property interest to another entity (grantee) to conserve natural values of the property such as water quality or unique native habitats. The grantor retains all rights not restricted by the easement. Conservation easements often have perpetual terms and offer the grantee the right to enforce the easement's terms against both the grantor and successor owners.

Construction and Inundation Losses - The wildlife losses that occurred as a direct result of construction of a dam and the flooding of the area upriver of the dam.

Consultation - All federal agencies must consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service (NOAA Fisheries) when any activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat. There are two stages of consultation: informal and formal.

Conversion rate - The survival rate of adult salmon as they migrate upstream past dams and reservoirs.

Coordination - Within the program, coordination is not an action or a subject by itself -- it is incidental to the need to make progress on a substantive program area that requires the coordinated work of more than one entity. What type of "coordination" needs to occur in any particular instance is wholly dependent on the work that needs to be accomplished and the particular entities identified that need to work together to accomplish it.

Corps of Engineers, U.S. Department of the Army (the Corps) - An agency with the responsibility for design, construction, and operation of civil works, including multipurpose dams and navigation projects.

Cost-effective - As defined in the Northwest Power Act, with regard to actions that implement the Council's fish and wildlife program, where equally effective alternative means of achieving the same sound biological objective exist, the cost-effective alternative is the one with the lowest economic cost.

Critical uncertainties - Critical research uncertainties are questions concerning the validity of key assumptions implied or stated in the program.

Direct mortality - Direct mortality is that which occurs directly from some event along the downriver passage through (or around) the hydropower system, that is, mortality directly associated with the hydropower system.

Dissolved gas - The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, which 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).

Distinct population segment - A vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The smallest division of a taxonomic species permitted to be protected under the U.S. Endangered Species Act.

Drawdown - The distance that the water surface of a reservoir is lowered from a given elevation as water is released from the dam for various purposes. It can also refer to the act of lowering reservoir levels below their normal operating elevations.

Ecological function - The role, or function, that species have within the community or ecosystem in which they occur.

Ecosystem - The set of species and biological communities, including all biotic and abiotic factors and their interactions, existing in a particular environment and geographic area.

Ecosystem Function - The ability of a river to sustain healthy populations of fish, wildlife, and plants, that is enhanced by environmental conditions that support healthy populations.

Effectiveness monitoring - Assessing whether certain actions and projects are having the intended affect and contribute to overall mitigation, protection, enhancement, and recovery efforts in the basin. This may require establishing a causal relationship or a correlation between the action and the change observed; i.e. statistical cause-and effect and correlation relationships. This can be at one of two scales: to detect a localized effect (project or stream reach level effect), and to detect a watershed level effect (intensively monitored effect).

Endangered - The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Endangered Species Act - Federal legislation, as amended in 1973, intended to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and provide programs for the conservation of those species, thus preventing extinction of native plants and animals.

Environmental characteristics - The environmental conditions or changes sought to achieve the desired changes in population characteristics.

Environmental risk assessment - Process to identify and evaluate the potential negative impacts of proposed actions on the environment.

Escapement - The numbers 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. In both the vertical and horizontal planes, the estuary is a complex transitional zone without sharp boundaries between freshwater and marine habitats.

Evolutionarily Significant Unit (ESU) - A distinct population segment for Pacific salmon (the smallest biological unit considered to be a “species” under the Endangered Species Act). A population will be considered an ESU if: 1) it is substantially reproductively isolated from other co-specific units, and 2) it represents an important component in the evolutionary legacy of the species.

Extirpated – The loss of a discrete subpopulation within a species.

Extinction - The loss of an entire species.

Federal Columbia River Power System (FCRPS) - The Federal Columbia River Power System comprises 31 federal dams and one non-federal nuclear power plant located primarily in the Columbia River Basin. The Bonneville Power Administration sells the output of the FCRPS and also constructed and operates a regional transmission system. Fourteen federal multipurpose hydropower projects are at the core of the FCRPS. Twelve of the projects are operated and maintained by the U.S. Army Corps of Engineers: Bonneville, The Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak dams. The Bureau of Reclamation operates and maintains the Hungry Horse Project and the Columbia Basin Project, which includes Grand Coulee Dam. The FCRPS also includes the mainstem effects of other Reclamation projects in the Columbia and Snake basins, Corps projects in the Willamette River Basin, and other power-producing federal projects in the Northwest.

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.

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; Montana Fish, Wildlife & Parks; the National Marine Fisheries Service of

NOAA Fisheries, a division of the U.S. Department of Commerce; the Oregon Department of Fish and Wildlife; and the Washington Department of Fish and Wildlife.

Fish and wildlife agencies and tribes – The federal and region’s state fish and wildlife agencies and Indian tribes.

Floodplain - Land adjacent to a stream or river that is periodically flooded.

Flow(s) - 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.

Focal species - A species that has ecological, cultural or local significance or protected legal status, and is used to evaluate the health of the ecosystem and the effectiveness of management actions. A set of focal species is established for each subbasin plan [see [Appendix N](#)].

Forebay - The part of a dam’s reservoir that is immediately upstream of the powerhouse.

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.

Habitat - The locality or external environment in which a plant or animal normally lives and grows. As used in this program, habitat includes the ecological functions of the habitat structure.

Habitat unit (HU) - A value derived from multiplying the Habitat Suitability Index (HSI) for an evaluation species by the size of the areas for which the HSI was calculated (HU = HSI x size of habitat)

Harvest - The total number or poundage of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.

Harvest management - The process of setting regulations for the commercial, recreational, and tribal fish harvest to achieve a specified goal within the fishery.

Harvest rates - The portion of an evolutionarily significant unit (ESU) that is expected to be harvested based on the management goals set by the fish and wildlife agencies and tribes.

Hatchery – Generally refers to an artificial production facility designed to produce fish for harvest or spawning escapement. A conservation hatchery

differs from a production hatchery in that a conservation hatchery specifically seeks to supplement or restore natural-origin populations. In this program, “hatcheries” may also refer to any of a suite of activities that includes assistance provided by human technology to animal reproduction. In the context of Pacific salmon, this assistance may include, but is not limited to, spawning and rearing in hatcheries, stock transfers, creation of spawning habitat, egg bank programs, captive broodstock programs and cryopreservation of gametes.

Hatchery population - A population of fish that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.

Hydroelectric power or hydropower - The generation of electricity using falling water to turn turbo-electric generators.

Hydrosystem - The federal and non-federal hydroelectric dams on the Columbia River and its tributaries.

Implementation monitoring - Monitoring conducted to determine whether an activity was performed and completed as planned. All actions under the program must have implementation monitoring that must be reported to Bonneville. In some cases this may be as simple as a photo point and a brief description.

Invasive species – A species that establishes and reproduces rapidly outside its native range. It may threaten the diversity or abundance of native species through predation, competition, parasitism, hybridization with native populations, introduction of pathogens, or the physical or chemical alteration of the invaded habitats.

Irrigation - Water diverted from surface-water bodies or pumped from groundwater and applied to agricultural lands through ditches, canals, dikes, pumps, pipes, and other water conveyance systems for the purpose of raising crops in areas that do not have sufficient moisture under natural conditions.

Juvenile salmon - Fish from approximately one year of age until sexual maturity.

Kelt - Steelhead that return to the sea after spawning and may return to natal streams to spawn again.

Kokanee - A land-locked form of sockeye salmon.

Lamprey or Pacific lamprey - Pacific lamprey are dark bluish gray or dark brown in color and can reach 30 inches in length and weigh over a pound. Pacific lamprey are anadromous. They enter freshwater streams of the Columbia River Basin from July to October and spawn the following spring. Juvenile lamprey will stay burrowed in the substrate of the streams for 4 to 6 years, During the ocean phase of two to three years, Pacific lamprey are scavengers, parasites, or predators on larger prey such as salmon and marine mammals.

Life history - The multitude of physical stages and behaviors exhibited by a species in the completion of its life cycle.

Limiting factors - Physical, biological, or chemical features (for example, inadequate spawning habitat, high water temperature, insufficient prey resources) experienced by fish that result in reductions in abundance, productivity, spatial structure, or diversity. Key limiting factors are those with the greatest impacts on a population's ability to reach its desired status.

Listed species - A species, subspecies, or distinct vertebrate population segment that has been added to the federal lists of endangered and threatened wildlife and plants as they appear in sections 17.11 and 17.12 of Title 50 of the Code of Federal Regulations (50 CFR 17.11 and 17.12).

Mainstem - Refers to the main channels of the Columbia and Snake rivers. The program includes a mainstem plan with specific objectives and actions for the federal operating agencies and others to implement in the mainstem Columbia and Snake rivers to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric dams.

Mainstem passage - The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.

Mid-Columbia Public Utility Districts - PUD No. 1 of Grant County, PUD No. 2 of Chelan County, and PUD No. 1 of Douglas County.

MPG (Major population group) – A set of populations that shares genetic, geographic (hydrographic), and habitat characteristics within an evolutionarily significant unit.

Native species - A species whose presence in a region or ecosystem is due to natural processes and not to human activities.

Natural-origin fish – 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

Natural production - Spawning, incubating, hatching, and rearing fish in rivers, lakes, and streams without human intervention.

Non-native species – An introduced species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental. These species can have a distinct advantage in competing with native species because they escape a large percentage of the pathogens and parasites from their native range and are slow to pick up new infections in their

newly invaded range. There is convincing evidence that non-native species are continuing to increase in the Columbia Basin aquatic habitats, and climate change is likely to further accelerate their expansion, often at the expense of native species.

Northern Pikeminnow - A giant member of the minnow family, the Northern Pikeminnow is native to the Columbia River and its tributaries and a known predator of young salmon.

Northwest Power Act - The Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power and Conservation Council. The Act directs the Council to develop the Columbia River Basin Fish and Wildlife Program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries, to establish an Independent Scientific Review Panel to review projects implementing this program that are proposed for funding by the Bonneville Power Administration, and to make final recommendations to Bonneville on implementation of projects.

Nutrient cycling - Process by which nutrients are continuously transferred between organisms within an ecosystem.

Objectives – The biological and non-biological changes needed to achieve the program vision in a quantifiable fashion. This is a broader term that includes biological objectives, defined above. Objectives serve as a benchmark to evaluate progress toward the vision and should be, as feasible, specific, measurable, achievable, relevant, and time-bound.

Off-site mitigation - The improvement in conditions for fish or wildlife species away from the site of a hydroelectric project that had detrimental effects on fish and wildlife, as part or total compensation for those effects. An example of off-site mitigation is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects caused by mainstem hydroelectric projects.

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

Passage efficiency - The percentage of the total number of fish that pass a dam without passing through the turbine units.

Passage survival - The proportion of anadromous fish that survive passage through the dams and reservoirs while migrating in the main channels of the Columbia and Snake rivers.

Performance measures - Performance measures are metrics that are monitored and evaluated relative to performance standards (benchmarks) and performance targets (longer-term goals) to assess progress of actions and inform future decisions.

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 identify individual fish. 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.

Precision - The degree to which repeated measurements show the same results. It is also called reproducibility or repeatability.

Predator - An animal that lives by killing and eating other animals for food.

Productivity - A measure of a population's ability to sustain itself or its ability to rebound from low numbers. The terms "population growth rate" and "population productivity" are interchangeable when referring to measures of population production over an entire life cycle. Productivity can be expressed as the number of recruits (adults) per spawner or the number of smolts per spawner.

Rearing - The juvenile life stage of anadromous fish spent in freshwater rivers, lakes, and streams or hatcheries before they migrate to the ocean.

Recovery - The re-establishment of a threatened or endangered species to a self-sustaining level in its natural ecosystem to the point where the protective measures of the Endangered Species Act are no longer necessary.

Recovery plan - A strategy for conserving and restoring a threatened or endangered species. An Endangered Species Act recovery plan refers to a plan prepared under section 4(f) of the Act and approved by the Secretary of the relevant federal agency, including: (1) A description of site-specific management actions necessary for recovery; (2) objective, measurable criteria that can be used as a basis for removing the species from threatened or endangered status; and (3) estimates of the time and cost required to implement recovery. (For Pacific salmon, "Secretary" refers to the U.S. Secretary of Commerce.)

Recruitment - The number of young-of-year fish entering a population in a given year.

Reference stream - Reference streams are similar in physical and biological character to streams in which an integrated production effort will take place. No new supplementation should occur in reference streams.

Removable Spillway Weir - A fish passage technology that is an overflow structure installed in a dam's spillway bay. It provides a more surface-oriented passage route with less delay and stress for juvenile anadromous fish.

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 include landlocked anadromous fish (for example, sturgeon, kokanee, and coho), as well as traditionally defined resident fish species. For example, freshwater mussels, threatened bull trout, burbot, Westslope cutthroat trout, mountain whitefish, endangered Kootenai white sturgeon, green sturgeon, and resident life histories of the native anadromous species, e.g. kokanee [see [Appendix N](#)].

Riparian - Riparian areas and wetlands are habitats along the banks of streams, lakes, or rivers where terrestrial and aquatic ecosystems are most closely linked. They are among the most diverse and dynamic habitats on the Earth, and are especially important sources of plant and animal species diversity in arid areas such as the interior Columbia River Basin. These habitats are critical to a broad range of wildlife.

Run - A population of fish of the same species consisting of one or more stocks migrating at a distinct time.

Salmonid - A fish of the Salmonidae family, which includes soft-finned fish such as salmon, trout, and whitefish.

Section 7 - The section of the Endangered Species Act that requires all federal agencies, in "consultation" with NOAA Fisheries or the U.S. Fish and Wildlife Service, to insure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

Self-sustaining population - A population of fish or wildlife that exists in sufficient numbers to replace itself through time without supplementation with hatchery fish or other type of human intervention. It does not necessarily produce surplus fish or wildlife for harvest.

Settlement - An agreement between natural resource trustees and responsible parties that specifies the terms under which liability is resolved.

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, typically in its second year of life.

Smolt to Adult Return (SAR) rate - A measure of survival from smolt outmigration to adult return. Depending upon the species, tag type, and research/management question, smolt outmigration and adult returns may be enumerated at various locations (e.g., Bonneville to Bonneville, Dworshak Hatchery to Lower Granite, or tributary to tributary). Therefore, SARs must be explicitly defined based on the enumeration points. The SAR indicator incorporates all sources of mortality between the smolt and adult life stages.

Spatial - Spatial, in the context of the program, refers to the geographic distribution of individuals in a population unit and the processes that generate that distribution.

Spawn - The act of fish releasing and fertilizing eggs.

Species - A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring. For purposes of the Endangered Species Act (ESA), a species is defined to include “any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” A population (or group of populations) will be considered “distinct” (and hence a “species”) for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. A population must satisfy two criteria to be considered an ESU: (1) It must be reproductively isolated from other conspecific population units, and (2) it must represent an important component in the evolutionary legacy of the species.

Spill - Releasing water through spillways at a dam rather than through the turbines.

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.

Stacking - A procedural step used to calculate the relationship between wildlife species and their habitat in the course of calculating Habitat Units (HUs) for the purposes of mitigating for wildlife losses. Stacking can produce varied results if inconsistent species or habitat types are used in the calculation.

Status and Trend Monitoring - Used to assess status over time of fish, wildlife, and habitat that informs program evaluation and reporting needs. This type of monitoring is intended to span a time-period adequate to understand the trend and be able to detect a negative change that would require a change in program implementation to rectify.

Stock - A population of fish spawning in a particular stream during a particular season. Stocks of fish generally do not interbreed with stocks spawning in a different stream or at a different time.

Straying - The act of a fish breeding in a population other than that of its parents.

Strongholds - Generally characterized as large and relatively intact areas that support abundant, diverse, genetically strong populations of native salmonids that can serve as “anchor recovery areas” to help re-establish and re-build core populations in the basin. The concept of native fish strongholds is further defined as conservation reserves to protect remaining areas of high-quality habitat supporting abundant populations and a diverse number of native fish species.

Subbasin - A set of adjoining watersheds with similar ecological conditions and tributaries that ultimately connects, flowing into the same river or lake. Subbasins contain major tributaries to the Columbia and Snake rivers. There are 62 subbasins in the Columbia River Basin.

Subbasin management plans - Management plans set forth the desired direction for the subbasin taking into account the science, local conditions, concerns, treaty rights, and applicable law and policy. It is where the science and the social aspects come together. Management plans begin with a *vision* for the subbasin, then outlines *biological objectives* describing the desired environmental conditions, and then identifies a set of *strategies* to achieve the objectives. In addition, management plans include a *monitoring and evaluation plan* for the strategies that may be implemented. Plans should have a 10-15 year horizon recognizing that additional information and analysis may indicate the need for periodic refinement.

Subbasin planning - A coordinated systemwide approach to planning in which each subbasin in the Columbia system is evaluated for its potential to produce fish in order to contribute to the goal of the overall system. Subbasin planning emphasizes the integration of fish and wildlife habitat, fish passage, harvest management, and production.

Subyearling - A fish that is less than 1 year old.

Supplementation - The use of hatcheries to re-establish or increase the abundance of naturally reproducing populations through the release of hatchery fry and juvenile fish in the natural environment.

Tailrace - The canal or channel that carries water away from a dam.

Tailwater - The water surface immediately downstream from a dam.

Target species - A species singled out for attention because of its harvest significance or cultural value, or because it represents a significant group of ecological functions in a particular habitat type.

Terminal Fishery- A fishery created to provide a significant degree of spatial separation from stocks bound for other streams. The terminal fishery targets a hatchery stock of fish to avoid harvest of listed and weak stocks.

Terrestrial - Of or relating to the earth or its inhabitants; non aquatic.

Threatened - The classification provided to an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Transboundary - Refers to the United States and Canadian border.

Transboundary stocks/species – Stocks or species whose range or migratory routes cross the United States/Canada border.

Transportation - Collecting migrating juvenile fish and transporting them around dams using barges or trucks.

Treaty rights - Rights of Indian tribes that were reserved by the 1855 Stevens Treaties between certain Northwest Indian tribes and the United States government. These reserved rights include the right of “taking fish at all usual and accustomed grounds and stations” as well as the “privilege of hunting, gathering roots and berries and pasturing horses on open and unclaimed lands.” Certain of these rights have been well defined by judicial decisions, such as those pertaining to treaty fishing.

Tribes - In the Council’s fish and wildlife program, these include the Burns-Paiute Tribe; the Coeur d’Alene Tribes; the Confederated Tribes of the Colville Reservation; the Confederated Tribes of the Grand Ronde; 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 Nation; the Kalispel Tribe of Indians; 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; the Spokane Tribe of Indians; the Confederated Tribes of the Siletz Indians of Oregon; and the Cowlitz Indian Tribe.

Turbidity - A measure of light penetration in a body of water. Higher turbidity indicates murkier water conditions.

United States v Oregon - The 1969 federal court decision that reaffirmed Indian treaty rights to fish. The decision only applies to Washington and Oregon treaty tribes and is the basis for allocating harvest of salmon in the Columbia River to those tribes.

Uplands - Land at higher elevations than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones.

VARQ - Variable outflows for flood control from a storage reservoir during the spring which are tied to the water supply forecast, which can provide additional water releases for fish requirements and improve a project's refill probability.

Water right - A legal authorization to use a certain amount of public water for specific beneficial use or uses.

Watershed - The area that drains into a stream or river. A subbasin is typically composed of several watersheds.

Weak stock - A stock of fish of which the long-term survival is in doubt. Typically this is a stock in which the population is small and is barely reproducing itself or is not reproducing itself. While ESA-listed stocks are considered weak stocks, the term also includes other populations that would not yet qualify for ESA listing.

Wild fish - Fish that have maintained successful natural reproduction with little or no hatchery influence.

Wildlife - Animals living in a natural state, unimpeded and undomesticated by humans.

Wildlife management - The application of scientific or technical principles to the practice of manipulating wildlife populations, either directly through regulating the numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

B. Estimates of hydropower-related losses

[“Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin”](#) and [“Numerical Estimates of Hydropower-Related Losses”](#) from the [1987 Fish and Wildlife Program](#).

C. Wildlife mitigation priorities, construction and inundation loss assessments, and dam licensing considerations

1. Mitigation priorities

a) Bonneville and wildlife agencies and tribes

Ensure that wildlife mitigation projects implemented in fulfillment of this program consider the basinwide implementation priorities described in Tables C-1, C-2 and C-3, below. The Council adopted these habitat types and species priorities for wildlife mitigation in the 1994 amendments to the program. The Council recognizes that the mitigation priorities of the relevant agencies and tribes in specific areas may have shifted since the mid-1990s. The Council requests the Wildlife Advisory Committee revisit and update the priorities, if necessary, and report to the Council. Wildlife mitigation projects and settlement agreements should address the losses identified in the program (see the next section) and address the following priorities or any changed priorities resulting from advice by the Wildlife Advisory Committee and Council action.

Table C-1 Lower Columbia Wildlife Mitigation Priorities

Habitat Types--Target Species	Priority
Riparian/Riverine <ul style="list-style-type: none"> • Great Blue Heron 	High
Old Growth Forest <ul style="list-style-type: none"> • Northern Spotted Owl 	High
Wetlands <ul style="list-style-type: none"> • Great Blue Heron • Band-tailed Pigeon • Western Pond Turtle 	High
Coniferous Forest <ul style="list-style-type: none"> • Ruffed Grouse • Elk • American Black Bear/Cougar 	Medium

Table C-2 Upper Columbia Wildlife Mitigation Priorities

Habitat Types--Target Species	Priority
Riparian/River <ul style="list-style-type: none">• Bald Eagle (breeding)• Black-capped Chickadee• Peregrine Falcon	High
Shrub-Steppe <ul style="list-style-type: none">• Sharp-tailed Grouse• Pygmy Rabbit• Sage Grouse• Mule Deer	High
Wetlands <ul style="list-style-type: none">• Mallard• Redhead	High
Islands <ul style="list-style-type: none">• White Pelicans	Medium
Agricultural Lands <ul style="list-style-type: none">• Swainson's Hawk• Ring-necked Pheasant	Low

Table C-3 Snake River Wildlife Mitigation Priorities

Habitat Type--Target Species	Priority
Riparian/Riverine <ul style="list-style-type: none">• Bald Eagle (breeding)• Bald Eagle (wintering)• River Otter• Black-capped Chickadee• Peregrine Falcon• Ruffed Grouse	High
Wetlands <ul style="list-style-type: none">• Mallard	High
Native Grasslands and Shrubs <ul style="list-style-type: none">• Mule Deer/Elk• White-tailed Deer• Sharp-tailed Grouse	Medium
Coniferous Forest <ul style="list-style-type: none">• Elk	Medium

Old Growth Forest <ul style="list-style-type: none">• Pileated Woodpecker	Medium
Lowland Forest <ul style="list-style-type: none">• White-tailed deer	Low

2. Mitigation for wildlife losses due to hydropower construction and inundation

The following tables represent the wildlife losses associated with the construction and inundation of the Columbia River hydrosystem, assessed in terms of lost units of habitat. The Council identified and adopted these losses into the program in the late 1980s and 1990s, assessed in terms of lost units of habitat.

From its inception, the fish and wildlife program's wildlife mitigation strategy has endorsed and encouraged the use of long-term agreements between wildlife managers and the Bonneville Power Administration as a primary mechanism to address identified wildlife losses. Several such agreements have been developed to mitigate for some or all of the wildlife losses associated with hydroelectric projects in the state of Montana, the Willamette Basin in Oregon and for Dworshak Dam in Idaho.

While the program originally identified the losses in habitat units, the Council recognizes that wildlife mitigation agreements may use a different metric for mitigation. Thus while the losses below are identified in habitat units, in settlement agreements for Dworshak, the Willamette, and Southern Idaho the parties have quantified and mitigated for those losses in acres of land.

Table C-4 Estimated Losses and Gains Due to Hydropower Construction and Inundation	
(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
Lower Snake Projects	
• Downy Woodpecker	-364.9
• Song Sparrow	-287.6
• Yellow Warbler	-927.0
• California Quail	-20,508.0
• Ring-necked Pheasant	-2,646.8
• Canada Goose	-2,039.8
Anderson Ranch	
• Mallard	-1,048
• Mink	-1,732
• Yellow Warbler	-361

<ul style="list-style-type: none"> • Black Capped Chickadee -890 • Ruffed Grouse -919 • Blue Grouse -1,980 • Mule Deer -2,689 • Peregrine Falcon -1,222 acres* <p>* Acres of riparian habitat lost. Does not require purchase of any lands.</p>
<p>Black Canyon</p> <ul style="list-style-type: none"> • 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
<p>Deadwood</p> <ul style="list-style-type: none"> • Mule Deer -2080 • Mink -987 • Spruce Grouse -1411 • Yellow Warbler -309
<p>Palisades</p> <ul style="list-style-type: none"> • 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 +68 acres of emergent wetland <p>* Acres of riparian habitat lost. Does not require purchase of any lands.</p>
<p>Willamette Basin Projects</p> <ul style="list-style-type: none"> • 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	-1,947
• 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
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
The Dalles	
• Lesser Scaup	+2,068
• Great Blue Heron	-427
• Canada Goose	-439

<ul style="list-style-type: none"> • Spotted Sandpiper -534 • Yellow Warbler -170 • Black-capped Chickadee -183 • Western Meadowlark -247 • Mink Black-capped Chickadee -330
Bonneville <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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
Minidoka <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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

3. Mitigation considerations in dam licensing decisions

a) Federal Energy Regulatory Commission

Non-federal hydroelectric projects are licensed by the Federal Energy Regulatory Commission. The Northwest Power Act and the Electric Consumers Protection Act of 1986 require the Federal Energy Regulatory Commission to give equal consideration to the protection, mitigation of damage to, and enhancement of wildlife in licensing and relicensing decisions. 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. In particular, it is important to take into account the mitigation efforts 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.

b) Council

The Council will monitor the Federal Energy Regulatory Commission licensing and relicensing proceedings and comment or intervene where appropriate.

D. Program goals and objectives

Theme One: Protect and Enhance Habitat to Provide a Home for Species

- 1. Goal:** Provide environmental conditions that support ecosystem functions necessary to restore healthy, self-sustaining and harvestable populations of native resident and anadromous fish and wildlife. This includes areas above and below Hungry Horse and Libby dams, and in and adjacent to Lake Roosevelt.
 - a) Objectives: remain to be identified and adopted
 - Strategies: habitat, non-native and invasive species, predator control, future hydroelectric development and licensing and protected areas, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume and near-shore ocean, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories

 - 2. Goal:** Enhance conditions in the estuary and near-shore plume to support habitat diversity, and productive, abundant, and diverse salmon and steelhead populations
 - a) Objectives: remain to be identified and adopted
 - Strategies: habitat, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume and nearshore ocean, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories

 - 3. Goal:** Reestablish a more natural hydrological pattern that reflects seasonal fluctuations, rate of fluctuations, peaks, and temperature.
 - a) Objectives: remain to be identified and adopted
 - Strategies: habitat, water quality, mainstem hydrosystem flow and passage operations, adaptive management
 - Indicators: to be developed under the ecosystem Health and council actions categories

 - 4. Goal:** Provide adequate water quality and quantity to support targeted species
 - a) Objective: Projects do not exceed the interim total dissolved gas (TDG) standards during spill events⁹:
-

⁹ For details about total dissolved gas standards consult Hydropower Strategy 1—*Operate the FCRPS to Provide Flows and Water Quality to Improve Juvenile and Adult Fish Survival*, RPA #4, Table 1 of the FCRPS Biological Opinion (BiOp); consult the FCRPS BiOp Implementation plan and the *Water Quality Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers* (WQP) for periodic updates to the TDG standards.

Project(s)	TDG standard
Dworshak	110% as set by Idaho State
Libby	110% as set by Montana State
Grand Coulee	Operate to minimize TDG production
Hungry Horse	110% as set by Montana State
Albeni Falls	None
Columbia River and Snake River Dams	In general, meet established TDG levels .Either 110 percent TDG standard, or as modified by State water quality waivers, currently up to 115 percent TDG in the dam forebay, and up to 120 percent TDG in the dam project tailwater.

- Strategies: water quality, mainstem hydrosystem flow and passage operations, adaptive management
 - Indicators: [Hydrosystem Passage and Survival](#); [Council Actions](#)
- 5. Goal:** Hydrosystem projects will rely on local inflows for drawdown and refill; maintain biological productivity in the reservoirs; and release water or dampen flow fluctuations to benefit fish in reservoirs and downstream.
- a) Objectives: remain to be identified and adopted
- Strategies: water quality, mainstem hydrosystem flow and passage operations, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 6. Goal:** Coordinate aquatic and terrestrial actions
- a) Objectives: remain to be identified and adopted
- Strategies: wildlife mitigation, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 7. Goal:** Improve and expand the habitat function, structure, complexity and range of aquatic habitats in mainstem and tributaries of the basin, including riparian, wetland, floodplain, alluvial reaches, estuary, and near-shore ocean, to enhance life history and species diversity that are impacted by the hydrosystem.
- a) Objectives: As interim habitat objectives, increase the amount of: acre-feet of water protected; stream miles with improved complexity; acres of riparian habitat treated or improved; fish screens installed or addressed for fish protection; and miles of improved access to fish habitat
- Strategies: habitat, non-native and invasive species, predation control, future hydroelectric development and licensing and protected areas, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume, and nearshore ocean, adaptive management
 - Indicators: [Council Actions](#); could be developed under the ecosystem health category

- 8. Goal:** Protect, enhance, reconnect, and restore fish populations in mainstem and tributary areas
- a) Objectives: remain to be identified and adopted
- Strategies: habitat, non-native and invasive species, predation control, future hydroelectric development and licensing and protected areas, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume, and nearshore ocean, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 9. Goal:** Improve natural populations by connecting stronger populations with weaker populations
- a) Objectives: remain to be identified and adopted
- Strategies: future hydroelectric development and licensing and protected areas, strongholds, adaptive anagement
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 10. Goal:** Reconnect side channels, floodplains, riparian areas, and uplands to improve and maintain aquatic conditions, especially in the Columbia and Snake river mainstems
- a) Objectives: remain to be identified and adopted
- Strategies: habitat, non-native and invasive species, predation control, future hydroelectric development and licensing and protected areas, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume and nearshore ocean, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 11. Goal:** Restore and protect thermal refuge areas for salmonids
- a) Objectives: remain to be identified and adopted
- Strategies: water quality, climate change, mainstem hydrosystem flow and passage operations, adaptive management
 - Indicators: to be developed under the ecosystem health and Council actions categories
- 12. Goal:** Mitigate for wildlife losses
- a) Objectives: Acquire habitat units (HU) to offset losses or fulfill settlement agreements
- Strategy: wildlife mitigation
 - Indicators: HUs acquired and maintained or settlements established

Theme Two: Ensure Species Survival by Promoting Abundance, Diversity and Adaptability

13. Goal: Achieve full mitigation for anadromous fish, native resident fish, and wildlife losses by restoring healthy¹⁰, self-sustaining, and harvestable, natural-origin anadromous fish, especially salmon, steelhead, eulachon, lamprey species, resident fish, including sturgeon and bull trout

- a) Objective: Halt declining trends in Columbia River Basin salmon and steelhead populations
 - Strategies: wild fish, lamprey, eulachon, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- b) Objective: Consistent with ESA efforts, increase total adult salmon and steelhead runs, with an emphasis on those above Bonneville Dam, by 2025 to an average of 5 million annually
 - Strategies: wild fish, , adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- c) Objective: As an interim population objective , increase total adult runs for listed lower Columbia salmon and steelhead to meet NOAA Fisheries' FCRPS Biological Opinion.
 - Strategies: wild fish, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- d) Objective: As an interim population objective for pacific lamprey populations, continue to maintain a stable and increasing population trend
 - Strategies: wild fish, lamprey, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- e) Objective: As an interim population objective, maintain a stable and increasing population trend for sturgeon and bull trout
 - Strategies: Resident fish mitigation, wild fish, sturgeon, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- f) Objective: As an interim population objective, maintain a stable and increasing population trend for kokanee, cutthroat trout and other resident fish focal species
 - Strategies: Resident fish mitigation, wild fish, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)

¹⁰ Healthy is defined as having abundance, productive, diverse and spatially distributed populations.

- 14. Goal:** Achieve full mitigation for anadromous fish and native resident fish
- a) Objective: As an interim objective, increase total adult salmon and steelhead runs to an average of 5 million annually by 2025 in a manner that emphasizes the populations that originate above Bonneville Dam and supports tribal and non-tribal harvest.
- Strategies: hatchery, wild fish, , anadromous fish mitigation strategy in blocked areas of the basin, adaptive management
 - Indicators: [Abundance of Fish and Wildlife](#); [Hydrosystem Passage and Survival](#)
- b) Objective: As an interim objective, achieve smolt-to-adult return rates in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead.
- Strategies: hatchery, wild fish, , , anadromous fish mitigation strategy in blocked areas of the basin, adaptive management
 - Indicators: [Abundance of Fish and Wildlife](#); [Hydrosystem Passage and Survival](#)
- 15. Goal:** Encourage biologically diverse species that are resilient to environmental variability
- a) Objective: Within 100 years, achieve population characteristics that, while fluctuating due to natural variability, represent full mitigation for losses of fish.
- Strategies: wild fish, propagation and hatchery programs, adaptive management, resident fish mitigation, lamprey, sturgeon, eulachon, anadromous fish mitigation in the blocked areas
 - Indicator: [Abundance of Fish and Wildlife](#)
- 16. Goal:** Achieve the delisting and recovery criteria for ESA-listed species in the biological opinions, including for listed salmon and steelhead in NOAA Fisheries' 2008 FCRPS, Upper Snake and Willamette River biological opinions, and those for listed Kootenai River White Sturgeon, bull trout, and Oregon chub in the U.S. Fish and Wildlife Service's FCRPS (2000), Libby Dam (2006) and Willamette River (2008) biological opinions (see footnote).
- a) Objective: Restore the widest possible set of healthy, naturally reproducing and sustaining populations of salmon and steelhead in each relevant geographic level.
- Strategies: sturgeon, wild fish, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)
- b) Objective: As an interim population objective for Kootenai River white sturgeon, bull trout, and other ESA-listed species tracked by program indicators, continue to maintain a stable and increasing population trend

- Strategies: sturgeon, wild, adaptive management
 - Indicator: [Abundance of Fish and Wildlife](#)

17. Goal: Achieve anadromous fish inriver migration and passage survival that approximates natural survival during inriver migration

a) Objective: Achieve the four juvenile and adult fish passage performance standards consistent with the most recent NOAA Fisheries FCRPS Biological Opinion¹¹. As of 2009 these consist of:

- Annually achieve juvenile fish dam passage performance standards at each Snake River (SR) and lower Columbia River dam:


ESU	Juvenile Standard
spring Chinook and steelhead (spring migrants)	Achieve at least 96 percent dam passage survival
Snake River fall Chinook subyearlings (summer migrants)	Achieve at least 93 percent dam passage survival

- Annually achieve the adult fish performance standards for each of the salmon and steelhead evolutionarily significant units (ESU) listed below for the specified reaches between Bonneville Dam (BON), Lower Granite Dam (LGR), and McNary Dam (MCN):

ESU	Adult Standard	Reach
SR Fall Chinook	81.2%	BON to LGR
SR Spring – Summer Chinook	91.0%	BON to LGR
SR Sockeye	Use SR spring/summer Chinook salmon and steelhead as surrogate until a standard is developed.	BON to LGR
SR steelhead	90.1%	BON to LGR
UCR spring Chinook	90.1%	BON to MCN
UCR steelhead	84.5%	BON to MCN
MCR steelhead	Use SR steelhead as surrogate until a standard is developed.	Variable
CR chum	None, assume survival is adequate if SR fall Chinook BON to LGR standard	None

¹¹ For more details consult the Reasonable and Prudent Alternative No. 52 - *Hydrosystem Research, Monitoring and Evaluation Strategy 2* of the NOAA Fisheries 2008 FCRPS Biological Opinion, including Table 7.

	is met	
LCR Chinook	None, assume that survival for spring and fall populations is adequate if SR spring/summer Chinook and SR fall Chinook standards are met.	None
LCR coho	None, assume that survival is adequate if SR fall Chinook BON to LGR standard is met.	None
LCR steelhead	None, assume that survival is adequate if SR steelhead BON to MCN standard is met.	None
UWR Chinook	None, not expected to migrate upstream of Bonneville Dam	None
UWR steelhead	None, not expected to migrate upstream of Bonneville Dam	None

- Strategies: water quality, mainstem hydrosystem flow and passage operations, adaptive management
 - Indicator: [Hydrosystem Passage and Survival](#) 

Theme Three: Compensate for a Wide Range of Impacts Caused by the Hydrosystem

18. Goal: Enhance harvest of anadromous fish including salmon, steelhead, and lamprey, and resident fish

a) Objective: remains to be identified and adopted

- Strategies: resident fish mitigation , anadromous fish mitigation strategy in blocked areas of the basin, hatchery, non-native and invasive species, wild fish, adaptive management
 - Indicators: to be developed under the abundance of fish and wildlife and Council action categories

19. Goal: Reintroduce anadromous fish extirpated from areas blocked by the construction and operation of the Columbia River Basin's hydrosystem

a) Objectives: remain to be identified and adopted

- Strategies: anadromous fish mitigation strategy in blocked areas of the basin, adaptive management
 - Indicators: to be developed under the abundance of fish and wildlife and Council action categories

Theme Four: Public Engagement

- 20. Goal:** Inform the public about the program to encourage involvement
- a) Objective: As an interim public engagement objective, update the indicator graphics on the program's High-level Indicator website and dashboards and produce the report to governors and Congress
 - Strategies: public engagement, adaptive management
 - Indicators: to be developed under the Council action category
- 21. Goal:** Encourage considering the program within a social and ecological context.
- a) Objectives remain to be identified and adopted
 - Strategies: public engagement, adaptive management
 - Indicators: to be developed under the Council action category
- 22. Goal:** Achieve open public access for all program-related data.
- a) Objectives remain to be identified and adopted
 - Strategies: public engagement, adaptive management
 - Indicators: to be developed under the Council action category

E. Council high-level indicators

The Council recognizes that it is only one among many entities invested in mitigating, protecting and enhancing the basin's species and habitat. The Council defines the program's responsibility as consisting of mitigating, protecting and enhancing for the hydrosystem impacts described by the [Northwest Power Act](#).

The Council approved during its October 2009 meeting three high-level indicators (HLI) that will be used to monitor the status and trend of the program's focal species and the progress of the Council's fish and wildlife program. The Council chose to postpone its decision on the fourth HLI, ecosystem health, until it is defined more clearly. [see [motion](#) and [presentation](#)]. These HLI will be used to report to Congress and the Northwest's governors:

1. Abundance of fish and wildlife
2. Hydrosystem survival and passage; and
3. Council actions.

During the October 2009 meeting, to guide the Council's HLI and their supporting fish and wildlife program indicators (FWIs), the Council also approved these fish and wildlife program management questions as a working list that is refined as needed:

- Are Columbia River Basin fish and wildlife abundant, diverse, productive, spatially distributed, and sustainable?
- Are the actions implemented by the Council fish and wildlife program having the expected biological effect on fish and wildlife and their habitat?
- Are Columbia River Basin ecosystems healthy?
- Are ocean conditions affecting Columbia River Basin anadromous fish?
- Is climate change affecting fish and wildlife in the Columbia River Basin?
- Are operations of the Columbia River Basin's hydropower dams supporting fish-passage survival objectives?
- Is harvest consistent with the fish and wildlife program's vision?
- Do hatcheries complement resident and anadromous recovery and harvest goals within the Columbia River Basin?
- Are the fish and wildlife losses associated with the development and operation of the Columbia River Basin's hydrosystem being mitigated as described by the Council's fish and wildlife program?
- What has been accomplished under the Council's fish and wildlife program?

The HLI graphics are reported on the Council's [High-Level Indicator report](#) and the supporting FWI graphics are reported on the Council's [subbasin dashboard](#). The development and refinement of the indicators, questions, and graphics are done in collaboration with fish and wildlife agencies and tribes. The information used to populate these indicator graphics is provided by program-funded projects as well as non-program-funded information gathered by fish and wildlife agencies and tribes. See the [Table of Indicators](#) on the Council's website for the current list and reporting status of the Council's questions, HLI, and supporting FWI.

F. Future hydropower electric development and licensing, and protected areas

The overarching sub-strategy and a summary of key provisions are in the main text of the program. Appendix F contains the substantive provisions of this portion of the program, in three parts; (a) future hydroelectric development and licensing standards and implementation; (b) protected areas and implementation; and (c) general implementation measures.

a) Future Hydroelectric Development and Licensing

Sub-strategy

Ensure that new hydroelectric development is carried out in a manner that protects the remaining fish and wildlife resources of the Columbia River Basin and the Pacific Northwest and does not add to the region's and ratepayers' mitigation obligation.

Rationale

New hydroelectric development has the potential to cause further damage to the Columbia River Basin's fish and wildlife resources, as well as to negate ongoing efforts to protect against and mitigate for damage caused by the existing hydropower system. On that basis, the Council has adopted a set of standards for the Federal Energy Regulatory Commission, Bonneville and other federal agencies to apply to the development and licensing of new hydroelectric facilities in the Columbia River Basin. As part of this effort, the Council has designated certain river reaches as "protected areas." The Council found that new hydroelectric development in a designated protected area would have unacceptable risks of loss to fish and wildlife species of concern, their productive capacity, or their habitat.

General Measures - Standards for new hydroelectric development and licensing:

- Potential effects on fish
 - The Federal Energy Regulatory Commission, Corps of Engineers, Bureau of Reclamation and Bonneville shall not license, exempt from license, relicense, propose, recommend, agree to acquire or wheel power from, grant billing credits for, or otherwise support any hydroelectric development in the Columbia River Basin without specifically providing for these development conditions:
 - Consultation with the fish and wildlife agencies and tribes and the Council throughout study, design, construction, and operation of the project
 - Development of specific plans for flows and fish facilities prior to construction
 - Use of the best available means for aiding downstream and upstream passage of anadromous and resident fish

- Provision of Columbia and Snake river 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 production, or similar measures consistent with the provisions of this program
- Assurance that the project will not inundate the usual and accustomed, traditional, or contemporary fishing places of any tribe without tribal approval
- Assurance that the project will not degrade fish habitat or reduce numbers of fish in such a way that the exercise of treaty or executive-order tribal rights will be diminished
- Assurance that all fish protection measures are fully operational at the time the project begins operation
- Assurance that the project developer will collect data needed to monitor and evaluate the results of the fish protection efforts
- Assurance that the project will not degrade water quality beyond the point necessary to sustain sensitive fish species (as designated in consultation with the fish and wildlife agencies and tribes).
- Potential effects on wildlife
 - The Federal Energy Regulatory Commission, Corps of Engineers, Bureau of Reclamation and Bonneville shall not license, relicense, exempt from license, propose, recommend, agree to acquire or wheel power from, grant billing credits for, or otherwise support any hydroelectric development in the Columbia River Basin without specifically providing for these development conditions:
 - Consulting with fish and 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 sub-impoundments 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, rip-

- apping, dredging, disposing of spoils and wastes, constructing diversions, and relocating structures and facilities
 - Replacing riparian vegetation if natural revegetation is inadequate
 - Creating sub-impoundments 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, such as conservation easements, 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
 - Collecting data needed to monitor and evaluate the results of the wildlife protection efforts
 - Assuring that the project will not inundate the usual and accustomed, traditional or contemporary hunting places of any tribe without tribal approval
 - Assuring that the project will not degrade wildlife habitat or reduce numbers of wildlife in such a way that the exercise of treaty or executive order tribal rights will be diminished
- Ensure that all licenses for hydroelectric projects or documents that propose, recommend, or otherwise support hydroelectric development explain in detail how the provisions of this section will be accomplished or the reasons why the provisions cannot be incorporated into the project.

b) Protected areas

Sub-strategy

The Council supports 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.

Protected Areas List

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 amended. For each river reach listed on the

Protected Areas List, the fish and wildlife to be protected are those on the list. Information on [protected areas](#) may be accessed through the Council's website. The Council will also supply a list of the protected areas to any party free of charge.

Rationale

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 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.

Most of the river reaches designated as protected areas are in the Columbia River Basin. But the designations also include river reaches outside the Columbia River Basin but within the service territory of the Bonneville Power Administration and thus within the scope of the Pacific Northwest's regional power system. The designations are intended as an expression of the Council's authority under the Northwest Power Act to protect, mitigate and enhance fish and wildlife in the Columbia River Basin from the adverse effects of the development and operation of the region's existing hydroelectric facilities *and* as an expression of the Council's obligations under the same Act to give due consideration in the Council's regional power plans to the effects of new energy resources (including new hydroelectric resources) on fish and wildlife resources and environmental quality and to internalize the environmental costs and benefits of such new resources to the greatest degree possible in deciding whether to recommend their addition to the region's power supply.

General Measures - Implementing protected areas:

- **Bonneville Power Administration**
 - Shall 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**
 - 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 decision-making 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.

Exemptions

- The Council adopts conditions for exemptions to this policy.
 - 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 existed, as of August 10, 1988, applications for hydroelectric projects that were in various stages of completion before the Federal Energy Regulatory Commission. In many cases the applicants made substantial investments and had completed, or nearly completed, agreements with all interested parties, including state fish and wildlife agencies. The Council recognized 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 that 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 recognizes that from time to time the designation of an unprotected area may be changed to protected. This is accomplished through a formal process under the Northwest Power Act to amend the program. If a project is moving ahead in an unprotected area -- a permit has been granted, or a license or exemption is pending -- at the time the Council enters the formal process to change the designation to protected, that project is exempted from the protected areas rule. However, it is the Council's intention that the Federal Energy Regulatory Commission gives 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

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.

Effect on riparian areas

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.

Amendment to protected area designation

- Any party may recommend an amendment to the program to change the designation of a river reach as protected or unprotected or to change the reason for a protected area.
- Before recommending a change in a protected area designation, the recommending party must notify the appropriate state and federal fish and wildlife agencies and Indian tribes and consult with those agencies and tribes regarding the proposed change in designation.

- Recommendations for a change to a designation 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 supporting the proposed change
 - 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
- The Council will decide whether to change the designation as recommended following the procedures and standards for a program amendment process under the Northwest Power Act. The Council will not designate as protected a river reach that is not protected without the concurrence of the state in which the river reach is located.

Technical corrections to protected areas data base

The Council staff is authorized, on its own initiative or on the request of any party offering technically credible information, to make minor technical corrections in the protected areas data base. Minor technical corrections include the correction of typographical errors, the correction of information regarding lengths of river reaches, and the inclusion of additional information regarding species present on a particular river reach. No technical correction shall change the protected or unprotected status or the reason for protection of a river reach.

Petitions for an exception to the protected area designation for proposed projects that will provide exceptional benefits to fish and wildlife

- Any party may file a petition with the Council for an exception to the effect of a protected area designation for a proposed project that will provide exceptional survival benefits as determined by the relevant fish and wildlife agencies and tribes for the fish, wildlife, or both that are the reason for the designation. Before filing a petition with the Council, the petitioner must notify the appropriate state and federal fish and wildlife agencies and Indian tribes and consult with those agencies and tribes regarding the petition for exception.
- 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 proposed project
 - An explanation of how the project will affect the Council's power plan and fish and wildlife program, or, if outside the Columbia River Basin, how the project will affect the plan and 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
- The Council may seek independent scientific review of the petition.
- After review, and after an opportunity for public review and comment, the Council will make a decision on the petition. The Council will approve the petition only if the Council determines the proposed project will provide exceptional benefits to fish and wildlife.

c) General implementation measures

- **Federal project operators and regulators**

- Shall review simultaneously all applications or proposals for hydroelectric development in a single river drainage, through consolidated hearings, environmental impact statements or assessments, or other appropriate methods. This review shall assess cumulative environmental effects of existing and proposed hydroelectric development on fish and wildlife.

Ensure consistency with this program

- **Federal Energy Regulatory Commission**

- Shall require all applicants for licenses (including license renewals, amendments, and exemptions) and preliminary permits in the Columbia River Basin to demonstrate in their applications how the proposed project would take this program into account to the fullest extent practicable. FERC also shall provide the Council with copies of all applications for licenses (including license renewals, amendments, and exemptions) and preliminary permits in the Columbia River Basin so that the Council can comment in a timely manner on the consistency of the proposed project with this fish and wildlife program. This provision is not intended to supplant review of such applications by the fish and wildlife agencies and tribes.

- **Federal land managers, federal and state fish and wildlife agencies and other state agencies**

- Federal and state fish and wildlife agencies and federal resource agencies shall 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 that federal land managers incorporate the development provisions of this program into their permit procedures related to hydroelectric development on lands they manage. And the Council requests that state agencies that grant permits for hydroelectric projects also apply these principles.

- **Corps of Engineers, Bureau of Reclamation, and any other federal agency studying or proposing hydroelectric development in the Columbia River Basin**
 - Shall provide opportunity for Council review and comment.

G. Climate change impacts in the Columbia River Basin

The purpose of this appendix is to identify possible future climate change impacts in the Columbia River Basin, based on literature review and available climate change studies. Most predicted impacts are associated with projected increases in air and water temperatures and include increased stress on coldwater fisheries sensitive to a warming aquatic habitat, potentially improved habitat for invasive Dreissenid mussels having implications for maintenance of hydraulic structures, and increased risk of watershed vegetation disturbances due to increased fire potential. Drought and hot, dry weather have led to an increase in outbreaks of insects in the Columbia Basin, especially mountain pine beetle, and insect outbreaks are likely to become more common and widespread. Other warming-related impacts include pole-ward shifts in the geographic range of various species, impacts on the timing of arrival and departure of migratory species, amphibian population declines, and effects on pests and pathogens in ecosystems. Climate change can also trigger synergistic and cascading effects in ecosystems and exacerbate non-native and invasive species problems.

Changes in hydrologic flow regimes and warming stream and reservoir temperatures caused by a warming climate will pose significant threats to aquatic ecosystems and are expected to alter key habitat conditions for salmon and other cold water aquatic species such as trout. For example, bull trout require very cold headwater streams for spawning, and a warming climate may disproportionately affect this species. Salmonids and other cold water species currently living in conditions near the upper range of their thermal tolerance will be particularly vulnerable to increased mortality and susceptibility to disease from higher water temperatures.

Anticipated climate change effects in the Northwest include specific hydrologic changes such as increased frequency and severity of winter flooding in mixed rain-snow basins. Region-wide increases in winter flows and summer temperatures, combined with lower summer flows, will threaten many freshwater species, particularly salmon, steelhead, and trout. Higher winter water temperatures also could accelerate embryo development and cause premature emergence of fry in basin tributaries. Rising temperatures will also increase disease and mortality in several salmon species such as spring/summer Chinook and sockeye, especially in interior Columbia and Snake river basins. Some Northwest streams have already warmed, on average, over the past three decades, contributing to changes such as earlier Columbia River sockeye migration.

As species respond to climate changes in various ways, there is also a potential for ecological mismatches to occur, such as the timing of emergence of predators and their prey. For example, increases in stream temperature are expected to result in greater habitat overlap between juvenile Chinook salmon and predatory

non-native species such as bass in the early summer, as well as greater abundance of bass and other warm water predator species.

Climate change could also have significant effects on mainstem Columbia and Snake river flows and habitat in terms of runoff timing, water quantity, and temperature, impacting salmon in various ways. It is believed that mainstem temperature increases would accelerate the rate of egg development of fall Chinook, which spawn in the mainstem of the Snake and Columbia rivers, leading to earlier emergence at a smaller size than historically. Smaller-sized fry are likely to have lower survival due to increased vulnerability to predators, and predation rates would also likely increase. Potential impacts of increased water temperatures on adult salmon migration in the mainstem include delays in dam passage, failure to enter (or exit) fish ladders, increased fallback, and loss of energy reserves due to increased metabolic demand. Increased adult salmon mortality may also be caused by fish pathogens and parasites, as these organisms often do not become injurious until the host becomes thermally stressed.

Changes in freshwater flow into the Columbia River estuary caused by climate change are expected to be less than those caused by the hydrosystem. However, some changes in estuary habitats may occur. For example, sea level rise, in conjunction with higher winter river flows, could cause the degradation of estuary habitats created by sediment deposition from increased wave damage during storms. Numerous warm-water adapted fish species, including several non-indigenous species, normally found in freshwater have been reported in the estuary and might expand their populations and range with warmer water and seasonal expansion of freshwater habitats. Climate change also may affect the trophic dynamics of the estuary due to upstream extension of the salt wedge in spring/early summer caused by reduced river flows. The upriver head of the salt wedge is characterized by a turbulent region known as the estuary turbidity maximum, an area with high concentrations of fish food organisms. Changes in the upstream extension of the salt wedge will influence the location of this zone, but it is difficult to forecast the effect this change will have on juvenile salmon.

Scientific evidence strongly suggests that global climate change is already altering marine ecosystems. Physical changes associated with warming include increases in ocean temperature, increased stratification of the water column, and changes in the intensity and timing of coastal upwelling, as well as increases in ocean acidification and hypoxia events. These changes will alter ocean productivity, the structure of marine communities, and, in turn, the growth, productivity, survival, and migration patterns of anadromous fish.

The possible changes in regional snowpack, river flows, temperatures, and reservoir elevations due to climate change could have a profound impact on the success of habitat restoration efforts under the program and the status of Columbia River Basin fish and wildlife populations. The Independent Scientific

Advisory Board produced a report on potential climate change impacts in the Columbia River Basin. See [ISAB Report 2007-2, *Climate Change Impacts on Columbia River Basin Fish and Wildlife*](#).

H. Fish Passage Center

The Council has established an oversight board for the Center, with representation from NOAA Fisheries, state fish and wildlife agencies, tribes, the Council, and others to ensure that the functions are implemented consistent with the Council's program. The oversight board will conduct an annual review of the performance of the center and develop a goal-oriented implementation plan to assure regional accountability and compatibility with the regional data management system, as well as program consistency. The oversight board will also work with the center and the ISAB to organize a regular system of independent and timely science review of analytical products. The oversight board shall determine the requirements for peer review of analytical products. The center shall prepare an annual report to the oversight board and the council, summarizing its activities and accomplishments. There will be no other oversight board or board of directors for the center.

Implementation shall include funds for a manager and for technical and clerical support necessary in order to perform the stated functions. The fish passage manager will be selected based on his or her 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 fish and wildlife agencies, tribes, the Council, project operators, regulators, and other interested parties, including members of the public. The manager shall be supervised by the contracting entity selected by Bonneville, and the contractor shall have the authority and obligation to conduct an annual performance review of the manager, after consultation with the oversight board.

Operation of the center should include a person with expertise in analyzing storage reservoir operations and in-season impacts on resident fish from operations of the Federal Columbia River Power System. When carrying out its functions, the center should consult with fish and wildlife managers who have knowledge and expertise on reservoir operations and resident fish requirements.

The center shall continue to provide an empirical data base of fish passage information for use by the region, not just by fish and wildlife managers. No information collected -- and no analyses -- shall be considered proprietary. The oversight board and the fish and wildlife managers will ensure that the data base conforms to appropriate standards for data management, including review of the data base by an appropriate scientific or data-review group. The Council may revise the center's fish-passage data collection functions as the region develops a comprehensive data management system.

I. Alternative operations at Grand Coulee

Operate Grand Coulee Dam from July through December consistent with the following considerations:

- Subject to in-season management, draft Lake Roosevelt to the target elevations of 1,278 or 1,280 feet by the end of August. As specified in Washington’s *Columbia River Basin Water Management Program*, by the end of August Lake Roosevelt may be drafted an additional 1.0 foot in non-drought years and by about 1.8 feet in drought years. As much as possible within current operating constraints, manage the reservoir and dam discharges to minimize fluctuations and ramping rates and produce steady flows across each season and each day
- From September through December, attempt to maximize water retention times and protect kokanee access and spawning. Federal action agencies, fish and wildlife agencies and tribes, and others should consult within the in-season management process to determine how to provide the biological benefits above while meeting biological opinion requirements, including chum flows, and operating to protect flows for the Hanford Reach.
- Two high priorities for Grand Coulee through the year should be to contribute to the establishment and protection of the necessary spawning and rearing conditions in the Hanford Reach described above and to refill by the end of June, subject to in-season management. Summer and fall operations should be consistent with these priorities.

Period	Minimum Mean Minimum Elevation	Water Retention Time
January	1,270 ft above sea level	45 days
February	1,260	40 days
March-April 15	1,250	30 days
April 16	1,255	30 days
May	1,265	35 days
June	Fill to 1,290	40-60 days or maximum historically achievable for each month

J. Wildlife crediting forum

In 2010 the Council chartered the Wildlife Crediting Forum to provide advice on the crediting and accounting of wildlife habitat mitigation associated with the construction and inundation impacts of the Federal Columbia River Power System (FCRPS). The forum submitted its [final report](#) to the Council in September 2011. It was accepted by the Council and published on the Council's website. The forum agreed on the following protocols and standards:

- Establishment of a ledger depicting the current status of Bonneville-funded wildlife mitigation activities
- Development of standard operating procedures for future applications of HEP
- Development of protocols for determining the amount of credit Bonneville should receive for management actions that occur on federal lands
- Development of protocols for determining the amount of credit that Bonneville should receive for fish mitigation projects that benefit wildlife
- Acceptance of the fish and wildlife program loss assessments as the agreed-upon measure of wildlife losses

Future wildlife mitigation efforts should rely on these protocols and standards as the basis for determining the amount of mitigation credit that Bonneville should receive for mitigation activities.

K. Resident fish mitigation settlements

Perpetual land protection efforts are one of the most effective ways to address losses of resident fish and changes to other freshwater species. This includes conservation easements, land purchases, or other long term measures. When purchasing land parcels, priority should be given to those that connect healthy riparian and stream habitat, as these will improve fish habitat resiliency as climate change and climate variability take effect.

General measures

- In areas of the basin where quantitative assessments of native resident fish losses have been completed, and mitigation based on native resident fish is not feasible, perpetual land acquisitions should be used, at a minimum ratio of 1:1 mitigation to lost distance or area, to benefit fish habitat as a primary tool for mitigation and settlement.
- Whenever possible, resident fish mitigation through habitat acquisitions should take place through settlement agreements that have clear objectives, a plan for action over time, a committed level of funding that provides a substantial likelihood of achieving and sustaining the stated mitigation objectives, and provisions to ensure effective implementation with periodic monitoring and evaluation. Resident fish mitigation agreements should be permanent or span multiple years and be long-term in duration. These agreements should include:
 - Measurable objectives, including the estimated resident fish habitat losses addressed by acquisitions
 - Demonstration of consistency with the policies, objectives, and strategies in the Council's program
 - Adherence to the open and public process language found in the Northwest Power Act, including measures to address concerns over additions to public land ownership and impacts on local communities, such as a reduction or loss of local government tax base or the local economic base, and consistency with local governments' comprehensive plans
 - When possible, provide protection for riparian habitat that can benefit both fish and wildlife, and protection for high-quality native habitat and species of special concern, including endangered, threatened, or sensitive species
 - Assurance for effective implementation of the agreement, with periodic monitoring and evaluation (including a periodic audit) and reporting of results; at a minimum, annual reports to Bonneville must continue in order for the Council to evaluate the mitigation benefits
 - Assurance of long-term maintenance of the habitat adequate to sustain the habitat values stated in the agreement for the life of the project (this is a requirement), along with a committed level of funding that provides a substantial likelihood of achieving and sustaining the resident fish mitigation objectives
 - Adequate funding for operation and maintenance

- Resident fish mitigation agreements may include the protection of undegraded or less degraded habitat or, in appropriate circumstances may include protection and improvement of degraded habitat when necessary for effective mitigation. In the latter case, any mitigation agreements with Bonneville should include sufficient funding to enhance, restore, and create habitat functions and values for the target species of resident fish on acquired lands that are degraded.
- Resident fish mitigation agreements may represent incremental mitigation based on individual habitat acquisitions. However, where a resident fish loss assessment has been developed for a particular hydropower facility or for an entire subbasin using the best available scientific methods and the loss assessment has been accepted as part of the program, the Council encourages mitigation settlement agreements.
- The Bonneville Power Administration will require, wherever possible, that resident fish mitigation agreements through habitat acquisitions include a management plan with clear objectives; a plan for action over time; a committed level of funding that ensures long term maintenance to sustain the stated mitigation objectives; and provisions to ensure effective implementation with periodic monitoring and evaluation.

Management plan and operation and maintenance funding

- Resident fish mitigation agreements shall include a management plan agreed to by Bonneville and the management entity adequate to sustain the minimum credited habitat values for the life of the project. Agreements shall include sufficient funding for operation and maintenance over the long term to demonstrate a substantial likelihood of achieving and sustaining the mitigation objectives.

L. Reporting

The [Council's annual report to Governors and Congress](#) (for example, the 2013 Columbia River Basin Fish and Wildlife Program Costs Report) provides an accounting of fish and wildlife expenditures and hydropower operation costs, and how program projects are being adapted to focus on high-priority limiting factors and focal species in priority areas. The report will include a discussion of any data gaps, redundancies and recommended changes to achieve greater efficiencies. The report is compiled by the Council from data provided by Bonneville.

Science/policy exchanges: These exchanges inform the region about emerging information, innovative tools, and critical research uncertainties that may have program policy implications such as updating its priority research uncertainties. These exchanges are organized by Council in collaboration with the Independent Scientific Advisory Board (ISAB) and other interested parties, as needed, and serve to inform the Columbia River Basin's Fish and Wildlife agencies and tribes (agencies and tribes), researchers, and policy-makers.

Council topic-specific tracking: This tracking will include: (1) starting in 2015 annual anadromous fish forecasts and results; (2) Annual reports by Bonneville and the hatchery managers on the number of juvenile fish released each year; the number of adults that contribute to harvest, are used for broodstock, and are present on the spawning grounds for all hatchery programs that receive Bonneville funding. The first report should be submitted in December 2014. Council staff, Bonneville, fish and wildlife agencies and tribes and other experts will prepare these topic-specific reports as requested by the Council for informing the Council and policy-makers.

Council's high-level indicator report: This is a web-based report of highly synthesized information that is conveyed graphically, related to the program's objectives and funded actions, supported by the dashboard's content, and is collaboratively updated as new information is made available. This report is produced annually by the Council in collaboration with the data providers, including agencies and tribes, to inform policy-makers and ratepayers.

Council's dashboard: This is a web-based report providing synthesis of information representing the scope of the program's mitigation, protection, and enhancement efforts related to the program's focal species and their habitat. The dashboards are updated as needed by the Council.

Action effectiveness report: This report from Bonneville assesses and reports on the status of evidence for the effectiveness of actions in altering physical habitat conditions, and as feasible, fish populations. This report will be compiled in collaboration with agencies and tribes and project sponsors who contribute data informing this assessment. Each report will provide an assessment of a

subset of action categories¹² implemented under the current program since the last one was adopted. These are produced by Bonneville one year prior to the start of each program amendment process to inform the Council, the Columbia River Basin fish and wildlife agencies and tribes and researchers, and ratepayers.

[Annual project progress reports](#)[🔗]: These reports will be produced by project sponsors and submitted electronically to Bonneville in a format and with content requested by Bonneville consistent with the following guidelines:

- Bonneville should require all research, monitoring and evaluation projects to report annually, providing an electronic summary of their results and interim findings as well as describing benefits to fish and wildlife.
- Reports for monitoring and research activities will include as a minimum: clear objectives and hypothesis, linkage to program priorities, description of any treatments applied, scientific methods including designs and protocols, statistical analyses, statistical results, conclusions, summary of accomplishments to-date, and implications for fish, wildlife, and their habitat.
- At a minimum, all projects must have implementation monitoring that must be reported to Bonneville within six months of completion of the project or annually in the case of multi-year projects.
- Bonneville, in its contracting process, should ensure that each project adheres to the relevant protocols and methods and satisfies the reporting and data-management criteria described in this program or as adopted by the Council.
- An annual project progress report will be a stand-alone, complete document that does not rely on other documents, such as past annual project progress reports, to provide information needed to assess what has been done.

The Council expects that the organization and content of these reports will evolve over time to make them more comprehensive and accessible for the purpose of addressing information needs of Bonneville, the Council, and the ISRP including, for example, the ISRP's project reviews and program retrospective reports.


[ISAB review of the fish and wildlife program](#)[🔗]: This review evaluates the program on its scientific merits to inform the Council, agencies, tribes, and researchers.


[ISAB topic-specific reports](#)[🔗]: **These reports** provide independent scientific advice and recommendations regarding [scientific issues](#)[🔗] as requested by the

¹² Action category refers to groups of identical actions implemented under the program, such as hatchery releases, riparian plantings, invasive species removal, and instream large wood-debris additions.

ISAB's administrative oversight panel and serves to inform the Council, NOAA Fisheries, agencies, tribes, and researchers.

ISRP recommendations based on the review of projects directly funded under the program: The ISRP provides this review as requested by the Council, following a specific set of criteria, to inform the Council's recommendations to Bonneville. The Council will ask Bonneville to assist in extracting relevant information from annual project reports for the ISRP's review process. This review informs the Council, agencies, tribes, researchers, and Bonneville.

ISRP  retrospective review of program accomplishments: The ISRP with assistance from the scientific peer review groups reviews annually the results of prior-year expenditures based on the project review criteria, focusing on measurable benefits to fish and wildlife, and submits its findings to the Council. This report informs the Council, Bonneville, agencies, tribes, and rate-payers. As part of this report, the ISRP should summarize (1) major basinwide programmatic issues identified during project reviews, and (2) findings from Bonneville's summary of monitoring research and findings.

ISRP  recommendation based on the review of projects funded through Bonneville's reimbursable program: The ISRP is responsible to review the fish and wildlife projects, programs, or measures included in federal agency budgets that are reimbursed by Bonneville, using the same standards and making recommendations as in its review of the projects proposed to implement the Council's program. This review is produced as requested by the Council and serves to inform the Council, Bonneville, and project sponsors.

In addition, for this review the Council suggests the use of the reporting and project management standards of relevant NOAA Fisheries' biological opinions for projects intended to meet the goals and objectives of those biological opinions.

M. List of subbasin plans and adoption dates

Table 1. Geographic subbasins in the Columbia River Basin and their adoption dates

Subbasin Name	Year Plan Adopted
Asotin	2004
Big White Salmon	2004
Bitterroot	2010
Blackfoot	2011
Boise	2005
Bruneau	2004
Burnt	2005
Clark Fork	
Clearwater	2005
Coeur d'Alene, including Coeur d'Alene Lake	2004
Columbia Estuary (Columbia River and tributaries from the ocean upstream to the Cowlitz River)	2005
Columbia Gorge (Columbia River and tributaries between, and including Bonneville and The Dalles dams)	2004
Columbia Lower (Columbia River and tributaries upstream of the Cowlitz to Bonneville Dam)	2005
Columbia Lower Middle (Columbia River and tributaries upstream of The Dalles including Wanapum Dam)	2005
Columbia Upper (Columbia River and tributaries from Chief Joseph Dam to the international border)	2004
Columbia Upper Middle (Columbia River and tributaries upstream of Wanapum Dam to Chief Joseph Dam)	2004
Cowlitz	2005
Crab	
Deschutes	2005
Elochoman	2005
Entiat	2005
Fifteenmile	2004
Flathead	2004
Grande Ronde	2005
Grays	2005
Headwaters of the Snake (Snake River and tributaries from the Heise gauging station upstream)	2005
Hood	2004
Imnaha	2005
John Day	2005
Kalama	2005
Klickitat	2005
Kootenai	2004
Lake Chelan	2004
Lewis	2005
Little White Salmon	2005
Malheur	2004
Methow	2005
Okanogan	2005
Owyhee	2004
Palouse	
Payette	2005
Pend Oreille	2004
Powder	2005
Salmon	2004
San Poil	2004
Sandy	
Snake Hells Canyon (Snake River and tributaries above the Clearwater River including Hells Canyon Dam)	2005
Snake Lower (Snake River and tributaries between the Columbia River and the Clearwater River)	2004
Snake Lower Middle (Snake River and tributaries upstream of Hells Canyon Dam to the Boise River)	2005
Snake Upper Middle (Snake River and tributaries from the Boise River upstream to Clover Creek)	2005
Spokane	2004
Tucannon	2004

Umatilla	2004
Upper Closed Basin (Snake River)	2005
Upper Snake (Snake River and tributaries from Clover Creek upstream to the Henry's Fork headwaters)	2005
Walla Walla	2005
Washougal	2005
Weiser	2005
Wenatchee	2005
Willamette	2004
Wind	2005
Yakima	2005

N. Species

Focal species are identified in the subbasin plans. Below is a general list of the program's 275 focal species. However to verify that a species is considered a focal species in a given subbasin, please refer to the [subbasin plans](#).

Anadromous Fish Focal Species (6 species)

Common Name	Scientific Name
Chinook salmon	<i>Onchorynchus tshawytscha</i>
Chum salmon	<i>Oncorhynchus keta</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Pacific lamprey	<i>Entosphenus tridentatus</i>
Sockeye salmon	<i>Oncorhynchus nerka</i>
Steelhead	<i>Oncorhynchus mykiss</i>

Resident Fish Focal Species (22 species)

Common Name	Scientific Name
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Bull trout	<i>Salvelinus confluentus</i>
Burbot	<i>Lota lota</i>
Coastal cutthroat trout	<i>Oncorhynchus clarki clarki</i>
Cutthroat trout	<i>Oncorhynchus clarki</i>
Freshwater sponge	<i>Ephydatia cooperensi</i>
Green sturgeon	<i>Acipenser medirostris</i>
Kokanee	<i>Oncorhynchus nerka</i>
Largemouth bass	<i>Micropterus salmoides</i>
Molluscs	<i>Mollusca</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Oregon chub	<i>Oregonichthys Crameri</i>
Redband trout	<i>Oncorhynchus mykiss gairdneri</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Walleye	<i>Stizostedion vitreum vitreum</i>
Westslope cutthroat trout	<i>Oncorhynchus clarki lewisi</i>
White sturgeon	<i>Acipenser transmontanus</i>
Wood River sculpin	<i>Cottus leiopomus</i>
Yellow perch	<i>Perca flavescens</i>
Yellowstone cutthroat trout	<i>Oncorhynchus clarkii bouvieri</i>

Wildlife Focal Species (209 species)

Common Name	Scientific Name
Acorn woodpecker	<i>Melanerpes formicivorus</i>
Agapetus caddisfly	<i>Agapetus montanu</i>
American avocet	<i>Recurvirostra americana</i>
American beaver	<i>Castor canadensis</i>

American bittern	<i>Botaurus lentiginosus</i>
American crow	<i>Corvus brachyrhynchos</i>
American dipper	<i>Cinclus mexicanus</i>
American marten	<i>Martes americana</i>
American pika	<i>Ochotona princeps</i>
American white pelican	<i>Pelecanus erythrorhynchos</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Banbury Springs lanx	<i>Lanx sp.</i>
Band-tailed pigeon	<i>Columba fasciata</i>
Barn owl	<i>Tyto alba</i>
Barrow's goldeneye	<i>Bucephala islandica</i>
Big brown bat	<i>Eptesicus fuscus</i>
Bighorn sheep	<i>Ovis canadensis</i>
Bitterroot mountainsnail	<i>Oreohelix amariradix</i>
Black bear	<i>Ursus americanus</i>
Black swift	<i>Cypseloides niger</i>
Black tern	<i>Chlidonias niger</i>
Black-backed woodpecker	<i>Picoides arcticus</i>
Black-chinned hummingbird	<i>Archilochus alexandr</i>
Black-crowned night heron	<i>Nycticorax nycticoras</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>
Bliss Rapids snail	<i>Taylorconcha serpenticola</i>
Blue grouse	<i>Dendragopus obscurus</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Boreal owl	<i>Aegolius funereus</i>
Boreal toad	<i>Anaxyrus boreas</i>
Brewer's sparrow	<i>Spizella breweri</i>
Brown creeper	<i>Certhia americana</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Bruneau hot springsnail	<i>Pyrgulopsis bruneauensis</i>
Burrowing owl	<i>Athene cunicularia</i>
Bushy-tailed woodrat	<i>Neotoma cinerea</i>
California bighorn sheep	<i>Ovis canadensis californiana</i>
California quail	<i>Callipepla californica</i>
Calliope hummingbird	<i>Stellula calliope</i>
Canada goose	<i>Branta canadensis</i>
Canada lynx	<i>Lynx canadensis</i>
Carinate mountainsnail	<i>Oreohelix elrod</i>
Cascades frog	<i>Rana cascadae</i>
Caspian tern	<i>Hydroprogne caspia</i>
Cassin's finch	<i>Carpodacus cassinii</i>
Chipping sparrow	<i>Spizella passerina</i>
Clark's nutcracker	<i>Nucifraga columbiana</i>
Coastal tailed frog	<i>Ascaphus truei Stejneger</i>
Coeur d'Alene salamander	<i>Plethodon idahoensis</i>
Columbian black-tailed deer	<i>Odocoileus hemionus columbianus</i>

Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>
Columbian white-tailed deer	<i>Odocoileus virginianus leucurus</i>
Common loon	<i>Gavia immer</i>
Common nighthawk	<i>Chordeiles minor</i>
Common snipe	<i>Gallinago gallinago</i>
Common tern	<i>Sterna hirundo</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Cordilleran flycatcher	<i>Empidonax occidentalis</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Dunlin	<i>Calidris alpina</i>
Elk	<i>Cervus canadensis</i>
Fender's blue butterfly	<i>Icaricia icarioides fenderi</i>
Ferruginous hawk	<i>Buteo regalis</i>
Fisher	<i>Martes pennant</i>
Flammulated owl	<i>Otus flammeolus</i>
Foster's tern	<i>Sterna forsteri</i>
Franklin's gull	<i>Leucophaeus pipixcan</i>
Fringed myotis bat	<i>Myotis thysanode</i>
Gillette's checkerspot	<i>Euphydryas gillettii</i>
Golden eagle	<i>Aquila Chrysaetos</i>
Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Gray (Hungarian) partridge	<i>Perdix perdix</i>
Gray flycatcher	<i>Empidonax wrightii</i>
Gray wolf	<i>Canis lupus irremotus</i>
Gray-crowned rosy-finch	<i>Leucosticte tephrocotis</i>
Great Basin Spadefoot	<i>Spea intermontana</i>
Great blue heron	<i>Ardea herodias</i>
Great gray owl	<i>Strix nebulosa</i>
Great horned owl	<i>Bubo virginianus</i>
Greater sandhill crane	<i>Grus canadensis tabida</i>
Green heron	<i>Butorides virescens</i>
Green-tailed towhee	<i>Pipilo chlorurus</i>
Grey flycatcher	<i>Muscicapa griseisticta</i>
Grizzly bear	<i>Ursus arcto</i>
Gyr Falcon	<i>Falco rusticolus</i>
Hammond's flycatcher	<i>Empidonax hammondii</i>
Harlequin duck	<i>Histrionicus histrionicus</i>
Hoary bat	<i>Lasiurus cinereus</i>
Hoary marmot	<i>Marmota caligata</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
Horned grebe	<i>Podiceps auritus</i>
Horned lark	<i>Eremophila alpestris</i>
House finch	<i>Carpodacus mexicanus</i>
Idaho springsnail	<i>Pyrgulopsis idahoensis</i>
Larch Mountain salamander	<i>Plethodon larselli</i>

Lark sparrow	<i>Chondestes grammacus</i>
Lazuli bunting	<i>Passerina amoena</i>
LeConte's sparrow	<i>Ammodramus leconteii</i>
Leopard frog	<i>Rana pipiens</i>
Lewis' woodpecker	<i>Melanerpes lewis</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Long-billed curlew	<i>Numenius americanus</i>
Long-toed salamander	<i>Ambystoma macrodactylum</i>
Lyre mantleslug	<i>Udosarx lyrat</i>
Magnum mantleslug	<i>Magnipelta mycophag</i>
Mallard	<i>Anas platyrhynchos</i>
Marbled Jumping-slug	<i>Hemphillia danielsi</i>
Marbled murrelet	<i>Brachyramphus marmoratus</i>
Merlin	<i>Falco columbarius</i>
Millipede	<i>Austrotyla montani</i>
Millipede	<i>Corypus cochlearis</i>
Mink	<i>Mustela vison</i>
Montane vole	<i>Microtus montanus</i>
Moose	<i>Alces alces</i>
Mountain goat	<i>Oreamnos americanus</i>
Mountain quail	<i>Oreortyx pictus</i>
Mule deer	<i>Odocoileus hemionus</i>
Northern alligator lizard	<i>Elgaria coerulea</i>
Northern bog lemming	<i>Synaptomys boreali</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern harrier	<i>Circus cyaneus</i>
Northern Idaho ground squirrel	<i>Spermophilus brunneus brunneus</i>
Northern pocket gopher	<i>Thomomys talpoides</i>
Northern pygmy-owl	<i>Glaucidium gnoma</i>
Northern sagebrush lizard	<i>Sceloporus graciosus graciosus</i>
Northern spotted owl	<i>Strix occidentalis caurina</i>
Nuttall's cottontail	<i>Sylvilagus nuttallii</i>
Olive-sided flycatcher	<i>Contopus cooperi</i>
Oregon slender salamander	<i>Batrachoseps wrightorum</i>
Oregon spotted frog	<i>Rana pretiosa</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Preble's shrew	<i>Sorex preblei</i>
Pronghorn antelope	<i>Antilocapra americana</i>
Purple martin	<i>Progne subis</i>
Pygmy nuthatch	<i>Sitta pygmaea</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Raccoon	<i>Procyon lotor</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Red tree vole	<i>Arborimus longicaudus</i>
Red-eyed vireo	<i>Vireo Olivaceus</i>

Redhead	<i>Aythya americana</i>
Red-legged frog	<i>Rana draytonii</i>
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Ring-necked pheasant	<i>Phasianus colchicus</i>
River otter	<i>Lutra canadensis</i>
Rocky Mountain elk	<i>Cervus elaphus nelsoni</i>
Rocky Mountain mule deer	<i>Odocoileus hemionus hemionus</i>
Ruffed grouse	<i>Bonasa umbellus</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Sage grouse	<i>Centrocercus urophasianus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Sandhill crane	<i>Grus canadensis</i>
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>
Sharptailed snake	<i>Contia tenuis</i>
Sheathhead slug	<i>Zacoleus idahoensis</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Smoky tailedropper	<i>Prophyaon humil</i>
Snake River physa	<i>Physa natricina</i>
Snowshoe hare	<i>Lepus americanus</i>
Snowy owl	<i>Nyctea scandiaca</i>
Snowy porter	<i>Charadrius alexandrinus</i>
Sora	<i>Porzana carolina</i>
Southern alligator lizard	<i>Elgaria multicarinatus</i>
Southern red-backed vole	<i>Myodes gapperi</i>
Southwestern Willow flycatcher	<i>Empidonax traillii adastus</i>
Spalding's catchfly	<i>Silene spaldingii</i>
Spotted bat	<i>Euderma maculatum</i>
Spotted frog	<i>Rana luteiventris</i>
Spotted owl	<i>Strix occidentalis</i>
Spotted skunk	<i>Spilogale gracilis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Taylor's checkerspot butterfly	<i>Euphydryas editha taylori</i>
Three-toed woodpecker	<i>Picoides tridactylus</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
Townsend's western big-eared bat	<i>Corynorhinus townsendii townsendii</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Tundra swan	<i>Cygnus columbianus</i>
Turkey vulture	<i>Cathartes aura</i>
Utah valvata snail	<i>Valvata utahensis</i>
Vaux's swift	<i>Chaetura vauxi</i>
Veery	<i>Catharus fuscescens</i>
Vesper sparrow	<i>Poocetes gramineus</i>
Washington ground squirrel	<i>Spermophilus washingtoni</i>
Western bluebird	<i>Sialia mexicana</i>

Western Grebe	<i>Aechmoporus occidentalis</i>
Western grey squirrel	<i>Sciurus griseus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Western pond turtle	<i>Clemmys marmorata</i>
Western rattlesnake	<i>Crotalus viridis</i>
Western skink	<i>Eumeces skiltonianu</i>
Western toad	<i>Bufo boreas</i>
Western wood-pewee	<i>Contopus sordidulus</i>
Western yellow-billed cuckoo	<i>Coccyzus americanus</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
White-faced ibis	<i>Plegadis chihi</i>
White-headed woodpecker	<i>Picoides albolarvatus</i>
White-tailed ptarmigan	<i>Lagopus leucura</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Willow flycatcher	<i>Empidonax traillii</i>
Winter wren	<i>Troglodytes troglodytes</i>
Wolverine	<i>Gulo gulo</i>
Wood duck	<i>Aix sponsa</i>
Yellow pine chipmunk	<i>Neotamias amoenus</i>
Yellow warbler	<i>Dendroica petechia</i>
Yellow-breasted chat	<i>Icteria virens</i>

O. Subbasin and basinwide measures

Fish and Wildlife Program measures

The Council received recommendations containing extensive lists of specific action measures for implementation in the next 5-10 years in these tributary subbasins, specific mainstem reaches, and the estuary. These specific measures cover an extensive array of habitat, production, and monitoring, evaluation and research activities. [Part Six, section I](#) includes conditions under which all such measures will be implemented.

1. Subbasin measures

Columbia Estuary Subbasin

Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Lower Columbia Fish Recovery Board [2009](#) and [Plan, 2014](#)
Lower Columbia River Estuary Partnership [2009](#) and [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Cowlitz, Elochoman, Grays, Kalama, Lewis, Little White Salmon, Lower Columbia Mainstem, Washougal, Wind Subbasins

Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Lower Columbia Fish Recovery Board [2009](#) and [Plan, 2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)
Natural Solutions [2009](#)

Willamette Subbasin

Columbia Basin Fish Accords-[Warm Springs](#)
The Confederated Tribes of Grande Ronde [2009](#) and [2014](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Willamette Biological Opinion [2008](#) (section 9)
City of Portland [2009](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Sandy Subbasin

Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan

White Salmon Subbasin

Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Fifteenmile Subbasin

Columbia Basin Fish Accords-[Warm Springs](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Hood Subbasin

Columbia Basin Fish Accords-[Warm Springs](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Hood Watershed Group [2009](#) and [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Klickitat Subbasin

Columbia Basin Fish Accords - [Yakama](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Columbia Gorge mainstem subbasin

Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Northwest Sportsfishing Industry Association [2009](#) and [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Crab Subbasin

Washington Department of Fish and Wildlife [2009](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Deschutes Subbasin

Columbia Basin Fish Accords-[Warm Springs](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Deschutes Basin Board of Control [2009](#)
Deschutes River Conservancy [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

John Day Subbasin

Columbia Basin Fish Accords -[Umatilla](#)
Columbia Basin Fish Accords-[Warm Springs](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Palouse Subbasin

Washington Department of Fish and Wildlife [2009](#)

FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Tucannon Subbasin

Nez Perce Tribe [2009](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Snake River Salmon Recovery Plan for Southeast Washington [2009](#) and [plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Umatilla Subbasin

Columbia Basin Fish Accords -[Umatilla](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Walla Walla Subbasin

Columbia Basin Fish Accords -[Umatilla](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Snake River Salmon Recovery Plan for Southeast Washington [2009](#) and [plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Yakima Subbasin

Columbia Basin Fish Accords - [Yakama](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Yakima steelhead recovery plan [2009](#) and [plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Lower Middle Columbia/Lower Snake Subbasins

Columbia Basin Fish Accords - [Yakama](#)
Nez Perce Tribe [2009](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Snake River Salmon Recovery Plan for Southeast Washington [2009](#) and [plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Entiat Subbasin

Columbia Basin Fish Accords - [Yakama](#)
Columbia Basin Fish Accords - [Colville](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Board [2009](#)
and [Plan](#)

Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Lake Chelan Subbasin

Washington Department of Fish and Wildlife [2009](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Methow Subbasin

Columbia Basin Fish Accords - [Yakama](#)
Columbia Basin Fish Accords - [Colville](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Board [2009](#)
and [Plan](#)
Methow Conservancy [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Okanogan Subbasin

Columbia Basin Fish Accords - [Colville](#)
Washington Department of Fish and Wildlife [2009](#)
Upper Columbia United Tribes [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Board [2009](#)
and [Plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Wenatchee Subbasin

Columbia Basin Fish Accords - [Yakama](#)
Columbia Basin Fish Accords - [Colville](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Board [2009](#)
and [Plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Upper Middle Columbia Subbasin

Columbia Basin Fish Accords - [Colville](#)
Columbia Basin Fish Accords - [Yakama](#)
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Board [2009](#)
and [Plan](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Coeur d'Alene Subbasin

Coeur d'Alene Tribe [2009](#)

Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
Upper Columbia United Tribes [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Pend Oreille Subbasin

Coeur d'Alene Tribe [2009](#)
Columbia Basin Fish Accord - [Kalispel](#) and Kalispel Tribe [2009](#) and [2014](#),
Kootenai Tribe of Idaho recommendation [2009](#)
Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
Upper Columbia United Tribes [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

San Poil/Lake Rufus Woods/Upper Columbia Mainstem Subbasins

Columbia Basin Fish Accords - [Colville](#)
Spokane Tribe of Indians [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#)
Upper Columbia United Tribes [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Spokane Subbasin

Coeur d'Alene Tribe [2009](#) and [2014](#)
Spokane Tribe of Indians [2009](#) and [2014](#)
Upper Columbia United Tribes [2014](#)
Washington Department of Fish and Wildlife [2009](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Flathead Subbasin

Columbia Basin Fish Accords - [Montana](#) and Montana Fish Wildlife and Parks [2009](#) and [2014](#)
Confederated Salish and Kootenai Tribes [2009](#) and [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Kootenai Subbasin

Columbia Basin Fish Accords - [Montana](#) and Montana Fish Wildlife and Parks [2009](#) and [2014](#)
Kootenai Tribe of Idaho recommendation [2009](#) and [2014](#)
Confederated Salish and Kootenai Tribes [2009](#) and [2014](#)
Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
Upper Columbia United Tribes [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Libby Dam [biological opinion](#), Libby Dam Biological Opinion [settlement agreement](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Asotin Subbasin

Nez Perce Tribe [2009](#)
Washington Department of Fish and Wildlife [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Snake River Salmon Recovery Plan for Southeast Washington [2009](#) and [plan](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Grande Ronde Subbasin

Columbia Basin Fish Accords -[Umatilla](#)
Nez Perce Tribe [2009](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Imnaha Subbasin

Nez Perce Tribe [2009](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Snake Hells Canyon Subbasin

Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Clearwater Subbasin

Columbia Basin Fish Accords ([Shoshone-Bannock](#)) and Shoshone-Bannock Tribes [2009](#)
Nez Perce Tribe [2009](#)
Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Salmon Subbasin

Columbia Basin Fish Accords ([Shoshone-Bannock](#)) and Shoshone-Bannock Tribes [2009](#)
Nez Perce Tribe [2009](#)
Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
Oregon Department of Fish and Wildlife [2014](#)
FCRPS Biological Opinion [2014](#) implementation plan
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

Boise/Payette/Weiser, Bruneau, Burnt, Malheur, Middle Snake, Owyhee, Powder, Upper Snake Subbasins

Burns Paiute Tribe [2009](#) and [2014](#)
Columbia Basin Fish Accords ([Shoshone-Bannock](#)) and Shoshone-Bannock Tribes [2009](#)
Shoshone-Paiute Tribe [2009](#)
Columbia Basin Fish Accord - [Idaho](#) and Idaho Department of Fish and Game/Office of Species Conservation [2009](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Columbia Basin Fish and Wildlife Authority [2009a](#), [2009b](#)

2. Basinwide and mainstem measures

To the extent the recommendations listed here include specific actions proposed for implementation, they are included as basinwide and mainstem measures. General principles and strategies provided in the recommendations are not included here as measures.

Research monitoring and evaluation, data management, coordination

Columbia Basin Fish Accords - [Colville](#)
The Confederated Tribes of Grande Ronde [2014](#)
Kalispel Tribe [2009](#) and [2014](#), [Columbia Basin Fish Accord \(Kalispel\)](#)
Kootenai Tribe of Idaho recommendation [2009](#) and [2014](#)
Nez Perce Tribe [2009](#)
Columbia Basin Fish Accords ([Shoshone-Bannock](#)) and Shoshone-Bannock Tribes [2009](#)
Spokane Tribe of Indians [2009](#) and [2014](#)
Columbia Basin Fish Accords - [Umatilla](#)
Columbia Basin Fish Accords - [Warm Springs](#)
Columbia Basin Fish Accords - [Yakama](#)
Columbia River Inter Tribal Fish Commission [2014](#)
Upper Columbia United Tribes [2009](#) and [2014](#)
Idaho Department of Fish and Game/Office of Species Conservation [2009](#),
Columbia Basin Fish Accord ([Idaho](#))
Columbia Basin Fish Accords ([Montana](#)) and Montana Fish Wildlife and Parks [2009](#) and [2014](#)
Oregon Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Department of Fish and Wildlife [2009](#) and [2014](#)
Washington Governors Office/Department of Ecology/Washington Department of Fish and Wildlife recommendation [2009](#)
Washington Governors Salmon Recovery Office [2014](#)
Yakima Basin Fish and Wildlife Recovery Board [2014](#)
Columbia Basin Fish and Wildlife Authority [2009](#), [resident fish section](#)
FCRPS Biological Opinion [2014](#) implementation plan
U.S. Environmental Protection Agency [2009](#) and [2014](#)
U.S. Fish and Wildlife Service [2009](#) and [2014](#)
U.S. Geological Survey [2009](#) and [2014](#)

Ad Hoc Supplementation Work Group [2009](#)
Pacific States Marine Fisheries Commission [2009a](#), [2009b](#) and [2014](#)
Columbia Basin Water Transaction Program [2009](#) and [2014](#)
Washington Monitoring Forum [2009](#)
Lower Columbia Fish Recovery Board [2009](#) and [Plan](#), [2014](#)
Stewardship Partners [2009](#)
Kintama [2009](#)
Northwest Habitat Institute [2009](#)

P. Maintenance of Fish and Wildlife Program Investments

Sub-strategy

The Council has determined adequate and dependable operation and maintenance support is needed to ensure ongoing proper functioning of past infrastructure investments by Bonneville and the action agencies intended to benefit fish and wildlife in the Columbia River Basin.

Rationale

Adequate funding for operation and maintenance will ensure the existing program-funded infrastructure remains properly functioning and will continue to benefit fish and wildlife in the basin as well as continuing to meet Bonneville's mitigation requirements.

There are several types of program-funded projects that require a long-term financial maintenance plan to ensure their longevity and integrity, including fish screens, fishways and traps, hatcheries, lands, and habitat actions.

Over time, changing regional priorities may result in the need to decommission or upgrade some fish or wildlife infrastructure emplacements. An adequately funded plan will help ensure that decommissioning will occur as necessary.

Principles

- Many projects' biological benefits do not come to fruition with the completion of project construction or habitat protection, but require long-term maintenance to realize the biological potential. Thus, Bonneville's financial responsibility for these projects continues over time. Bonneville, the Corps, the Bureau of Reclamation and FERC licensed projects must allocate sufficient funding to ongoing operations and maintenance, and also to decommissioning infrastructure when it is no longer useful or necessary.


General Measures

- The Council will work with Bonneville and the other action agencies to ensure that past fish-and-wildlife-related investments are kept current or properly decommissioned.
- The federal action agencies shall define the comprehensive maintenance costs by fish and wildlife investment types for both the direct and reimbursable aspects of the program. Anticipated costs should be developed year by year within a 20-year timeframe and be provided annually to the Council.
- The Council will convene a work group comprising action agencies and agencies and tribes with expertise in fish screens, fishways and traps, hatcheries, lands, and habitat actions, to define and develop a long-term maintenance plan and process. This work group will be assisted by the IEAB, the Wildlife Advisory Committee, Fish Screening Oversight Committee, and federal action agencies. The work group shall report to the Council quarterly on its progress toward developing a long-term plan for protecting fish and wildlife

investments. The long-term plans shall be completed at the end of one year from the initial meeting of the work group. The plan will be presented to the Council for review and recommendation to Bonneville and the action agencies. Bonneville shall fund the long-term maintenance plan as reviewed and recommended by the Council.

- The Council and the federal action agencies will work together to ensure that federal agencies provide adequate funds for long-term maintenance for facilities where they have responsibility (such as NOAA Fisheries for Mitchell Act hatcheries).
- Annual symposiums will be convened by the Council to ensure collaboration and efficiencies are achieved by all parties seeking to protect past investments in fish and wildlife by Bonneville and the action agencies under the program.

Link to Subbasin Plans

See the Council's [subbasin plans](#)  for subbasin-level measures pertaining to program-funded facilities.

Q. Administration and procedures of the Independent Scientific Review Panel, the Scientific Peer Review groups, and the Independent Scientific Advisory Board

ISRP Review Procedures

The ISRP is a standing group that conducts reviews throughout the year. The ISRP evaluates projects with the basic criteria from the 1996 amendment of the Northwest Power Act, which are that the project 1) is based on sound scientific principles; 2) benefits fish and wildlife; 3) has clearly defined objectives and outcomes; and 4) has provisions for monitoring and evaluation of results.

Recommendations from the ISRP are reached by consensus. The ISRP may enlist Peer Review Group members to assist in reviews. From the pool of Peer Review Group members, the ISRP selects reviewers who have the appropriate expertise for the review at issue. The ISRP develops guidelines for reviews that describe lists of materials needed, site-visit protocols, and limits to reviewer and project sponsor communication.

ISAB Administrative Oversight Panel

The oversight panel consists of the chair of the Northwest Power and Conservation Council, the regional administrator of NOAA Fisheries, and the director of the Northwest Fisheries Science Center as joint participants; a senior representative of the Columbia River Basin Indian tribes provides administrative oversight for the ISAB and approves the annual work plan and budget. The panel makes appointments to the ISAB from a list of nominees developed by the National Academy of the Sciences. Final selection of ISAB members is made by majority vote of the three members of the Administrative Oversight Panel.

ISAB Review Procedures

The ISAB is a standing group that meets regularly throughout the year. ISAB recommendations are reached by consensus. The ISAB may enlist ad-hoc members to assist in reviews. Ad-hoc members may include ISRP and Peer Review Group members. The ISAB conducts reviews in a manner consistent with its terms of reference and procedures policy.

The ISAB's general tasks for the Council, NOAA Fisheries, and tribes are described in the [ISAB Terms of Reference](#). In addition to these tasks, the ISAB provides scientific advice on topics and questions requested from the region or the ISAB itself and approved by the Oversight Panel by majority vote. Fish and wildlife agencies and others may submit questions to the ISAB through the Oversight Panel. The ISAB may also identify questions and propose reviews. The Oversight Panel, in consultation with the ISAB, reviews these questions in a timely manner and decides which are amenable to scientific analysis, are relevant to the Tribes', Council's, and NOAA Fisheries' programs, and fit within the ISAB's work plan. Many questions pertaining to the recovery of the Columbia River ecosystem contain both scientific and policy aspects. The ISAB should confine itself to dealing only with scientific aspects of issues.

ISAB and ISRP Membership

The ISRP and the ISAB shall each be composed of 11 members. Peer Review Groups shall be composed of a pool of scientists sufficient in size and expertise to assist the ISRP in its review responsibilities. To ensure coordination and avoid redundancy of efforts between the ISRP and the ISAB, at least two members of the ISRP shall be on the ISAB. Other ISAB members should be considered for appointment to the Peer Review Groups.

Membership shall include, to the extent feasible, scientists with expertise in Columbia River anadromous and resident fish ecology, statistics, wildlife ecology, ocean and estuary ecology, fish husbandry, genetics, geomorphology, social and economic sciences, and other relevant disciplines. There should be a balance between scientists with specific knowledge of the institutions, history, geography, and key scientific issues of the Columbia River Basin and those with more broad and diverse experience. Members should have a strong record of scientific accomplishment, high standards of scientific integrity, the ability to forge creative solutions to complex problems, and a demonstrated ability to work effectively in an interdisciplinary setting.

ISRP and ISAB membership terms are normally for three years, not to exceed two terms. Term limits of the members are staggered to ensure continuity of effort. Peer Review Group members do not have specific terms, but the ISRP and the Council will periodically review the pool of Peer Review Group members and update it when appropriate.

Appointment procedures

The appointment procedures to fill vacancies on the ISAB and the ISRP, and to augment the pool of Peer Review Group members, follow three steps. The first two steps are the same for each group. First, the Council, in cooperation with the ISAB Administrative Oversight Panel, invites the region to submit nominations. Second, the National Academy of Sciences, assisted by the National Research Council, evaluates the credentials of the nominees, submits additional nominees if necessary, and recommends a pool of qualified candidates for potential appointment. This pool of candidates should span the areas of needed expertise and meet the membership criteria for the ISRP and ISAB. The pool should be robust enough to last through several rounds of appointments. The third step, the appointment procedure, varies for the ISAB and ISRP. The ISAB Oversight Panel appoints ISAB members. The Council alone appoints ISRP and Peer Review Group members.

Conflict of interest

ISAB, ISRP, and Scientific Peer Review Group members are subject to the conflict of interest standards that apply to scientists performing comparable work for the National Academy of Sciences. At a minimum, members with direct or indirect financial interest in a project shall be recused from review of, or recommendations associated with such a project. The Council has approved a conflict of interest

policy that satisfies the needs of the program, applies to the ISRP and the ISAB, and is based on the National Academy of Science's standards.

R. Assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply

Introduction

Section [4\(h\)\(5\)](#) of the Northwest Power Act requires that the Council's fish and wildlife program consist of measures that protect, mitigate and enhance fish and wildlife affected by the development, operation and management of the Columbia River hydroelectric facilities "*while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.*" At the conclusion of a program amendment process, the Council signifies in some manner that (1) it has considered the fish and wildlife measures to be adopted as part of the program and their potential effect on the region's power supply, and (2) has an appropriate level of confidence that the region may implement the revised fish and wildlife program while maintaining an adequate, efficient, economical, and reliable power supply. This is known as the "AEERPS" consideration or conclusion, documented here. And as explained more fully below, the Council concludes here that the region's power supply can remain adequate, reliable, economical, and efficient as the region implements the protection, mitigation, and enhancement measures in the 2014 Columbia River Basin Fish and Wildlife Program.

Under the Northwest Power Act, subsequent to the fish and wildlife program amendment process, the Council begins the separate statutory process to review and revise it by reviewing the Council's regional electric power and conservation plan. The AEERPS conclusion in the fish and wildlife program decision recognizes and assumes that the Council will adhere to the Power Act requirements in developing the regional power plan, including approving a conservation and generating resource strategy to guide Bonneville and the region in acquiring the least-cost resources necessary to meet the demand for electricity and to "assist [Bonneville] in meeting the requirements of section [4\(h\)](#) of this Act," that is, to implement the Council's fish and wildlife program.

The relevant terms -- adequate, reliable, efficient, and economical -- are not defined in the Act. The legislative history of the Act provides only general guidance. The Council began analyzing the relationship of the fish and wildlife program decision to these aspects of the power supply in the first fish and wildlife program decision in 1982. In 1994, as the program grew in scope and extent, the Council produced an extensive analysis explaining its understanding as to what it means to maintain these elements of the power supply in the context of approving the fish and wildlife program. This became Appendix C to the 1994 Fish and Wildlife Program, *Assuring an Adequate, Efficient, Economical and Reliable Power Supply and the Ability to Carry Out Other Purposes of the Power Act*, combined in the analysis and AEERPS conclusion with Appendix B, *Summary of Hydropower Costs and Impacts of the Mainstem Passage Actions*. The Council has understood and applied the statutory AEERPS provision in a consistent way both before and after the 1994 explanation, although that has been the most extensive discussion. See Appendix A to the 2003 Mainstem Amendments, *Analysis of the Adequacy, Efficiency, Economy, and Reliability of the Power*

System, and for the 2009 Program, the *Analysis of Adequacy, Efficiency, Economy, and Reliability of the Pacific Northwest Power System* (analysis before the Council at the time of the program decision and included in the administrative record). The documents noted above remain source documents for understanding the Council's approach. Each element of the AEERPS conclusion is discussed below.

Adequate and reliable power supply

General principles

“Adequate” and “reliable” have specific meanings in the power industry. Adequacy is a component of reliability. A power system is “reliable” if it is:

- Adequate - the electric system can supply the aggregate electrical demand and energy requirements of the end-use customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.
- Secure - the electric system can withstand sudden disturbances, such as electric short circuits or unanticipated loss of system elements.

“Adequacy” refers to having sufficient resources – generation, efficiency, and transmission – to serve loads. To be adequate, the power supply must have sufficient energy across all months, sufficient capacity to protect against the coldest periods in winter and the hottest periods in summer, and sufficient flexibility to balance loads and resources within each hour. In determining adequacy, the Council uses a sophisticated computer model that simulates the operation of the power system over many different futures. Each future is simulated with a different set of uncertainties, such as varying water supply, temperature, wind generation, and thermal resource performance. The adequacy standard used by the Council deems the power supply inadequate if the likelihood of curtailment five years in the future is higher than five percent. The Council uses probabilistic analysis to assess that likelihood, most often referred to as the loss of load probability.

“Security” of the regional power supply is achieved largely by having sufficient reserves and transmission capability to bring power on line quickly in the event of a system disruption. These reserves can be in the form of generation or demand-side curtailment that can take load off the system quickly. The North American Electric Reliability Corporation (NERC) and the Western Electricity Coordinating Council (WECC) establish reserve requirements, frequently expressed in terms of a percentage of load or largest single contingency. An additional resource requirement for the region is thus maintaining the reserves required by NERC and WECC for security and thus for a reliable power system.

Implementing dam operations for the benefit of fish that alter or reduce hydropower generation is one of the power system changes that may affect the adequacy and reliability of the power supply. This is not a surprise -- that this should happen to some extent is one of the premises underlying the Northwest Power Act. The generation effects of the operations that the Council adopts into the fish and wildlife program then become one of the many factors the Council has to take into account in its subsequent power planning when making decisions on the new resources necessary to maintain an adequate and reliable power supply. In the context of power planning, adequacy and reliability are as much a matter of

time and cost as anything. That is, in the event of changes that threaten the standards, adequacy and reliability can be maintained to the standards with enough lead time to develop the necessary resources and with the investment of enough dollars in those resources.

Decisions on the resource actions necessary to ensure adequacy and reliability take place within the context of the subsequent power plan. But even before that, at the time the Council makes a decision on fish and wildlife program amendments, the Council is able to estimate the effects of the fish operations on hydropower generation from existing projects, including the incremental effects of any new operations for fish and wildlife. The Council combines that information with other information relevant to the adequacy and reliability of the power supply and, with an assumption that the subsequent power planning will function as it should, the Council is able to make a determination whether it can adopt the fish and wildlife program and still maintain an adequate and reliable power supply.

In the past the Council had to undertake extensive technical analysis of the adequacy and reliability of the power system in the fish and wildlife program amendment process itself. Now the Council, with the assistance of its [Regional Adequacy Advisory Committee](#) (originally, the Resource Adequacy Forum), regularly [assesses](#) the adequacy of the region's power supply, evaluating the resources available to the region against a resource adequacy standard for the Pacific Northwest that the Council adopted in 2011. The Advisory Committee and the Council most recently [assessed](#) the adequacy and reliability of the power supply at the end of 2012 and then again in [2014](#).

2010, 2012, and 2014 adequacy assessments

In the recent adequacy assessments -- for the Sixth Power Plan in 2010 and then in 2012 and 2014 -- the contribution of hydropower generation to overall system generation incorporated the effects of the operations for fish found in the 2008/10 biological opinions and the Columbia Basin Fish Accords -- and thus also included the baseline measures in the Council's 2009 Fish and Wildlife Program. The 2012 and 2014 assessments also factored in the generation effects of the additional spill ordered by the federal district court in Oregon.

Since 1980, implementation of operations to benefit fish has reduced hydroelectric generation on average by about 1,200 average megawatts relative to an operation without any constraints for fish and wildlife. For perspective, this energy loss represents about 10 percent of the hydroelectric system's firm generating capability (that is, the amount of energy the system can be expected to generate under the lowest runoff conditions). Most of the 1,200 aMW reduction occurred gradually over a 30-year period, and the system has had ample time to adjust. The recent changes in hydroelectric generation considered in the most recent adequacy assessments were small in comparison to the 1,200 aMW as a whole.

After factoring in all the information relevant to power supply adequacy, of which the fish and wildlife operational effects were but a small part, the most recent adequacy assessment did show the potential for a power supply adequacy problem in 2019, with a loss-of-load probability of about 6 percent, if the region relies only on existing generating plants (those that are expected to be operational in 2019) and new energy-efficiency savings outlined in the Council's 2010 Sixth Power Plan. The majority of potential future problems seen were short-term capacity shortfalls, with the most critical months being January and February. The analysis also suggested that there were a number of reasonable actions the region's utilities and Bonneville can take well before 2019 -- new generation, new energy efficiency, or a combination -- to result in 400 megawatts of additional capacity and bring the adequacy estimate to the minimum acceptable level by 2019. And the recent assessment also adds 670 megawatts of planned thermal resource capacity that should be operational before 2019. Looking ahead over the next 10 years, the region's utilities show about 1,800 megawatts of additional planned generating resources (in aggregate), with a mixture of wind and gas-fired generation. These resources are not included in the most recent adequacy assessment because they may not yet be sited or licensed or may not be expected to be operational by 2019. Obviously, not all of these planned resources are needed by 2019 to meet the Council's adequacy requirement, but it is a good indication that the region is on track to maintain an adequate supply. Most important here, the operations for fish and wildlife were not seen as a particular impediment to our ability to make the power system adaptations needed to assure the region a continued adequate and reliable power supply.

The adequacy assessments do not directly assess the ability of the system to balance loads and resources within the hour, a growing regional concern in the last decade due to the addition of significant amounts of variable generation, primarily wind. However, assuring that the system has the necessary balancing capability is reflected in the adequacy assessment. This is because the system holds in reserve sufficient amounts of generating capacity (commonly referred to as incremental and decremental reserves) to be able to balance variable generation and loads on short-term notice. The adequacy determination includes an inquiry into whether the region has sufficient resources not only to meet all regional loads but also to provide sufficient flexibility for within-hour balancing needs.

The operations to benefit fish can affect the flexibility of the system to balance loads and resources within hour, especially to the extent that fish benefit from reducing the short-term fluctuations in hydroelectric generation that might be optimum for power system balancing. As with other aspects of adequacy, the power planning work of the Council and the region has to take these constraints into account and, if necessary, add resources to make sure the system has adequate resources for this purpose and others.

2014 Fish and Wildlife Program measures and adequacy and reliability

The operational measures to benefit fish included in the 2014 Fish and Wildlife Program amendments have not changed materially from the operations included as part of the 2012 adequacy assessment. The operations specified in the NOAA Fisheries' 2014 FCRPS Biological Opinion similarly have not changed dramatically from those in the 2008/2010 FCRPS Biological Opinion, and the biological opinion operations along with the Columbia Basin Fish Accords remain the baseline operational measures of the Council's 2014 Program.

The operational provisions added by the Council to this baseline -- such as the call to investigate potential refinements to Libby and Hungry Horse operations to benefit resident fish in the upper river and reservoirs -- are not sufficiently specific at this time to model the possible effects. Even so there is no indication that the refinements contemplated will significantly alter current operations to such a degree as to alter the most recent adequacy assessment. A spill experiment proposal recommended to the Council could in theory alter system generation to such a material extent as to necessitate a further adequacy assessment in this process. The Council concluded that proposal was not sufficient to consider for implementation, for a number of reasons. If and when a new operation is proposed that is sufficient to consider, there will be time to evaluate the power system implications as well as the biological implications before making a decision on implementation.

For these reasons, the Council concludes that the measures in the 2014 Fish and Wildlife Program will not alter system generation materially from the measures included in the most recent adequacy assessment. The Council's conclusion in that 2012 assessment was that the region would be able to take the necessary steps to maintain system adequacy. The Council thus concludes that adopting the 2014 Fish and Wildlife Program measures will not preclude the Council from developing a regional power supply that assures the region an adequate and reliable power supply.

Efficient power supply -- and cost-effective fish and wildlife measures

Efficient power supply and the addition of cost-effective energy resources

One objective of planners and operators of the Pacific Northwest power system is to provide a system that is as efficient as possible *given that* its largest component -- the hydroelectric dams -- have equally important non-power uses, including physical modifications and operational changes to benefit fish and wildlife. From the single objective of power operations, the power system is less efficient than it was at the time of the passage of the Northwest Power Act in 1980. This is the result of many factors, some of which are related to characteristics of the new resources available to meet growth and some related to the effects of fish mitigation and protection measures that reduce the optimum generation of the system to meet loads. Even so, the region continues to have an efficient system relative to systems elsewhere.

The Northwest Power Act clearly expected the region to meet both fish and power objectives, that is, to operate the system to meet multiple objectives. Congress in the Power Act thus did not mean the term “efficient” to establish an absolute standard for the power supply alone. Instead, the system must be operated efficiently given all the constraints under which it must operate. The consequences of being inefficient are economic -- additional costs to supply a given amount of power. The Council’s least-cost planning requirements encourage the development of efficient resources to serve the electricity needs of the region while meeting other objectives as well, including fish and wildlife.

As noted in the discussion of adequacy and reliability, the measures added to the program in this amendment cycle will not significantly change the operation of the system compared to the measures adopted and analyzed before. System efficiency faces many challenges in the current era, including how efficient the system can be as it integrates intermittent resources. Even so, the Council is able to conclude that it can adopt the 2014 Fish and Wildlife Program while still assuring the region a power supply produced efficiently while meeting multiple system objectives.

Efficient and cost-effective fish and wildlife measures

Fish and wildlife objectives should also be met as efficiently and as cost-effectively as possible. Given the high cost of some measures and the uncertainty regarding their effectiveness in meeting biological objectives, it is imperative that continual efforts be made to assess and improve the effectiveness and cost-effectiveness of these measures. Section [4\(h\)\(6\)\(C\)](#) of the Northwest Power Act in particular requires the Council to adopt program measures that “utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost.” Cost effectiveness more

generally is an important consideration in all aspects of the Council's fish and wildlife and power planning. The following discussion, conclusions and recommendations regarding cost-effectiveness and efficiency in the implementation of the fish and wildlife program are not part of the formal conclusions required by the statute with regard to efficiency and the region's power supply. This is, however, a useful place in the program to consider these broader issues of fish and wildlife implementation, efficiency, and cost-effectiveness.

Quantitative cost-effectiveness comparisons of fish and wildlife measures

A quantitative cost-effectiveness comparison of alternative energy resources is a cornerstone of the Council's power plan, made possible by our ability both to estimate the total costs of alternative measures and to use a singular metric of benefits -- megawatts generated or saved -- for the comparison. Useful quantitative cost effective comparisons of alternative fish or wildlife measures have proven far more difficult to achieve, for a number of reasons. The Council periodically considers the potential for quantitative cost effectiveness analysis in the fish and wildlife program. A notable early effect came in a report produced by the Council staff in 1997 with the assistance of the Council's newly-formed Independent Economic Advisory Board, "Methods of Economic Analysis for Salmon Recovery Programs," [Council Document No. 97-12](#) (July 1997). The "methods analysis" continues to guide the Council today. And at the other bookend is the most recent report from the IEAB -- a March 2014 review of the Council's fish and wildlife program: "Recommendations related to amendments for the 2014 Fish and Wildlife Program," [IEAB 2014-1](#). The following discussion is drawn from these and other sources.

Several factors make it difficult for the Council and the region to undertake a quantitative cost-effectiveness comparison among different fish and wildlife measures for the program. The most important has been the inherent difficulty of developing a single measure of ultimate biological effectiveness for different types of actions, so as to be able to determine if two measures "achieve the same sound biological objective" and then choose the one with the least cost. The complex life-cycles of fish and wildlife, especially anadromous fish, and the many human and environmental factors that affect their survival, make it difficult to isolate and determine the ultimate biological benefits of any particular activity or to compare the different biological effects of different activities in a rigorously quantitative manner.

At best the region has been able to compare the immediate biological effects of very similar activities on specific quantitative terms that are something less than life-cycle survival. This includes, for example, comparing the immediate passage survival of juvenile spring Chinook from different passage methods; or comparing the amount of habitat that might be protected per dollar for different land

acquisitions in the same subbasin or the different amounts of habitat that might be opened per dollar through the removal of passage barriers in a particular subbasin; or roughly estimating the different gains in productivity of juvenile habitat or survival of juveniles that might result from different riparian habitat improvements in a particular subbasin. Even these types of comparisons, as limited as they have been, have made the program more cost-effective over the last 30 years.

The region's use of these quantitative comparative techniques has been improving and increasing every year. The Council encourages continued efforts in this direction. So does the Independent Economic Advisory Board (IEAB): Its most recent review report began with the recommendation that the Council "[c]onsider funding a science initiative to assess the state of achievement metrics, methods to standardize metrics, the value of comparing metrics across types of projects, and research needs to develop standard metrics." The Council will consider this and other approaches for making further progress in standardizing the metrics of benefits; supporting the development of improved analytical and modeling techniques for relating individual activities to life-cycle benefits; and in pushing for the increasing use of metrics and techniques of this nature in cost-effectiveness comparisons of different measures.

Other ways of improving the cost-effectiveness of fish and wildlife measures

Still, our ability to undertake quantitative cost-effectiveness comparisons is limited at this time. So the Council and the IEAB have also focused on other ways to increase the region's confidence that program measures and the projects that implement them are effective and the costs appropriate, and thus that the region's expenditures are as cost-effective as can be. Much can be done and had been done to review the efficiency of projects; to improve the likelihood that measures and projects selected will be the most cost effective; to improve project management; to monitor, report, and review results; to develop better and more cost-efficient techniques for monitoring and evaluating improvements in habitat and population characteristics; and to emphasize accountability for results and effectiveness.

Most notably the Council has focused significant resources on an ongoing and rigorous review of both the projects implementing the program and of the broader biological premises and uncertainties underlying the program. This work has particularly involved the use of independent scientific review of both individual projects and of larger scientific questions, assumptions, decisions, and reports underlying the program. The Council's work in this regard has improved the quality, effectiveness and efficiency of the projects that implement the program, and ultimately of the program measures that are the underlying basis for these projects. Early in this effort, in the late 1990s and early 2000s, the Council also focused significant attention on: improving the quality of the information generated

on the costs of individual projects and of the program as a whole; significantly improving the biological and fiscal review of major capital investments (such as the Council's "three-step review"); increasing attention on ongoing operation and maintenance obligations; and improving contract management procedures.

In recent years, the Council has focused increasing attention on four areas: (1) improving the state of the monitoring and evaluation elements of the program to make them more effective, relevant, and cost-effective, pushing for the results from monitoring and evaluation to be used more often in decision-making; (2) calling for more regular reporting and review of results and for the standardization of what is reported; (3) requiring improved study designs and review of program research, including bringing research projects to effective conclusions; and (4) improving the annual reporting to the public and decision-makers on program costs, program activities, and the biological indicators of results. More can be accomplished in all four areas, and the Council will continue its efforts.

Finally, the IEAB included a number of other recommendations for the Council to consider, in the IEAB's review of the Council's fish and wildlife program for the 2014 program amendment process. The IEAB's first recommendation called for continued efforts to develop better and more standardized metrics and methods to estimate benefits, so as to allow for more of a quantitative approach to cost-effectiveness, discussed above. A number of IEAB's other recommendations are in the nature of further improvements in cost information and in non-quantitative techniques that could help assure a more effective and efficient program. These include:

- Projects and project proposals should include not only a discussion of expected outcomes but also an efficient "exit strategy" if the project is not performing as planned.
- Program measures and project proposals with important cost implications and investments that are not reversible or recoverable should include and analyze an appropriate range of alternatives, including the implications of a "do nothing" alternative.
- New project proposals that require future operations, maintenance, replacement or decommissioning costs should provide information on expected life-cycle costs by year, including the expected life of depreciable assets, and a discussion on how future costs will be paid.
- Existing projects that have unfunded needs for future maintenance or replacement should provide such cost information for review and consideration as soon as practical.
- The Council should consider an external review of the future financial needs, the ability to meet those needs, and alternatives for financing those needs, for the entire fish and wildlife program that includes operation and maintenance, disaster management, and expected hydrosystem revenue base.

As part of the implementation of the 2014 Program, the Council will consider whether and how to implement these recommendations from the IEAB.

Economical power supply

General principles

The final aspect of the AEERPS conclusion is that the Council adopts the fish and wildlife program while assuring the region an “economical” power supply. As with the other terms, the Northwest Power Act does not define an “economical” power supply. One of the expectations of the Power Act is that the power system is to bear the cost of managing the hydroelectric system to improve conditions for fish and wildlife. This means the regional power system absorbs both the financial effects of fish operations that reduce the output and revenue of the system as well as expenditures on other measures to implement the fish and wildlife protection and mitigation program. In order to do so, the power system must generate sufficient revenue to cover these financial requirements. This necessarily makes the region’s power supply more expensive, intentionally so. This is the point of the provisions in the Power Act requiring the Council to assure that the power supply remains economical or affordable to the region even while the revenues are used to meet the fish and wildlife and other objectives of the Act.

Fish and wildlife program costs in total

The first step is to estimate what the fish and wildlife program costs are that the power system is to bear. The Council did not develop program cost estimates in the amendment process itself. The Council produces an annual report to the region’s governors on Columbia Basin Fish and Wildlife Program Costs, based mostly on information produced by Bonneville. The Council issued the most recent report, for [Fiscal Year 2013](#), in September 2014. The Council has drawn on the FY 2012 cost report for the information and conclusions here; the figures in the draft FY 2013 cost report are not significantly different.

Bonneville uses well-defined methods for calculating the costs of the fish and wildlife program. For Fiscal Year 2012, Bonneville reported its fish and wildlife program costs as follows:

- \$248.9 million in direct expense costs
- \$73.0 million in direct costs and reimbursements to the federal Treasury for expenditures by the Corps of Engineers, Bureau of Reclamation, and U.S. Fish and Wildlife Service for investments in fish passage and fish production, including direct funding of operations and maintenance expenses of federal fish hatcheries; also includes one-half of the Council’s annual approximately \$10 million budget
- \$131.5 million in fixed costs (interest, amortization, and depreciation) of capital investments for facilities such as hatcheries, fish passage facilities at dams, and some land purchases for fish and wildlife habitat
- \$152.2 million in forgone hydropower sales revenue that results from dam operations that benefit fish but reduce hydropower generation

- \$38.5 million in power purchases during periods when dam operations reduce generation to protect migrating fish

The FY 2012 costs totaled \$644.1 million, including the forgone revenue. The \$644.1 million total does not include annual capital investments in 2012 totaling \$57.5 million for program-related projects, and \$114.5 million for associated federal projects, including capital investments at dams operated by the Corps of Engineers and Bureau of Reclamation. These latter investments are funded by congressional appropriations and then repaid by Bonneville. Including them in the same total as fixed costs would double-count some of the capital investment. The total also does not reflect a credit of \$77.0 million from the federal Treasury related to fish and wildlife costs in 2012. Adding in the credit reduced the total fish and wildlife costs to \$567.1 million. The fish and wildlife costs for FY 2012 (with the addition of the forgone revenue figure to the expenditures) represented over 20 per cent of Bonneville's total costs for its power business.

The costs Bonneville reported for FY 2012 are in line with the range of costs for program implementation that Bonneville has reported in recent years and that Bonneville anticipates in the near future. The financial effects of operations in particular can fluctuate significantly from year to year depending on runoff conditions and market prices. This means FY 2012 costs are in the lower end of a range that Bonneville estimates can be as high as \$900 million before subtracting the credit. Similarly, the FY 2013 costs reported by the Council in September 2014 total \$682.4 million. This amount is also in the lower end of the range of Bonneville's estimated annual fish and wildlife costs.

The Council realizes that how and why Bonneville reports forgone revenue is controversial with some. The controversy is not relevant here, because as noted below the Council concludes that even as the fish and wildlife costs are reported by Bonneville, the region's power supply remains affordable. The Council has not limited the measures in the program based on either the costs of individual measures or on the basis of total program costs.

Effects of the 2014 Program on fish and wildlife costs

In past fish and wildlife program decisions over the last 32 years, the Council has determined each time, as the program grew in scope and extent, that the costs of implementing the program could be absorbed by the power system and maintain an economical power supply. So particularly important in any program amendment decision, including this one, is whether the newly amended program represents an *additional* increment of costs to the power system, and if so, whether and how that changes the consideration of the economical nature of the region's power supply.

As noted in the adequacy discussion above, the Council does not expect the operations for fish in the 2014 Fish and Wildlife Program to be materially different

from the operations in the recent past. And thus the financial effects of operations should remain stable over at least the next few years, within the expected range.

Bonneville (and Congress) decide in any particular year how much to budget and expend on measures to protect, mitigate and enhance Columbia River Basin fish and wildlife in a manner consistent with the Council's program. Even so, the Council expects that expenditures on program measures and on reimbursement of appropriations will remain relatively stable over the next few years. Based on the fish and wildlife recommendations to the Council, the 2014 Program does contain additional measures in certain areas, with an expectation that expanded work in these areas will take place in the next few years. This includes, for example, additional measures to deal with toxic contaminants, blocked area mitigation, non-native species, and passage. Even so, the Council concludes that the additional investments in these areas are unlikely to change significantly the scope of power system expenditures over the next few years. This is in part because the Council intends program implementation to move carefully into these areas; in part because the Council considers a number of these activities to be the shared responsibility and investment of a number of sectors of the economy, not just the power supply; and in part because the Council is aware Bonneville has entered into stable multi-year funding commitments with many program implementers that continue to 2018.

For all these reasons the Council's expectation is that fish and wildlife program costs will not differ significantly -- certainly not a significant difference in magnitude or scale -- as a result of the decision to approve the measures in the 2014 Fish and Wildlife Program. The general conclusion that the power supply remains affordable at this level of fish and wildlife investments should remain valid.

Different perspectives for considering an "economical" power supply and conclusions

Understanding what the fish and wildlife program costs are is the beginning, not the end, of the consideration as to whether the power supply is economical. There are at least three perspectives to consider.

One perspective is at the regional scale, in comparison to the regional economy as a whole and in comparison to other regions. The per-kilowatt-hour costs of the Pacific Northwest power supply have increased significantly over time, because of fish and wildlife expenditures as well as other reasons, and in this sense the power supply is less economical than it was in the past. Even so, the Pacific Northwest still ranks as one of the lowest-cost regions in the nation, and the region's electrical energy costs remain a relatively steady percentage of the region's overall economy.

An aggregate regional perspective, however, does not capture the potential impacts of energy costs on specific sectors of the economy and particular local areas within the region. Electricity-intensive industries and industries subjected to global economic pressures, such as aluminum smelting, are proportionately more affected by increases in electricity costs than the region's economy as a whole. The same is true for local areas within the region that lag behind in economic vitality compared to the region as a whole. All increases in costs, including energy costs and including the portion of energy costs related to the fish and wildlife program, contribute to difficulties for these sectors and areas. Even so, there is no indication that the fish and wildlife cost obligations of the power system are such a particular drag on these aspects of the economy to cause the Council to conclude the fish and wildlife program measures in the 2014 Program have unbalanced the economical nature of the region's power supply.

Finally, the question of whether the power supply is economical has to be seen within the perspective of whether the demands of the fish and wildlife program are consistent with the financial health of the agency primarily dependent upon for these continuing investments -- the Bonneville Power Administration. Bonneville must be able to implement the program while also meeting the other financial purposes of the Power Act and other laws relevant to Bonneville, including being able to cover all of its costs and make timely repayments of Bonneville's debt to the United States Treasury. Bonneville always has to be diligent in protecting its financial status to maintain a viable operation. But the agency is not currently in difficult financial circumstances, and the implementation of the 2014 Program will not change those circumstances. Still, fish and wildlife costs are a significant contributor to Bonneville's overall cost structure and must be reviewed periodically.

Longer-term questions about assuring the region an economical power supply into the future will be addressed by the Council in the Seventh Power Plan. The issues in that setting relate not to fish and wildlife costs, but to whether the region can add the least-cost resources needed to meet energy demands while adequately hedging risks, conforming to environmental constraints on new resources, and meeting all system costs -- and in the end maintain a power supply that is economical within the region.

In conclusion, the Northwest Power Act recognizes that the region's power system has an obligation to address the adverse effects of the hydrosystem on fish and wildlife. The Council is adopting a program with substantial measures to protect, mitigate and enhance fish and wildlife. The Council recognizes that these actions to do so impose significant costs on the region's ratepayers. Despite these costs, the power system remains economical in the broad sense that power rates remain affordable within the context of the region's economy.

S. Responses to recommendations and comments, including findings on recommendations not adopted into the 2014 Fish and Wildlife Program

March 2015

In this section of the fish and wildlife program (Appendix S), the Council explains its disposition of the program amendment recommendations the Council received at the outset of this program amendment process. This includes explanations that are part of the program as to the “basis for [the Council’s] finding” not to adopt recommendations, consistent with the requirements of Section 4(h)(7) of the Northwest Power Act (often referred to as “the findings”).

In explaining how the Council used and responded to the recommendations in developing the final program, this appendix also provides a response to comments that the Council received on the recommendations and on the draft program amendments released by the Council for public review. The document also describes how the Council conducted a program amendment process consistent with the requirements of Section 4(h) of the Act.

Introduction and program amendment process

Pursuant to Section 4(h) of the Northwest Power Act, in March 2013 the Northwest Power and Conservation Council requested in writing that state and federal fish and wildlife agencies, the region's Indian tribes, and others submit recommendations for amendments to the Council's *Columbia River Basin Fish and Wildlife Program*. ("Request for Recommendations to Amend the Columbia River Basin Fish and Wildlife Program"; <http://www.nwcouncil.org/media/6658706/Amendment-Letter-Council-approved-032213-f.pdf>). By the deadline for submitting recommendations (extended to September 17, 2013), the Council had received nearly 1,700 pages of recommendations and supporting information from 68 entities and 412 individuals. (Fish and Wildlife Program Amendment Recommendations; <http://www.nwcouncil.org/fw/program/2013amend/recs>). As required by Section 4(h)(4), the Council then sought and received extensive written public comment on the program amendment recommendations. (Comments on Fish and Wildlife Program Amendment Recommendations; <http://www.nwcouncil.org/fw/program/2013amend/comments>).

In this period – from the release of the letter calling for recommendations in March 2013 until the release of a draft revised fish and wildlife program in May 2014 – the Council or its four-member fish and wildlife committee discussed in public the fish and wildlife program, the program amendment process, the program recommendations, the comments on the recommendations, and proposed program amendments. The Council's discussions included discussions among the members and with staff and discussion involving other participants, at all of the Council's regularly scheduled monthly meetings and at dozens of specially called and publicly noticed committee and Council meetings. The Council also organized two ad hoc working committees to focus on two aspects of the program amendment process – one focused on recommendations regarding toxic contaminants and their effects on fish and wildlife and one concerning recommendations received on the research, monitoring and evaluation and biological objectives elements of the program. These two ad hoc committees met in public at least a half-dozen times through this period.

In May 2014, after reviewing the recommendations, the supporting information received with the recommendations, the written comments on the recommendations, and other information in the administrative record (including oral comments to the Council at the Council's regular monthly meetings), the Council released for public review a draft revised Fish and Wildlife Program. (*Public Review Draft, Columbia River Basin Fish and Wildlife Program 2013/2014*; <http://www.nwcouncil.org/media/7076544/2014-3.pdf>; see also <http://www.nwcouncil.org/fw/program/2014-03/> (draft F&W Program page); <http://www.nwcouncil.org/fw/program/2014-03/invite> (letter inviting comment on draft)).

By the close of the written comment period on the draft program at the end of July 2014, the Council had received 1500 pages of substantial written comments on the draft program amendments from entities and individuals. (Comments on Draft Fish and Wildlife Program; <http://www.nwcouncil.org/fw/program/2014-03/comments>). The Council also took oral testimony at ten public hearings around the region and at regularly scheduled Council meetings. Transcripts of these hearings and meetings are in the administrative record along with the written comments. See <http://www.nwcouncil.org/fw/program/2014-03/>. As specified in Section 4(h)(5), Council members also held a number of consultations on the recommendations and draft amendments with representatives of state and federal fish and wildlife agencies, Indian tribes, federal agencies responsible for managing, operating, or regulating Columbia hydroelectric facilities, and the regional utility customers of the Bonneville Power Administration. Notes from these consultations are also in the administrative record.

Following the lengthy public review process required by the Northwest Power Act, and after deliberations in public over the course of dozens more regularly scheduled and special Council meetings throughout the middle of 2014, the Council adopted the final revised Fish and Wildlife Program in October 2014 at a regularly scheduled Council meeting in Pendleton, Oregon. The Council based its decisions on the recommendations, supporting documents, and the views and information obtained through public comment and consultations with the agencies, tribes, and customers. *2014 Columbia River Basin Fish and Wildlife Program* (<http://www.nwcouncil.org/fw/program/2014-12/>.)¹³

As described in the 2014 Program, the Council's Fish and Wildlife Program also includes detailed plans for nearly 60 subbasins of the Columbia River Basin, most originally adopted in 2004-05. The Subbasin Plans themselves were not revised in this process. See <http://www.nwcouncil.org/fw/program/2014-12/program/>; http://www.nwcouncil.org/fw/program/2014-12/program/partfive_subbasin_plans/; <http://www.nwcouncil.org/fw/subbasinplanning/home/>.

As noted at the outset, in what follows the Council explains its disposition of the program amendment recommendations that the Council received to begin this program amendment process. This includes an explanation as part of the program for "the basis for [the Council's] finding" not to adopt a recommendation as part of the program, consistent with the requirements of Section 4(h)(7) of the Northwest Power Act (often referred to as "the findings"). If recommendations were found by the Council to be inconsistent with each other, the Council, in consultation with

¹³ All references to the 2014 Fish and Wildlife Program in these findings, including all specific page citations, are to the "Pre-publication version," Council Document No. 2014-12 (October 2014) in pdf form, at <http://www.nwcouncil.org/media/7148624/2014-12.pdf>.

appropriate entities, resolved these inconsistencies giving due weight to the recommendations, expertise, and legal rights and responsibilities of the federal and state fish and wildlife agencies and Indian tribes. When the Council rejected all or part of a recommendation, these findings explain how the Council's decision comports with the standards in the Northwest Power Act for rejecting recommendations.

In explaining how the Council used and responded to the recommendations in developing the final program, this appendix also provides a response to comments that the Council received on the recommendations and on the draft program amendments released by the Council for public review. This includes comments received in writing, through oral testimony at public hearings or at Council meetings, or during formal or informal consultations under Section 4(h)(5) of the Northwest Power Act. Nearly all of the comments reiterated, supported, objected to, or elaborated on the recommendations received or on how the Council dealt with the subject matter of the recommendations in the draft. For that reason, there is no separate section summarizing the comments and responses to comments; responding to the recommendations also responds to the related points made in the comments. To the extent the comments on the recommendations or on the draft program amendments raised new or different issues regarding the recommendations or draft program language, or provided special emphasis on points already made, the Council has tried to identify those comments here and provide a response along with the findings on the related recommendations. Even if not identified explicitly here, the Council carefully considered all recommendations and comments in making its final decisions, as indicated in the administrative record.

In this way the document also serves as the "statement of basis and purpose" called for in Section 553 of the federal Administrative Procedures Act (APA) to accompany agency decisions on final rules. Along with the requirements in the Power Act, the Council largely follows the notice-and-comment rulemaking procedures of the APA in developing and adopting amendments to the fish and wildlife program.

The program amendment recommendations contained hundreds of individual recommendations. The Council considered each one in shaping the final revised program. The Council's obligation under Section 4(h)(7) of the Northwest Power Act is to produce a written finding as part of the program only for those program amendment recommendations the Council decided *not* to adopt. The Council is providing explanations below for how it handled a number of the recommendations and the issues posed by these recommendations, even when the Council adopted or largely adopted the underlying recommendations. This is because (a) the Council has a separate, general responsibility to respond to comments and controversies on key issues raised in the amendments process, even when the Council followed the recommendations and (b) because in certain circumstances the Council modified recommendations to fit the provisions into the

program, requiring some explanation even if in the Council's view it largely followed the substance of the recommendations. Even so, not all recommendations are discussed in the following findings, by any means. All recommendations (and comments) were considered by the Council in shaping the program. If a program amendment recommendation is not mentioned here that is because the Council concluded that the final program provisions are consistent with the recommendation and the process did not develop a significant set of comments or issues or controversy around the subject to require an explanation.

The discussion of recommendations and comments that follows has been organized to match the organization of the final program. This means that the recommendations have been grouped or organized into categories by topic and portion of the program that the recommendations address. Most of the comments on the recommendations and on the draft amendments fell into these same topical or issue categories. The recommendations and comments largely focused on a discrete set of topics, and so the focus of the discussion that follows is on the set of topics that dominated the amendment process. One key point to make at the outset is that with some few exceptions, the Council maintained the body of strategies, principles, measures, and objectives built up over thirty-four years of program development. This is true even as the Council reorganized and to some extent refocused the program. The recommendations simply did not put at issue the bulk of the program. As will become clear below, most of the key issues and controversies raised in the amendment process concerned recommendations and comments about what the Council and the participating entities recognized as new or emerging issues for the region fish and wildlife program, or expansion of certain under-emphasized areas – again, with some exceptions discussed in the findings.

Contents

1. Program framework, program organization, and scientific foundation and principles
2. Program goals and objectives
3. Ecosystem function and habitat protection and improvement
4. Non-native and invasive species, especially aquatic nuisance species and quagga and zebra mussel interdiction
5. Predator management
6. Protected areas and future hydroelectric development
7. Water quality – toxic contaminants
8. Climate change
9. Mainstem water management, flow and passage measures and objectives, including recommendations relating to the FCRPS Biological Opinions under the Endangered Species Act and the Columbia Fish Accords
10. Proposed experiment to increase spill for juvenile fish passage
11. Estuary, near-shore ocean and freshwater plume, ocean
12. Wildlife mitigation
13. Fish propagation and hatcheries, wild fish protection, strongholds, and quantitative objectives for anadromous fish
14. Anadromous fish mitigation in blocked areas, including anadromous fish reintroduction and passage
15. Resident fish mitigation, assessments, settlement agreements and crediting
16. Specific species other than salmon and steelhead, especially sturgeon, lamprey and eulachon
17. Willamette River subbasin issues
18. Adaptive management, including monitoring, evaluation, research, reporting, and data management
19. Subbasin plans
20. Implementation procedures, including program funding, program scope and funding priorities; long-term funding for operation and maintenance; “in lieu” expenditures; project review; program and regional coordination
21. Renewable energy development and the effects on wildlife and fish
22. Determination as to the power supply’s adequacy, efficiency, economical nature, and reliability, including information on the costs of the fish and wildlife program

(1) Program framework, program organization, and scientific foundation and principles

In the 2000 Fish and Wildlife Program, the Council comprehensively revised the program around a framework that linked a program vision to biological objectives to basinwide measures, tied together by an explicit scientific foundation and a underlying habitat-based approach, a framework then replicated at different geographic levels including the mainstem Columbia and Snake rivers and the tributary subbasins, estuary and specific mainstem reaches. 2000 Fish and Wildlife Program, at 9-20, 35-43 (<http://www.nwcouncil.org/fw/program/2000/2000-19/>). The Council retained this program framework at the conclusion of the 2009 program amendments. See 2009 Fish and Wildlife Program, at 3-4, 6-14, 27-40, 57-58 (http://www.nwcouncil.org/media/115273/2009_09.pdf).

In this amendment process the Council did not receive recommendations to change the program framework in any fundamental way. And so the program framework remains fundamentally the same. See 2014 Fish and Wildlife Program, at 10-13 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

The Council did receive recommendations to revise or restructure certain aspects of the program framework. The Council's own internal review suggested others. This included a coordinated set of recommendations from a number of the state fish and wildlife agencies and tribes to emphasize adaptive management as the principle or purpose for linking together the different elements of the program framework (Oregon Department of Fish and Wildlife Washington Department of Fish and Wildlife; Washington State Governor's Salmon Recovery Office; Nez Perce Tribe, Burns Paiute Tribe, Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, Upper Snake River Tribes). Along with that came recommendations to better incorporate the estuary, plume and near-shore ocean into the main strategy of the program. Another related set of recommendations and subsequent comments sought to make improving ecosystem function an underlying substantive organizing principle or strategy, rather than improving habitat (see #3 and #9 below). The Independent Scientific Advisory Board recommended certain revisions in the program's scientific foundation and principles, and others supported those revisions (described in more detail below). Other recommendations called for the Council to group measures relating to certain topics together and make those topics into more explicit and distinct sections of the program, such as a section that organizes all the measures relating to sturgeon or lamprey or predator management. The Council's own review identified, among other things, a need to better integrate the mainstem water management, flow, and passage strategies into the overarching ecosystem function strategy, and that the geographic level of "ecological provinces" has not proven a useful planning, implementation or evaluation layer for the program.

Based on these recommendations, comments and considerations the Council did revise and reorganize the program framework elements to a certain extent. The

Council integrated an adaptive management approach into the program framework, to recognize how the work done under the program to monitor and evaluate progress should feed back into decisions to refine objectives and measures. 2014 Fish and Wildlife Program, at 10-11, 101-07 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The “basinwide strategies” in the previous programs were reshaped into an overarching strategy to protect and restore ecosystem functions, a companion program strategy on fish propagation, and a set of other policies or strategies for how these two large-scale strategies come into play in different contexts. *Id.*, at 4, 10, 37-38, 76, 80 (for more on the ecosystem function concept, see #3 and #9 below). The Council revised the scientific principles. *Id.*, at 27-29 (more immediately below). The Council revised the geographic structure of the program; eliminated “ecological provinces” as a specified, functional planning level for the program, replaced by recognition that a variety of subregional groupings may make more sense for different circumstances; better integrated mainstem water management and passage and the estuary, plume and near-shore ocean considerations into the overarching ecosystem function strategy (*and see #9 and #11 below*), and retained the subbasin structure and subbasin plans. *Id.*, at 11-13, 60-71, 108-09.

With regard to the scientific principles in particular, the Independent Scientific Advisory Board recommended certain revisions in the program’s scientific foundation and principles. In the ISAB’s view the principles could be improved by being more explicit about enhancing resilience and adaptability of ecosystems, incorporating a landscape perspective, and better describing the role of human engagement in ecosystem. *Review of the 2009 Fish and Wildlife Program*, at 4-6, ISAB No. 2013-1 (March 2013) (<http://www.nwcouncil.org/fw/isab/isab2013-1/>). The ISAB’s recommendations on revising the scientific principles were then supported by others either in their program recommendations (in some cases, recommending to the Council the entirety of the ISAB’s recommendations from the review report) or in subsequent comments. This includes recommendations or comments from the Washington Department of Fish and Wildlife; NOAA Fisheries; Washington State Governor’s Salmon Recovery Office; Trout Unlimited; Native Fish Society and Wild Steelhead Coalition. Comments from the Columbia River Inter-Tribal Fish Commission and Yakama Nation did not object to revising the principles, but did make clear that the views on the scientific principles from the independent science panels must be balanced with the practical knowledge, recommendations and perspectives from the fish and wildlife agencies and tribes, especially as the agencies and tribes applied these scientific principles in management decisions. And they commented that the program’s scientific foundation should recognize the significant ecological and environmental modifications that have occurred in the Columbia River and its tributaries and that a combination of habitat restoration and hatchery implementation is necessary to maintain healthy populations of salmon and steelhead for the foreseeable future.

The Council revised the scientific foundation and principles along the lines recommended by the ISAB and those who supported those revisions. *Id.*, at 27-28.

At the same time the Council recognized elsewhere in the program (consistent with the comments) the significantly altered state of the Columbia ecosystem and the challenges that presents for successful protection and mitigation of key fish and wildlife species. The program does rely heavily on the practical management knowledge and judgments of the fish and wildlife agencies and tribes in applying these principles and deciding how best to implement and combine the strategies and tools available. See *Id.*, at 16, 17, 37, 76-77.

(2) Program goals and objectives

The Council received an extensive set of recommendations regarding the program's goals and objectives, primarily from the state and federal fish and wildlife agencies and tribes but also from other state and federal resource agencies, Bonneville, the Bonneville customer groups, and a number of the conservation groups. Agency and tribal recommendations came from NOAA Fisheries, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Montana Fish Wildlife and Parks, Columbia River Inter-Tribal Fish Commission, Nez Perce Tribe, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Kootenai Tribe of Idaho, Spokane Tribe, Colville Confederated Tribes, Upper Columbia United Tribes, Burns Paiute Tribe, Upper Snake River Tribes, Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, Pacific Fishery Management Council, Washington State Governor's Salmon Recovery Office, Yakama Basin Fish and Wildlife Recovery Board, and Bonneville. Bonneville customer group recommendations and comments came from Northwest RiverPartners, Public Power Council, PNGC Power, and Northwest Requirements Utilities. Conservation, fishing and environmental groups that provided recommendations and comments on goals and objectives included the Save Our Wild Salmon coalition, American Rivers, Trout Unlimited, Northwest Sportfishing Industry Association, Association of Northwest Steelheaders, Native Fish Society, and the Wild Steelhead Coalition. A number of the fish and wildlife agencies and tribes and conservation groups also recommended to the Council for the program the recommendations about biological objectives from the Independent Scientific Advisory Board in the ISAB's review of the 2009 Fish and Wildlife Program. Specific recommendations by specific entities will be identified below only as necessary.

The Council was aided in its deliberations on these recommendations (and subsequent comments to the same effect by many of the same entities) by the use of an ad hoc committee of its members to sift through and consider the recommendations on program goals and objectives and on the monitoring, evaluation and research elements of the program in shaping the draft program provisions (see also #18 below for the latter elements) and by a series of consultations with agency and tribal representatives that combined issues about the hatchery and wild fish provisions of the draft and issues about the direction the program should take in terms of organizing, assessing, and further developing the quantitative objectives of the program for adult salmon and steelhead (see #13 below).

The final program provisions are in 2014 Fish and Wildlife Program, at 29-36, 153-61 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>), summarized as follows:

A number of recommendations called for the Council to reorganize the program's goals and objectives in some fashion. This included gathering the program's goals, objectives and biological objectives together rather than spread through disparate parts of the program (for example, bring the biological objectives of the mainstem together with the program objectives). It also included recommendations to organize the material so as to display in a better way the relationships between the qualitative goal and objective statements, quantitative objectives, program strategies, and the indicators used in reporting, as a better basis for adaptive management. The Council significantly restructured the program's discussion of goals and objectives consistent with these recommendations. *Id.*, at 29-30, 153-62. It is a work in progress to link all these elements satisfactorily, but the Council made good progress in this amendment process. The provisions on adaptive management, of which the objectives are a part, are at 101-07, 162, and 180-82.

As recommended especially by a number of the fish and wildlife agencies and tribes and conservation groups, the Council retained the program's two broad quantitative goals for salmon and steelhead – increase total abundance to an annual average of five million adults by 2025 with an emphasis on the populations that originate above Bonneville Dam, and contribute to achieving smolt-to-adult return rates in the two-to-six percent range for listed spring Chinook and steelhead in the Snake River and upper Columbia. Bonneville also explicitly supported the continuation of the total “five million” goal. As part of an effort to refine the program's quantitative objectives (see below), the Council did ask the region to consider the ISAB's recommendation to refine the 2- to 6-percent smolt-to-adult return ratio to reflect the survival levels that populations need to achieve both recovery and harvest goals. *Id.*, at 29, 156-57.

The Bonneville customer groups recommended that Council remove the smolt-to-adult return rate goal as beyond the scope of the Northwest Power Act, as these rates incorporate all sources of mortality throughout the fish's life-cycle and not just that caused by the development and operations existence and operation of the hydrosystem. In their view, the smolt-to-adult return rate goal serves no useful function in the program and would be an inappropriate basis for a program decision by the Council. As noted above, the Council did not adopt this recommendation. The Council's recognizes that there a number of factors that contribute to low smolt-to-return rates in salmon and steelhead, not just the effects of the hydrosystem, and that achieving this goal will depend on the coordinated actions of many entities and programs in the basin. *Id.*, at 14-15, 29. At the same time the consensus recommendations of especially the agencies and tribes has been that the ultimate touchstone of success is sustained improvement in adult returns, and that means not just abundance but also sustained increases in productivity represented by the higher smolt-to-adult return rate goal. Thus it makes sense to display that goal in the program, revise it as appropriate, and work to see that the protection and mitigation measures implemented under the Act contribute their share to meeting this objective.

Beyond continuing in the program the goals noted above, the Council received a wide variety of recommendations for further developing the quantitative objectives of the program, including:

- refine the goal of five million salmon and steelhead by 2025 by specifying proportions of wild and hatchery fish; or refine to distinguish contributions of adults to harvest, spawning, and hatchery broodstock
- refine and expand the smolt-to-adult return rate goal into productivity objectives that reflect differences among species and populations
- retain the long-term goal of achieving abundance numbers and other population characteristics that represent full mitigation even while recognizing populations fluctuate due to natural variability
- refine, expand and develop the program's quantitative objectives at the appropriate subregional levels, including provinces, subbasins, ESUs, and populations, as a more appropriate scale
- align the program's objectives with the ESU/DPS/MPG/population approach to objectives used in the ESA planning
- expand quantitative objectives to include sustainable and useable abundance, distribution, and generic viability objectives as interim quantitative performance objectives for upper Columbia basin salmon and steelhead populations
- develop quantitative objectives for the initiative to reintroduce anadromous fish above blockages (see #14 below)
- as blocked areas are opened, establish escapement objectives in tributaries where fish passage and access to spawning and rearing habitat has been restored
- add biological objectives for lower river salmon and steelhead populations directly affected by hydrosystem operation – the program currently includes and emphasizes only upper river populations
- refine the five million goal and other salmon and steelhead abundance goals by removing the emphasis on populations above Bonneville Dam (or others would recommend retaining that emphasis)
- consider establishing quantitative goals for habitat, flow, hatchery performance, and harvest at the population scale
- establish quantitative objectives for biological diversity and population structure for key species and habitats by 2025
- maintain the 2009 program language for the qualitative objectives for environmental characteristics
- develop quantitative objectives for the ecosystem characteristics and functions that are needed to achieve the biological objectives for population performance
- develop an ecosystem-based function goal or goals for a restored, resilient and healthy Columbia River basin ecosystem, to match an overarching ecosystem function strategy; or to match an ecosystem function for river flow and reservoir operations

- establish quantitative objectives and timelines for floodplain restoration and for changes in flood risk management
- establish spawner abundance goals and escapement objectives for each species and race in each watershed based on an estimate of the carrying capacity of each watershed; refine over time with additional monitoring and evaluation and with better information that accounts for a range of biological processes related to adult salmon spawning and dying
- establish a conservation target or wild fish objective for each watershed and each population
- establish a carrying capacity target or objective for key watersheds
- establish nutrient enrichment targets for watersheds from naturally spawning wild salmonid carcasses as specific criteria to increase the productivity of watersheds for salmonids, riparian areas, and wildlife
- develop quantitative objectives for other species of fish and wildlife in addition to salmon and steelhead, including quantitative objectives of various types for lamprey, sturgeon, eulachon, bull trout, and other resident fish important to the program – or recognize relevant objectives that already exist in other plans and programs, such as for lamprey
- establish quantitative objectives for resident fish mitigation based on resident fish loss assessments – and develop indicators for tracking
- add quantitative objectives and indicators for wildlife, including related to operational and secondary losses
- develop quantitative objectives for improving habitat and ecosystem functions for wildlife
- incorporate into the program or recognize as program objectives the quantitative goals, objectives and standards in the biological opinions and recovery plans adopted under the Endangered Species Act
- incorporate or recognize as program objectives the quantitative goals and objectives in a range of other plans and programs, including a number of the tribal plans and programs
- add a goal to achieve 75% of the ESA recovery goals by 2025 as part of the quantitative biological objectives
- incorporate into the program the performance standards for juvenile salmon and steelhead passage through the hydrosystem salmon and steelhead in the biological opinion – could be considered interim quantitative milestones
- incorporate into the program performance standards for Pacific lamprey, white sturgeon, and bull trout from various biological opinions
- develop hydrosystem performance standards and flow objectives for non-listed salmon and steelhead anadromous species, and for sturgeon, lamprey and other species
- to the extent the Council sees the need to develop additional quantitative objectives for the program – beyond what already exists in the program and in other plans and programs – the Council should work with and largely defer to the expertise of the fish and wildlife agencies and tribes in developing the biological goals for the program

- make clear that the program’s goals and objectives for protection and mitigation under the Northwest Power Act are broader and greater than the quantitative goals set under ESA to recover and delist species – or conversely, recognize that the recovery plans have also included broad-scale recovery goals (and incorporate those into the program), goals that take into account abundance and harvest factors that already reflect the broader protection and mitigation responsibilities of the Power Act and the vision of the fish and wildlife program
- develop geographical-based program objectives to ensure that mitigation activities and investments are fairly distributed across the basin
- adopt objectives that focus new mitigation activities in the area above Grand Coulee and Chief Joseph dams as having sustained the greatest loss with less mitigation to date
- assure that any quantitative objectives established for the program are based in sound science, and not just aspirations, and reflect and are limited by the adverse effects of the hydrosystem
- revise and refine the language of the narrative or qualitative objectives in various ways
- add timelines and more definition to many objectives, quantitative and qualitative
- link quantitative biological objectives and the program’s High Level Indicators (HLIs) to track and report on progress

This was a varied and complicated and not entirely consistent set of recommendations. And except for the few recommendations that sought to maintain existing program objectives, and those that sought to have the Council simply recognize or incorporate the goals and objectives in another plan, few of the recommendations included specific quantitative objectives as much as call for their development. And even an effort to describe how that might happen became a subject of controversy, as provisions in the draft program about assessing and establishing quantitative objectives for naturally spawning and artificially produced adult salmon and steelhead became part of the long series of comments and consultations with agency and tribal representatives and comments from conservation groups and others. The nature of the issues, the consultations, and the outcome are described and explained below (#13).

In this light, the Council decided to retain most of the existing goals and objectives from the 2009 program for a range of anadromous fish, resident fish and wildlife, most but not all them qualitative. The Council did reshape and reorganize these; many are labeled interim; and some of the qualitative statements about environmental change became principles and even measures for the ecosystem function, habitat and mainstem strategies rather than objectives for environmental characteristics. See *Id.*, at 29-30, 38-39, 42-43, 60-62, 64-65, 153-61. The Council also recognized that helping to achieve the quantitative objectives and goals in the biological opinions and recovery plans should be seen as at least interim goals for the regional protection and mitigation program as well, and the Council

incorporated into the program as baseline objectives in the mainstem the performance standards, flow objectives and water quality objectives for juvenile and adult survival through the hydrosystem that are in the biological opinions. *Id.*, at 60-62, 153-54, 157-59. Recommendations about objectives that were really part of the broader sets of recommendations regarding program provisions on certain topics are addressed below, including mainstem water management, flow and passage (#9); wildlife mitigation (#12); mitigation for anadromous fish losses in blocked areas (#14); resident fish assessments and mitigation (#15); and species specific recommendations for lamprey, sturgeon, eulachon and bull trout (#16).

Beyond that, the Council deferred major changes in the existing goals and objectives. The Council will work with the state and federal fish and wildlife agencies and tribes, other state and federal agencies, the independent science panels, and others to refine program goals and quantitative objectives, with an emphasis on surveying a wide swath of plans and programs in the region and from those collecting, identifying and refining a realistic set of quantitative objectives for focal species and habitat. *Id.*, at 30-31. The Council agreed with the fish and wildlife agencies and tribes to work together on an initiative that will begin in 2015 to collect, organize, assess and report on what quantitative objectives already exist in the region with regard to adult salmon and steelhead, both natural origin and produced in or intended for hatcheries, and listed and non-listed. This effort will include defining the most effective and efficient way to track progress on the objectives and identifying specific indicators for hatchery programs to track progress on meeting the range of objectives represented by propagation efforts. Presumably another result could be identifying what important gaps exist in quantitative objectives for salmon and steelhead and then deciding together how to fill those gaps. *Id.*, at 33.

Following that, the Council will work with the agencies and tribes and others to survey, organize and assess what quantitative goals and objectives exist in the region to relate to the losses of lamprey, sturgeon, eulachon, bull trout, cutthroat trout, kokanee and other fish species important to the program. The Council will use this information to decide at least in an informal way which of these objectives to consider as possible program objectives; what modifications may need to be made to the existing goal statements, objectives, and indicators in the program; and if and when to initiate a program amendment process to incorporate revised and expanded objectives into the program. *Id.*, at 34. The Council will do the same for goals and quantitative objectives for ecosystem function, habitat and hydrosystem objectives. *Id.*, at 34.

The Council will ensure that the process to assess and develop further quantitative objectives is science based, and subject to independent scientific review at appropriate moments. *Id.*, at 31. And cognizant of the comments of the Bonneville customer groups in particular, the Council will relate these program goals and quantitative objectives, and the measures that address them, to the fundamental goal set in the Northwest Power Act to protect, mitigate and enhance

fish and wildlife for the adverse effects the development and operation of the hydrosystem only. Where goals and objectives represent losses or aims greater than the hydrosystem is responsible for, the program will be clear as to that fact and the shared nature of the responsibility with other programs and entities.

(3) Ecosystem function and habitat protection and improvement

As noted in #1 above, the Council received recommendations to incorporate as a central or key goal of the program to improve and restore ecosystem functions that are healthy and resilient for the species important to the program. The most extensive recommendations and subsequent comments on this came from the Columbia River Inter-Tribal Fish Commission, Upper Columbia United Tribes, and the US Geological Survey. But recommendations and comments in support came from a broad array of agencies, tribes, conservation organizations and others. This included NOAA Fisheries; Kootenai Tribe of Idaho; Upper Snake River Tribes; Burns Paiute Tribe; Washington State Governor's Salmon Recovery Office; Upper Columbia Salmon Recovery Board; Seattle City Light; the combined comments of the conservation group coalition (such as American Rivers, Save Our Wild Salmon coalition and others); Trout Unlimited; Wild Salmon Center; Native Fish Society and Wild Steelhead Coalition; and others, including a number of individuals. The Inter-Tribal Fish Commission submitted a definition and set of principles for ecosystem-based function adopted by all of the Columbia River tribes participating in the U.S. Columbia River Treaty review. The focus of the Independent Scientific Advisory Board's recent large-scale review reports to the Council – the ISAB's 2013 review of the Fish and Wildlife Program and its 2011 review reports on food webs as a broader scientific foundation for fish and wildlife restoration and on a comprehensive landscape approach to conservation – pointed to the same concept: Improving habitat characteristics may be an important component of an ecosystem that functions for the desired species. But other elements are important, too, including food webs, invasive species, predators, climate change, contaminants, physical river structures, and other influences – all interrelated aspects of an ecosystem that functions best for productive and abundant populations of key species.

Two entities in particular (Western Montana Electric Generating and Transmission Cooperatives and Idaho Irrigation Pumpers Association) commented with concerns about incorporating this concept. They were concerned that such a broad ecosystem function strategy strays too far in too broad a language from the obligation under the Northwest Power to protect, mitigate and enhance fish and wildlife affected by the development and operation of the hydroelectric facilities. That is the obligation of the Council, not generally improving the ecosystem functions of the entire basin, altered through many different causes.

Based on the recommendations and comments especially from the agencies and tribes, the Council revised the program to state a fundamental, overarching strategy to protect and restore natural ecosystem functions. A set of sub-strategies was then organized within the ecosystem function strategy, all aimed at contributing to protecting and restoring the complex of ecosystem functions that best serve to protect and mitigate anadromous and resident fish and wildlife affected by the Columbia hydrosystem. Protecting and restoring habitat conditions remains a critical part of this overarching strategy, in what is still essentially a

habitat-based program. 2014 Fish and Wildlife Program, at 26-28, 30, 35, 37-75 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

The Council understands the concerns expressed by the Western Montana Electric Generating and Transmission Cooperatives and Idaho Irrigation Pumpers Association. The Council agrees that the obligation under the Power Act has not changed – the responsibility of the program is to protect, mitigate and enhance fish and wildlife adversely affected by the Columbia River basin hydroelectric facilities. What the Council has done here is recognize that the best scientific and management advice is that taking actions across a broad range of factors, if done effectively and efficiently, can improve the functions of the ecosystem and bring about the desired protection and mitigation to address hydrosystem impacts. The Council also recognizes that other human actions have also altered the environment to the detriment of desired native fish and wildlife. The Council's obligation is not to mitigate for the losses from the other sources, although enhancing functions by addressing problems caused in other ways is, in appropriate circumstances, an off-site mitigation opportunity allowed under the Act as part of the program. At bottom, improving ecosystem conditions for fish and wildlife basin is a responsibility the program and the ratepayers share with other programs throughout the region. What the program does is describe the objectives, strategies, tools and measures by which the hydrosystem and its ratepayers bear its portion of the responsibility. See *Id.*, at 14-15, 37-38, 114-15.

A number of fish and wildlife agencies and tribes then recommended a host of topics relating to habitat and ecosystem function that should be incorporated and addressed in the habitat strategies of the program. This included protect habitat infrastructure investments, encourage long term funding agreements, use ecosystem concepts, work with local organizations, rehabilitate mainstem habitat, fully incorporate the estuary, plume and near-shore ocean, reduce toxic contaminants, integrate climate change, implement predator control, address large woody debris, prioritize habitat restoration work, maintain the water transaction program, develop an understanding of risks associated with habitat restoration work, and consider how hatcheries integrate with habitat efforts. Nearly all of these are addressed in the topics that follow. A few miscellaneous are addressed here:

The Council received a number of recommendations emphasizing the need to focus program resources on improving habitat and functions in the mainstem portion of the river to support spawning, rearing, resting and migration, and not just consider habitat improvements as a program concept or emphasis in the tributaries. Some version of recommendations of this type came from (among others) Columbia River Inter-Tribal Fish Commission, Cowlitz Tribe, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, US Geological Survey, Upper Columbia United Tribes, US Fish and Wildlife Service, and Native Fish Society. The Council revised provisions on mainstem habitat from the prior

programs and made clear the importance of mainstem habitat improvements and measures in the ecosystem function strategy and the sub-strategies related to habitat improvement, mainstem water management and passage, and estuary. *Id.*, at 38-39, 42-43, 6-61, 64-65, 68-69 (see also #9 and #11 below).

The Council also received recommendations and comments to maintain the commitment to the water transactions program, an important tool for improving habitat conditions in the tributaries. Recommendations of this nature came from the Idaho Water Resources Board, Deschutes River Conservancy, the Clark Fork Coalition, and the Columbia Basin Water Transaction Program itself. The Council did so, as a general measure in the habitat sub-strategy. *Id.*, at 42. The recommendations included a certain amount of detail that the Council did not include. To the extent refinements are needed in how the water transaction program is implemented – and the Council is not sure any are needed – it would be more effective to address these within the water transaction project itself and among its partners and participants, in contracting and implementation and in yearly planning and evaluation.

Finally, the Council received a recommendation from the Washington State Governor's Salmon Recovery Office and the Upper Columbia Salmon Recovery Board (and later comments from them and from the Snake River Salmon Recovery Board) to develop standards or guidance on the use of large wood in increasing habitat complexity. They emphasized that issues of liability and responsibility for maintaining restoration projects with large wood components have not been completely resolved, in part because while these structures are designed to re-create natural conditions and processes and thus appear to part of the natural environment, in reality these are artificial structures that require maintenance over time to ensure continued safety and function. The recovery office and boards noted that Council is in an important leadership position to develop standards or guidance to address the issues with regard to the use of wood, increasing awareness of the importance of wood in the habitat improvement work and supporting the investments needed to support these efforts. The Yakama Nation separately recommended that the program support and implement habitat actions that include large woody debris restoration. The Yakama Nation also recommended more broadly that the Council initiate a regional discussion and outreach program to educate project sponsors, stakeholders, and landowners on the values and risks associated with habitat restoration actions, including the placement of large woody debris.

The Council agrees in the value of the restoration and recruitment of large wood as one of the many habitat actions and habitat characteristics important to functioning river ecosystems. The program's ecosystem function and habitat measures are more general, *Id.*, at 38-43, and so the Council did not mention large woody debris projects specifically (nor any other specific techniques). But placing and maintaining wood structures, and making other improvements to increase natural wood recruitment are certainly techniques that are part of the

core of habitat work in the basin. As for issues of responsibility and liability to maintain, the Council concluded that at first blush, these issues seem best resolved at this level of specificity in contracting and implementation. But to the extent a general problem exists that others around the region recognize, the Council is willing help. One suggestion might be to schedule a policy discussion on this topic, as part of program implementation and coordination. The Council has also called on Bonneville and the other federal action agencies to work with the fish and wildlife agencies and tribes to ensure that funds are provided for the long-term maintenance of program investments, something the Council considers a high priority for program implementation in the next five years. *Id.*, at 114-16, 199-200 (*and see #20 below*). This effort may be a place to raise the issue of responsibility for long-term maintenance of large wood structures as well as other significant habitat investments.

(4) Non-native and invasive species, especially aquatic nuisance species and quagga and zebra mussel interdiction

The Council's 2009 Fish and Wildlife Program included a general strategy and then both mainstem and subbasin measures to evaluate and control non-native and invasive species. The 2009 program recognized that these species represent direct threats to the fish and wildlife protection and mitigation efforts through competition, predation and habitat modification, and that besides the direct threats to species and habitat, aquatic invasive species in particular can also invade and significantly threaten infrastructure at hydroelectric dams and fish passage facilities in the Columbia River basin. The program labeled the possible introduction into the basin of quagga and zebra mussels the greatest known threat to the FCRPS, with particular focus on efforts to monitor and prevent their appearance in the basin. 2009 Fish and Wildlife Program, at 18, 53 (http://www.nwcouncil.org/media/115273/2009_09.pdf). The program also recognized that in certain particular circumstances, the introduction and enhancement of non-native resident fish species in highly altered habitats (such as in the blocked areas) might be an appropriate mitigation option, preceded by an environmental risk assessment of potential negative impacts on native fish species. *Id.*, at 18, 24.

Non-native and invasive species issues were again a significant topic in the current amendment process. In particular, nearly all of the fish and wildlife agencies and tribes and other related state and federal resource agencies submitted recommendations addressing the threat of non-native and invasive species. Most of them called for the fish and wildlife program and the Council to play a leadership role in coordinating at a basinwide level the myriad of state, federal, tribal and local efforts at effective management, control, prevention and eradication of invasive species, connecting and overseeing strategies, forging and facilitating partnerships. Many recommended that the Council engage in a coordinated regional effort with what is known the 100th Meridian Initiative-Columbia Basin Team, an inter-agency team particularly focused on preventing aquatic nuisance species from taking hold in the basin

In addition, a number of the agencies and tribes recommended specific measures to address a variety of non-native and invasive species efforts. This included continued and increased support for the efforts to prevent introduction and establishment of invasive species, particular aquatic nuisance species, and for measures to address the adverse effects of invasive, non-native species already in the basin on native populations of fish and wildlife and their habitats. Many of these recommendations particularly called for Bonneville to fund or support particular measures, or for the federal actions agencies to support. Some also recommended Bonneville funding for monitoring of invasive species, research on innovative control and eradication methods, and research on the effects of invasive species on fish and wildlife program restoration efforts. The Council also received recommendations to make clear that the requirement of conducting

environmental risk assessments concerning the possible use or management of non-native fish should apply in any location where management of non-native invasive fish overlaps with native fish conservation and endangered species listings.

Recommendations of one or both types – general coordination or specific evaluation and control measures – came from the Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Montana Fish Wildlife & Parks, Confederated Salish and Kootenai Tribes, Coeur d'Alene Tribe, Spokane Tribe, Kootenai Tribe of Idaho, Colville Confederated Tribes, Upper Columbia United Tribes, Burns Paiute Tribe, Upper Snake River Tribes, Nez Perce Tribe, Columbia River Inter-Tribal Fish Commission, Confederated Tribes of the Grand Ronde Community of Oregon, Cowlitz Tribe, U.S. Fish and Wildlife Service, U.S. Geological Survey, Washington Invasive Species Council, Washington State Governor's Salmon Recovery Office, Lower Columbia Fish Recovery Board. A number of these agencies and tribes – and others, such as the Upper Columbia Salmon Recovery Board – commented subsequently in support of the recommendations and of provisions in the draft program based on the recommendations.

The only real issue with regard to the non-native and invasive species recommendations was the issue of responsibility. No recommending or commenting entity questioned the seriousness of threat of invasive and non-native species, or the need for a coordinated regional effort to address the threat or even the fact that the Council could be useful in helping to coordinate this effort. Especially with regard to the infrastructure threat posed by aquatic invasive species such as quagga and zebra mussels, the Bonneville customer groups (Public Power Council, Northwest RiverPartners, PNGC Power, and Northwest Requirements Utilities) recommended that the Council resist expansion of the fish and wildlife program and the ratepayer obligation to deal with threats not directly caused by or related to the development and operation of the federal hydrosystem and perhaps only indirectly a threat to fish survival in any event. In their view, this and other expansions of the fish and wildlife program were inconsistent with and a distraction from the requirements and goals of the Act and the program, and had the potential to dilute the effect of available funding from Bonneville and its ratepayers. Others such as the Idaho Irrigation Pumpers Association commented in similar fashion. The Association commented that that expanding the fish and wildlife program to address non-native and invasive species may be necessary, but that because the problems are not related to or caused by the dams or by hydropower generation, the costs should not be borne solely or even significantly by the ratepayers. The Association emphasized its support for the Council's intent to form partnerships in the region and share costs. Bonneville, in its recommendations and comments, noted its similar concerns over expecting the fish and wildlife program to carry much if any of this burden and saw a more appropriate source of responsibility and funding in the hydropower facility operation and maintenance funding by project operators. The best role for

Bonneville and the Council was to coordinate with regional partners on invasive mussel prevention and response strategies. Even a number of the agencies and tribes commented that the threat of the most serious aquatic invasive species was an ongoing maintenance issue for the project operators and not a fish and wildlife mitigation obligation to be funded out of the fish and wildlife program.

On this record, the Council included in the 2014 program a sub-strategy on “non-native and invasive species” based on and consistent with the fish and wildlife agency and tribal recommendations and comments. The substance of the sub-strategy is not significantly different than the provisions in the 2009 fish and wildlife program, yet more detailed and expanded in certain ways, with a shift in emphasis towards prevention and response and towards the need for regional coordination of efforts to address the problems caused by invasive and non-native species. The Council also included “aggressively addressing non-native and invasive species” as one of the emerging program priorities. 2014 Fish and Wildlife Program, at 46-48, 116 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The separate “strongholds” areas strategy to help protect and conserve stronghold habitats and populations of native wild fish also has a component calling for efforts to eradicate non-native and invasive species (or prevent their introduction) in these areas. *Id.*, at 44-45.

The Council also agreed with the cautions about shared responsibility and funding. With specific regard to what was identified as the greatest known threat from aquatic invasive species – introduction of quagga and zebra mussels – the Council made clear that monitoring and prevention is a regional effort led by states and federal resource agencies and regional inter-agency organizations. The role of Bonneville and the other federal action agencies under the fish and wildlife program is to assist the states and regional efforts to prevent the establishment of these species, not to lead and not to bear much if any of what could be a substantial funding and implementation burden. Suppression or eradication of other harmful non-native and invasive species already in the basin is also noted as a shared effort of state and federal fish agencies and tribes and others. To the extent non-native species are a limiting factor or threat to the success of the program’s efforts at protection and mitigation, and taking action to suppress those species can protect or enhance fish or wildlife survival, then clearly there is an appropriate role for the program and for possible funding support from Bonneville in appropriate circumstances, as well as implementation support from the other federal action agencies, all consistent with the Northwest Power Act. But the Council’s most appropriate contribution is to focus on coordination and public awareness of all the needs and efforts in the region to address non-native species that pose the greatest risk to the Columbia ecosystem and hydropower system, and not to lead or recommend a ratepayer-funded effort to address all these risks.

(5) Predator management

A set of the state and federal fish and wildlife agencies and tribes submitted a relatively coordinated set of recommendations to support and expand the program's efforts to control predators that are a significant source of mortality not just for juvenile and adult salmon and steelhead but also sturgeon, lamprey and resident species of importance. This included recommendations from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, NOAA Fisheries, Colville Confederated Tribes, Confederated Salish and Kootenai Tribes, Confederated Tribes of the Grand Ronde Community of Oregon, Cowlitz Tribe, Upper Snake River Tribes, and the Lower Columbia Fish Recovery Board. Recommendations cover predation by other fish (piscivorous), by birds (avian), and by marine mammals (pinniped). Not every agency and tribe in the list submitted every recommendation, but collectively the recommendations included:

- continue implementing the existing piscivorous predator-control program and expand northern pikeminnow removals to other mainstem dams in the lower Columbia River
- evaluate the effectiveness of pikeminnow removals expand efforts as warranted
- Bonneville and the other federal action agencies should work cooperatively with NOAA Fisheries, US Fish and Wildlife Service, states, tribes and the Council to develop and implement systemwide strategies to manage and reduce non-native fishes that compete and feed on native fish (both anadromous and resident) in the mainstem and in tributaries
- support and Bonneville funding for additional research into the overall magnitude of the impacts of non-native predators and food- web interactions to improve management of non-native species
- adopt into the program management plans developed in other processes to reduce the effects of avian predation in the Columbia River, including in the estuary and in the mid-Columbia River area; prioritize actions for implementation (some recommended explicitly that Bonneville and the action agencies should fund implementation)
- Corps of Engineers (or Bonneville) should fund federal, tribal and state agencies to evaluate the extent of pinniped predation on salmonids, sturgeon, and Pacific lamprey in the lower Columbia River from Bonneville Dam to the mouth of the river
- Corps of Engineers should improve the exclusion of sea lions at all main adult fish ladder entrances and locks at Bonneville Dam
- identify opportunities to reduce fish losses through pinniped predator management in the lower Columbia River
- fund federal, tribal and state agencies to implement strategies resulting from the evaluation above to manage and reduce pinniped predation on salmonids, sturgeon and lamprey

NOAA Fisheries added the recommendation for the development of a common metric (such as adult salmon equivalents) to measure and compare the effects of the different types of predation on salmonids with each other and with other limiting factors, and to evaluate the effectiveness of measures to reduce predation. The US Fish and Wildlife Service supported the development and implementation of a comprehensive regional, multi-species management approach by the states, tribes, and federal agencies to address avian predation while also ensuring the long-term sustainability of migratory bird populations. Bonneville recommended that the program encourage collaborative policies and efforts to address the adverse effects of non-native species and predators, with particular emphasis on Bonneville's longstanding pikeminnow reduction efforts. Bonneville also subsequently commented that expansion of the pikeminnow removal program to other dams (as recommended by agencies and tribes) was not warranted at this time. Grant County PUD recommended that the program endorse and advocate for the removal of Caspian tern colonies in the mid-Columbia region, as called for in the inland Avian Predation Management Plan.

Note also that the FCRPS biological opinion on salmon and steelhead and the Columbia Fish Accords include actions to address predation, actions that overlapped with the existing and newly recommended measures for the program. As explained below in the discussion of mainstem water management, flow and passage measures (#10), a broad range of fish and wildlife agencies and tribes and others recommended those biological opinions and Columbia Fish Accord actions be included as measures for the program as well.

The Council approved an expanded predator management section of the final fish and wildlife program based on the recommendations. 2014 Fish and Wildlife Program, at 49-51 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). Certain provisions in the separate section on the control and removal of non-native species also reflect these recommendations. *Id.*, at 46-48 (see also #4 above). The separate sections in the program regarding sturgeon and lamprey refer back to the predation management section. *Id.*, at 90, 92, 94, 95 (see also #16 below). And biological opinion and Columbia Fish Accord actions to reduce the effects of predation are also measures in the program. *Id.*, at 60-62 (see also #10 below).

Consistent with the agency and tribe recommendations, but mindful of the comment from Bonneville, the final program calls for Bonneville to expand the pikeminnow removal program to other dams only "where warranted," based on evaluation and adaptive management principles with input from NOAA Fisheries, the state fish and wildlife agencies, the tribes and the Council. *Id.*, at 49-50. The Council did not include an explicit reference to ensuring the long-term sustainability of migratory bird populations when collaboratively managing avian predation, as recommended by the US Fish and Wildlife Service. Sustaining migratory bird populations over the long term is not the responsibility or within the scope of the fish and wildlife program. It is within the scope of the responsibilities

of others under other laws and treaties, such as the Fish and Wildlife Service. And so the Council recognizes that considerations about protecting the long-term health of migratory bird populations will be and should be part of avian predation management.

(6) Protected areas and future hydroelectric development

The Future Hydroelectric Development/Protected Areas element of the Council's Fish and Wildlife Program was the subject of significant attention during the program amendment process, with particular focus on the issue of whether to add back the possibility of an exception to the protected areas provisions for any proposed hydropower project that will have exceptional benefits for fish and wildlife. The Council did not receive recommendations asking the Council to rethink or make fundamental changes to the protected areas policy established first in 1988 and maintained in the fish and wildlife program (and power plan) ever since. To the contrary – the recommendations overwhelmingly supported maintaining the protected areas. E.g., NOAA Fisheries recommended that the “protected areas remain a critical component of the Program,” preventing unacceptable risks of further loss of fish and wildlife, an importance only “increased by the emerging threat of climate change.” Nor did the Council receive recommendations to remove any areas from protected status or to change any particular protected area designation at this time.

Instead the Council received recommendations and comments relating mostly to two issues. The issue that garnered the most attention concerned whether to include in the program again a process allowing for an exception to a protected area designation for a proposed new hydroelectric project that will provide exceptional benefits to fish and wildlife. The other issue concerned whether the protected areas database and designations remain consistent with information about fish and wildlife resources developed since the Council's original designations in 1988.

The first issue in more detail: The original protected areas policy approved by the Council in 1988 included a provision allowing any interested party to “file a petition with the Council for an exception to a protected areas designation for a project with exceptional fish and wildlife benefits.” Protected Areas Amendments (1988), at 6-8 (http://www.nwcouncil.org/media/63794/88_22.pdf). The “exception” provision was part of a section that also included a provision allowing an interested party to petition for a change in a protected areas designation, and a provision allowing the Council staff to make technical corrections to the protected areas database as needed.

The Council amended the language of these three provisions in a number of ways in subsequent program amendments. But all three provisions – including the “exception” provision – remained in the program until the Council's comprehensive revision of the fish and wildlife program in 2000. At that time the section containing all three provisions dropped out of the program. This happened due to an oversight and not because the Council intended to change that element of the protected areas policy. In fact, the Council's intent in developing the 2000 program was not to change or affect the protected areas element of the program in any way. See 2000 Fish and Wildlife Program

(<http://www.nwcouncil.org/media/115340/FullReport.pdf>.) The omission of three provisions went unnoticed for more than a decade – an indication of how little these provisions had been used – until shortly before the beginning of the amendment process that led to the 2014 Fish and Wildlife Program.

As the program amendment process began the Council was already engaged in discussions with staff about whether to consider adding back in the “exception” provision and the other two missing provisions to the protected areas part of the program. The Council then received a program amendment recommendation from Public Utility District No. 1 of Snohomish County, requesting the Council reinsert the provisions allowing an interested party to petition the Council for a change in status of a protected area to enable new hydropower development; and seek an exceptional benefits exception to the prohibition on new hydropower development in a protected area when the proposed project would enhance fish and wildlife resources. The Council received a similar recommendation from Black Canyon Hydro LLC.

The Council also received recommendations from the U.S. Fish and Wildlife Service, the Snoqualmie Tribe, dozens of conservation and public interest groups (including American Whitewater, American Rivers, the Save Our Wild Salmon coalition of groups, Idaho Rivers United, Conservation Northwest, Pilchuck Audubon Society, The Lands Council, Trout Unlimited, Water Watch of Oregon, and a letter jointly signed by more than twenty of these and other conservation groups) and more than 350 individuals all recommending the Council *not* reinsert any exception process into the program and thus preserve the protected areas provisions of the program as they were in the 2009 Program. Many of these groups and individuals – and others – made the same comments both orally and in writing to the Council following the recommendations and then following the release of the draft fish and wildlife program.

The Washington Department of Fish and Wildlife recommended that the Council maintain the integrity and structure of the protected areas program and “[s]trengthen exemption standards to ensure ‘exceptional benefits to fish and wildlife.’” American Whitewater, The Lands Council and others recommended – and subsequently commented – that *if* the Council was inclined to add back in an “exception” provision (something they opposed), the Council should strengthen the provision by including a definition as to what constitutes “exceptional benefits to fish and wildlife” and strengthened provisions for public participation and Council decisionmaking on a petition for an exception. Additional comments *supporting* the reinsertion of an exemption process included the National Hydropower Association, the Northwest Hydropower Association, Northwest RiverPartners and the Tulalip Tribes.

In the draft and then the final program amendments, the Council decided to reinsert into the protected areas portion of the program provisions similar to the three excised in 2000. This included a provision allowing project developers to

petition the Council for an exception to the protected areas policy for a proposed project in a protected area that will provide exceptional benefits for fish and wildlife. The Council also added back in provisions allowing, under different circumstances, for substantive amendments and technical corrections to protected areas designations. 2014 F&W Program, at 52-53, esp. 53, 163-71, esp. 168-70 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The Council did so not because the recommendation from one utility in some way outweighs the recommendations, comments and views of the hundreds who opposed re-including the exception, as was the concern of some of these commenters. It did so because the concept underlying the exception is an integral part of the underlying premise of the protected areas policy. The point of the protected areas was to prevent new hydroelectric development that would add to the fish and wildlife mitigation burden of the region that the program is otherwise intended to address. If a new hydroelectric project met what is a truly high standard of not just posing no adverse impact on fish and wildlife and instead actually providing not just benefits but “exceptional” benefits to fish and wildlife, then the purpose of the program’s protected areas policy has been fully satisfied. Also, it is critically important to the Council that it have control over a determination of this nature, and not the Federal Energy Regulatory Commission. That is why the Council included an explicit statement calling on FERC in its licensing decisions to take into account in the appropriate way any Council decision on a petition for an exception, whether favorable or unfavorable to the petition. *Id.*, at 53.

The Council greatly appreciates the participation and recommendation and views of the many hundreds concerned about this issue. And cognizant of and consistent with certain aspects of those recommendations and views, the Council added provisions to be more clear as to how fish and wildlife will be protected as compared to the original exception provision from 1988. The most important addition was to clarify what constitutes “exceptional benefits”: An exception may be allowed for “a proposed project that will provide *exceptional survival benefits as determined by the relevant fish and wildlife agencies and tribes for the fish, wildlife, or both that are the reason for the designation.*” *Id.*, at 169 (emphasis added). Other provisions added include:

- the need to document in the petition filed with the Council the interactions with and determinations of the agencies and tribes;
- the Council may ask for independent scientific review of the petition
- a provision for public review and comment as part of the Council’s consideration of a petition
- a clear statement that it is the Council that will make the final decision on the petition

Id., at 169-70. The Council concludes that what it adopted into the program in this regard is more effective in the protection of fish and wildlife than other alternatives offered in the recommendations and comments.

The Council also received substantial recommendations and comments from conservation groups and individuals asking for continued protection for the Sunset Falls reach on the Skykomish River, currently within a protected area but also the locale for a proposed hydroelectric development by Snohomish PUD. The proposed project at Sunset Falls was the spark for the extensive controversy over the possibility of reinserting the exception process into the program. This area retains its protected areas status – that was never at issue in this amendment process. Whether Snohomish PUD will file a petition seeking an exemption and, if so, whether a review of such a petition results in a determination by the relevant fish and wildlife agencies and tribes and the Council that the proposed project will provide exceptional survival benefits to fish are unknown and outside the scope of this amendment process. The Council also received comments asking the Council to reverse or revoke an exception approved decades ago for a proposed project on the Bear River in Idaho, a proposal never developed and which may no longer be live. This request was also outside the scope of the amendment process.

The second set of issues raised in this process concerned whether the protected areas database and designations remain consistent with information about fish and wildlife resources that has developed since the Council made the original survey and designations in 1988 – or whether the Council should update the database and revise the protected areas designations to match.

Recommendations of this type included:

- review whether and how the protected areas database and designations overlap with areas designated as critical habitat for bull trout under the Endangered Species Act (Montana Fish Wildlife and Parks , Snoqualmie Tribe, American Rivers, American Whitewater, Conservation Groups, Idaho Rivers United, Save Our Wild Salmon, and Trout Unlimited)
- review whether and how the protected areas relate to rivers and stream reaches that can serve as a migration corridors or valuable habitat in light of climate change impacts (American Rivers, Conservation Northwest, NOAA Fisheries, Pilchuck Audubon Society, Save our Wild Salmon, Lands Council, and Trout Unlimited)
- investigate the relationship of protected areas designations to areas above barriers that have been removed, such as the White Salmon River above the removed Condit Dam (Columbia River Inter-Tribal Fish Commission, Yakama Nation, American Rivers, American Whitewater, and the Snoqualmie Tribe)
- investigate the relationship of protected areas to the habitat needs of new ESA listings and to such areas as Pacific flyways (Water Watch of Oregon)
- support for technical upgrades to the database if the substance of the designations and policy remain intact (Conservation Groups and Idaho Rivers United)

Subsequent comments from some of these groups and others echoed the recommendations.

As part of the consideration of these ideas, the Council's Fish and Wildlife Committee invited StreamNet (the entity that maintains the protected areas database) to brief the Council both on possible technical updates to the database and on what StreamNet could inform the Council as to how the protected areas database and designations relate to a number of the factors identified in the recommendations, such as the recent bull trout critical habitat designations. See <http://www.nwcouncil.org/news/meetings/2014/04/>; <http://www.nwcouncil.org/media/6954980/f1.pdf>; <http://www.nwcouncil.org/media/7078496/minutes.pdf>. Council staff also presented information to the Committee and full Council on these matters at various points in the amendment process.

After review of the recommendations and comments and a review of the information presented by StreamNet and the staff following their preliminary investigation into the relationship of the protected areas designations to these other factors, the Council's working conclusion was that the current protected areas designations continue to represent an excellent overlap of unimpounded stream reaches and valuable fish and wildlife resources. Where differences may or do exist due to new ESA designations or barrier removals or other factors, the stream reaches not in a protected area designation appear to have sufficient protection for the foreseeable future from new hydroelectric development based on other considerations. To do such an assessment of all the protected areas designations in a detailed way would take a substantial amount of time – more than the year available in the amendment process (it took several years to develop the original database before entering into the 1988 amendment process to add the protected areas to the program) – and would also require substantial dedication of resources. For these reasons the Council concluded there was no need to initiate or act immediately within this amendment process to review the protected areas database and consider additional areas for protected areas designations. Committing substantial Council, contractor, and agency and tribal resources and funds to such an assessment at this time was not a cost-effective use of resources or a priority for the program. Outside of the amendment process the Council will consult with the fish and wildlife agencies and tribes, conservation organizations, utilities and others in the hydropower industry and determine whether and when it makes sense to begin a reassessment of the protected areas database. The Council finds that its decision not to adopt these recommendations in the 2014 Fish and Wildlife Program and defer consideration of the reassessment of the protected areas database is more effective than the alternatives in allowing for the continued protection of important fish and wildlife resources from new hydroelectric development while allowing for program resources to be dedicated to higher priority protection and mitigation activities.

The Council also received comments seeking to protect fish and wildlife in rivers and streams from threats other than new hydroelectric development. An example is a comment from Wild Washington Rivers to “include into the Protected Areas Program all additional rivers and streams that are in areas where mineral compositions pose a threat to salmon and human health.” This is outside the scope and concept of the protected area policy and the interaction under the Northwest Power Act of electric resource development and protection and mitigation for fish and wildlife affected by hydroelectric development.

On the other hand, Northwest RiverPartners commented with regard to legislation and administration actions promoting renewable energy, including hydropower, that the “Council should review the criteria behind the Protected Areas designation to determine whether the current list of areas makes sense in light of new state and federal policies promoting renewable energy and specifically hydropower development. The Council would then need to reassess the impact of Protected Area designation on the supply curve of new hydropower available for meeting future power needs for the Council’s next Power Plan.” There was no other support in the amendment process – and certainly none from the fish and wildlife agencies and tribes – for a wholesale review of the policy, criteria and designations of the protected areas. The Council believes the basic premises of the protected areas policy and designations remain sound and an effective approach to fish and wildlife protection and mitigation in the Pacific northwest. Most of the focus of recent hydroelectric development in the northwest has been the addition of hydropower at existing dams and structures. This is something that has always been appropriate under the Council’s future hydroelectric development provisions, assuming appropriate review procedures and safeguards.

Finally, a number of the entities (the Washington Department of Fish and Wildlife, American Whitewater, a coalition of Conservation Groups, and Idaho Rivers United) included within their recommendation a provision that that the Council send a letter to hydropower developers within 30 days after a preliminary permit is issued for a project proposed to be located in a protected area. The provision is unnecessary, as it is covered by routine agency procedures and has been since 1988. The Council has lodged with FERC each successive fish and wildlife program and power plan – including the future hydroelectric development and protected areas measures and the protected areas designations – as comprehensive plans for the waterways in the Pacific Northwest to be considered by FERC under the Northwest Power Act and Federal Power act in all its licensing decisions. FERC (and others) notify the Council of any filing for consideration of its protected areas status. And the Council staff routinely notifies by letter FERC and other interested entities of confirmation that a project proposal lies either within or without a protected area. The Council has not had any experience with a project developer or FERC not being aware that a proposed project area is in a designated protected area.

(7) Water quality – toxic contaminants

The issue that dominated water quality considerations in this program amendment process concerned toxic contaminants in the river, particularly in the mainstem Columbia. The Council received a suite of recommendations calling for an increase in the attention the Council's fish and wildlife program gives to assessing the extent of toxic contaminants in the river and the extent to which toxins may be or are adversely affecting fish survival, and, if so, taking actions to reduce toxic contaminants or their effects. Some of the recommendations focused on the hydropower system itself, calling for an evaluation of the extent to which the development and operation of the hydrosystem contributes to a toxic contamination problem or exacerbates the effects of toxic contamination on fish survival. These included recommendations that the federal agencies operating the system investigate how anoxic conditions in the reservoirs may mobilize contaminants, particularly mercury. Other recommendations called for increased efforts to assess the extent to which toxic contaminants are present in general in the river and affecting fish survival and possibly undermining the program's efforts to increase the survival of fish through the program's other direct and off-site protection and mitigation actions. This included recommendations to assess and map the location and types of contaminants in the Columbia River basin; summarize and advance the state of the science related to toxics and the effects on fish in a far-reaching manner; develop methods and models for identifying contaminants of emerging concern; identify and fund toxics-reduction efforts around the basin; and implement the recommendations of the Independent Scientific Advisory Board's recommendations with regard to toxic contaminants (actively investigate the impact of chemicals on mitigation and restoration activities and implement an inter-agency toxic reductions plan).

The most extensive set of recommendations on toxic contaminants came from the Columbia River Inter-Tribal Fish Commission, NOAA Fisheries (and its Northwest Fisheries Science Center), the U.S. Environmental Protection Agency, and the Save Our Wild Salmon environmental and fishing group coalition. Significant recommendations also came from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, U.S. Geological Survey, Nez Perce Tribe, Yakama Nation, Confederated Tribes of the Grand Ronde Community of Oregon, Spokane Tribe, Coeur d'Alene Tribe, Upper Columbia United Tribes, Upper Snake River Tribes, Lower Columbia Estuary Partnership, Pacific Fishery Management Council, American Rivers, Northwest Sportfishing Industry Association, Association of Northwest Steelheaders, Conservation Northwest, and close to 50 individuals. Many entities and people commented further throughout the amendment process in support of these recommendations. Topics covered in the recommendations included:

- support for regional coordination on toxic contaminants
- characterizing the state of the science related to toxics

- support for basin-wide monitoring and characterization of toxic contaminants
- monitor and assess effects of toxic contaminants on fish and mitigate impacts
- assess effects of toxic contaminants on native fish and wildlife and food webs
- assess the extent to which the development and operation of the dams, reservoirs and coordinated hydropower system contributes to or exacerbates toxic contamination problems or their effects
- incorporate toxics into ongoing efforts to restore and improve habitats
- reduce and prevent toxic contaminants and their effects on fish survival
- a call on the federal agencies to help implement the Columbia River Toxics Reduction Action Plan
- reduce spills and leakage of toxic contaminants at FCRPS dams
- develop models to extrapolate toxicity effects to the population scale
- anticipate and minimize future pollution threats

A number of these recommending entities called directly for Bonneville funding in support of efforts to assess and reduce toxic contaminants. Others called on the federal action agencies operating the hydropower projects and the hydrosystem (Bonneville, Corps of Engineers and the Bureau of Reclamation) to take on responsibility for certain tasks collectively. Other recommendations simply described the needs without identifying the particular agencies to be responsible, and many recognized the inter-agency nature of the problem and the collective role and responsibilities of governments and agencies at all levels to deal with this emerging problem.

On the other hand, in recommendations and subsequent comments, Bonneville and a number of the Bonneville customers and customer groups (including Public Power Council, Northwest RiverPartners, PNGC Power, and Northwest Requirements Utilities) called on the Council to resist expanding the fish and wildlife program to assess and address any problems not caused by or related to the development of the Columbia River hydrosystem, with particular concern about the recommendations related to toxic contaminants, and with the greatest concern about the notion of Bonneville having a funding responsibility to address toxic contaminants in the river. In their view, toxic contaminants in the river and their effects on fish survival were not caused by and have no relationship to the development and operation of the FCRPS, and thus research and actions to address toxic contaminants are not the responsibility of the FCRPS or the system's ratepayers. These entities raised concerns about the program moving into this area as inconsistent with the requirements, limitation and goals of the Northwest Power Act, as a distraction from attention to the core responsibilities, measures and objectives of the fish and wildlife program under the Act, and as having the potential to dilute or misuse the funding available from ratepayers intended to address the effects of the hydrosystem on fish and wildlife.

Supporters of the toxic contaminant recommendations – most notably the Columbia River Inter-Tribal Fish Commission – commented in response that the Council did have authority under the Northwest Power Act to include measures based on these recommendations in the program. And that Bonneville and the other federal action agencies have authority under certain circumstances to fund and implement measures within this category.

The Council established an ad hoc working committee as part of its efforts to understand and sort through the issues related to this extensive set of recommendations and comments on toxic contaminants. The committee met a number of times over the months of January to March 2014, deliberating on the recommendations and comments and listening to the views of various participants. The toxics subgroup eventually approved a set of recommendations for the fish and wildlife committee and then the full Council to consider in developing the draft fish and wildlife program. The Committee and Council then continued to review the recommendations, comments on the recommendations and, eventually, comments on the draft program provisions.

On this record, the final program amendments approved by the Council recognized the “growing concern about toxic contaminants in the mainstem Columbia and Snake rivers and tributaries,” as one of the key issues of degraded water quality that “may be having adverse effects on the health of both our native fish and wildlife populations and the ecosystem these populations depend upon, thus impacting mitigation and recovery efforts in the Columbia River Basin.” 2014 Fish and Wildlife Program, at 54 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). This recognition was obviously highlighted by the extensive and essentially consensus views of the federal and state fish and wildlife and resource agencies and Indian tribes as to the seriousness of the problems and the need for provisions in the region’s fish and wildlife program to recognize and help address the problems. Consistent with those recommendations and comments, and the comments of many others in support, and then shaped by consideration of the entire record before it, the Council adopted a set of “general measures to address toxic contaminants,” *Id.*, at 55-56. These measures were approved as part of an overarching water quality strategy aimed at providing flows and habitat conditions of adequate quality for improved survival of anadromous and native resident fish populations and at improving water quality to promote healthy and productive populations of anadromous and native resident fish and wildlife, *Id.*, at 54. The toxic measures adopted included, among other matters:

- support for ongoing regional efforts to identify, assess and reduce toxic contaminants in the Columbia River basin; for science/policy workshops on characterizing the state of the science related to toxic contaminant issues; and for efforts by regional parties to advance public education and information on toxics issues

- support for implementation of the regional Columbia River Basin Toxics Reduction Action Plan and its water quality monitoring, research, and preventive, remedial and improvement measures
- support for efforts to monitor water quality parameters and implement water quality improvement measures in the basin to reduce toxic contaminants to meet water quality standards and improve the health, condition, and survival of anadromous and native resident fish, as well as their related spawning and rearing habitat
- a call for the federal action agencies in particular to partner with and support ongoing federal, state, tribal, and regional agencies' efforts to:
- monitor, assess and map high priority toxic contaminant hot spots in the Columbia River basin and evaluate their relationship to the development and operation of the hydrosystem
- identify and assess the effects of toxic contaminants on native fish, wildlife, and food webs in toxic hot spots in the basin
- conduct targeted monitoring in the basin of vulnerable native fish and wildlife species for specific, high-priority toxic contaminants and other priority contaminants of emerging concern and evaluate if toxic contaminants limit the reproductive success of native fish
- a call for the federal and non-federal project operators at each project to (a) monitor and report oil spills and leakages; (b) replace all lubricating oils and fluids containing PCBs with non-PCB oils and fluids; and (c) develop and implement best practices for reducing spills and leakages of oils and lubricating fluids
- a call to Bonneville and the other federal action agencies to continue to identify areas where aquatic habitat restoration projects implemented under the fish and wildlife program may be affected by toxic contaminants and incorporate pollution reduction and mitigation techniques into restoration projects when toxic contamination is a concern
- support for regional efforts to persuade Congress to provide funding similar to the funding provided to other large aquatic ecosystem areas to protect and restore water quality in the Columbia River basin, including efforts to identify and reduce toxic contaminants affecting fish survival

The Council was carefully attentive to the concerns appropriately expressed by Bonneville and the Bonneville customers about expecting the ratepayers to bear a large share of the burden to address toxic contamination problems in the Columbia River basin. The Council does believe it is appropriate under the Northwest Power Act for Bonneville and the federal hydrosystem action agencies to share in the responsibility for assessing how toxic contaminants are adversely affecting fish health and fish survival and for supporting and helping to address those effects if and where deemed to be serious. To the extent that development and operation of the hydrosystem contributes to a toxic contamination problem that affects fish survival, there is of course a direct protection and mitigation obligation under the Act. The Council recognizes, however, that most toxic contamination problems in the river that affect fish survival are neither caused by

nor exacerbated by the development and operation of the hydrosystem. That itself does not bar inclusion of protection and mitigation measures regarding toxic contaminants in the fish and wildlife program. The Northwest Power Act authorizes the inclusion of off-site mitigation and protection measures to improve fish survival, and measures to deal with toxic contamination problems that affect fish health and fish survival and jeopardize the success of our mitigation and protection efforts are in one sense just another category of off-site mitigation. *All* off-site mitigation efforts aimed at addressing problems that affect fish survival address problems not caused by the hydrosystem – that’s the inherent nature of off-site mitigation, and there is nothing unusual about using this authority in the right circumstances to address toxic contaminants that are a serious impediment to fish survival. For these reasons, the Council did include the toxic contamination measures in the fish and wildlife program, assumes that Bonneville and the other federal action agencies have a role to play in their implementation, and even identified certain aspects of the toxic measures as an emerging program priority for the program’s investment strategy with certain expectations for Bonneville funding, *Id.*, at 115-17.

However, the Council also recognized, in concert with the comments from Bonneville and its customers, that the origin and extent of the toxic contamination problems in the river basin make this a problem that is the collective responsibility of all governments and agencies at all levels to address, and that it would be inappropriate for Bonneville and the FCRPS ratepayers to bear a large portion of this burden. Rather than try to parcel out responsibility, the Council was careful in all its general toxics measures – even those in which Bonneville and the other federal FCRPS agencies may be called out for some role or support – to be clear that the responsibilities for implementation are shared by federal action agencies, the U.S. EPA and a host of other federal, tribal, regional, and state agencies. The Council believes the best result would be a continued inter-agency collaboration – which the Council will help support – to identify and address these problems, with each agency participating and contributing to an appropriate extent as determined in these ongoing implementation forums. And the Council also believes, and expressed in the program, that Congressional appropriations ought to be the source for major funding support at least for research efforts, as it is with similar water quality programs in other large aquatic ecosystem, such as the Great Lakes, Chesapeake Bay, and Puget Sound.

(8) Climate change

The Council received a substantial number of recommendations seeking to have the Council expand its consideration of climate change in the fish and wildlife program. This included a coordinated set of recommendations from a number of the state fish and wildlife agencies and tribes calling for better integration of assessments and planning for climate change and its effects, as well as implementation of long-term habitat protections to combat expected climate change impacts on the basin's fish and wildlife resources. Recommendations also called for implementation of various specific assessments and actions to understand and mitigate for climate change impacts in the mainstem, the estuary, plume and the near-shore ocean, and for consideration of impacts on specific species, such as salmon and steelhead, lamprey, sturgeon, and forage fish. Specific actions recommended included measures such as:

- promoting system operational flexibility to be able to respond to climate change effects on runoff and flows
- reassessment of flood risk management and water management for flood risk
- particular attention given to changes in mid- to late-summer streamflows and temperatures, with research directed toward how various species may be affected
- maintaining key hydrologic monitoring stations in the basin, improved runoff forecasting, and planning for changes to reservoir operation and refill curves under altered precipitation.
- establishing a framework for prioritizing flow restoration actions in light of expected flow changes due to climate change
- integrating climate change considerations into future water use assessments
- identifying, preserving, and if possible expanding the number and size of cool-water refugia
- increased research on the effects of higher temperatures on run migration, timing, and spatial distribution as well as approaches to lowering those temperatures
- identifying interactions between chemical and non-chemical stressors, and reducing pollution threats, which will be important under future climate change conditions
- strengthening the Protected Areas designations to ensure protections are in place in light of hydrologic changes expected under a changing climate

A number of agencies and tribes and others recommended that the program incorporate the ISAB's recommendations addressing climate change, which dovetailed with the subjects covered above.

Recommendations of this nature from the state fish and wildlife agencies, tribes and tribal groups, federal fish and wildlife agencies and other agencies included

those from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Montana Fish Wildlife and Parks, Cowlitz Tribe, Columbia River Inter-Tribal Fish Commission, Nez Perce Tribe, Upper Snake River Tribes, Upper Columbia United Tribes, Kootenai Tribe of Idaho, the Confederated Salish and Kootenai Tribes, NOAA Fisheries, NOAA's Northwest Fisheries Science Center, Washington Governor's Salmon Recovery Office, US Geological Survey, US Environmental Protection Agency, and Bonneville. Not every agency or tribe submitted every recommendation, of course, but collectively and in a somewhat coordinated fashion they covered the topics above. Similar recommendations came from American Rivers, the Save Our Wild Salmon coalition and associated conservation groups, and 20 individuals.

At bottom what most of the recommendations (and subsequent comments) focused on was the systematic integration of considerations about climate change into program planning and decisions of all types, to ensure our efforts to protect, mitigate, enhance and restore fish and wildlife and functional habitat are not undermined by climate change effects. Commenters recognized that the program should continue to focus on improving habitat, but with a need to review existing as well as new habitat work to assess how sustainable those habitat improvements will be as the climate changes. A number of entities thus recommended the need for flexibility, adaptive management and operational tools to mitigate for the expected effects of climate change. They also recommended that the Council expand its leadership role in identifying fish recovery and mitigation actions to address the effects of climate change, and that the Council recognize that the work already ongoing under the program – habitat protection and restoration actions, such as creation of riparian buffers, managing water withdrawals to increase tributary flows, and restoring and connecting wetlands and floodplains to store water – already represents significant work to limit the effects of increasing temperatures on fish and wildlife and their habitats in the face of climate change.

The only significant cautions the Council received in the comments was to recognize that climate change is not caused by the development and operation of the hydrosystem, and the purpose of the program is not to protect, mitigate and enhance the region's environment from the effects of climate change. The purpose is to protect, mitigate and enhance fish and wildlife affected by the hydrosystem, with the effects of climate change a potentially significant consideration in managing that responsibility successfully.

Based on the recommendations and comments, the Council included a climate change strategy in the final program, as well as a discussion in an appendix of climate change impacts in the Columbia River basin. 2014 Fish and Wildlife Program, at 57-59, 172-74 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). A number of other provisions in the final program are also relevant to dealing with climate change impacts, including the core ecosystem function principles and measures; mainstem habitat measures, including thermal refugia;

water quality measures regarding summer water temperatures; mainstem water management measures; wild fish protection considerations, and the principles and strategies of adaptive management. *Id.*, at 38-39, 42-43, 54-55, 60-65, 81, 101-07.

The final program provisions may not be as extensive as the complete set of recommendations, but they are consistent in substance with the main themes and specifics of the recommendations. And the program measures are focused primarily on ensuring that future planning and implementation of measures to protect, mitigate and enhance fish and wildlife include explicit consideration of the possible effects of climate change on populations and their habitats and key ecosystem functions, and the use of adaptive management and flexible planning and implementation tools to adapt as successfully as we can to climate change effects.

The Council will follow the completion of the 2014 Fish and Wildlife Program with the development of the region's Seventh Power Plan. The power plan will include significant consideration of the effects of climate change and climate change policy on both the existing power system and the appropriate selection of new conservation and generating resources.

(9) Mainstem water management, flow and passage measures and objectives, including recommendations relating to the FCRPS Biological Opinions under the Endangered Species Act and the Columbia Fish Accords

NOAA Fisheries, a number of the region's Indian tribes and tribal organizations (Colville Confederated Tribes, Kalispel Tribe, Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, Yakama Nation, the Columbia River Inter-Tribal Fish Commission), the Bonneville Power Administration, the U.S. Bureau of Reclamation, and a number of the Bonneville customer utilities and customer groups (Public Power Council, Northwest RiverPartners, PNGC Power, and Northwest Requirements Utilities) recommended that the Council continue to recognize the reservoir management, spill and passage measures and performance standards in the FCRPS biological opinions adopted pursuant to the federal Endangered Species Act as the Program's baseline or starting-point for the measures and objectives for mainstem hydrosystem water management and passage. Most of these recommendations also included the mainstem water management and passage provisions in the Columbia Fish Accords. A number of other recommending entities – e.g., the Kootenai Tribe of Idaho, Montana Fish, Wildlife and Parks, Washington Department of Fish and Wildlife – recommended tweaks to the FCRPS operations (noted below) that make sense only in the context of acceptance of the operations in the FCRPS biological opinions as a starting point for the program's mainstem measures. Most of these entities reiterated these viewpoints in subsequent comments on the recommendations and on the Council's draft fish and wildlife program.

At the same time a number of these and other entities recommended refinements, adjustments or additions to the baseline operations. Montana and the Kootenai Tribe of Idaho recommended adjustments in operations at Libby Dam, and Montana also at Hungry Horse, to improve conditions for sturgeon and other fish in and below the reservoirs, adjustments they recommended as consistent with the flexibility in operations built into the FCRPS biological opinions for salmon and steelhead and bull trout as well as the Libby Dam biological opinion for sturgeon. The Spokane Tribe recommended the Council continue to include in the fish and wildlife program an altered set of operations at Grand Coulee that the Spokane Tribe considers important for improving conditions for fish in Lake Roosevelt. Washington recommended continued adherence to the Vernita Bar operations that benefit Columbia upriver fall Chinook in the Hanford Reach. The Oregon Department of Fish and Wildlife, the Nez Perce Tribe, the Pacific Fishery Management Council and environmental and fishing groups and many individuals recommended implementing increased spill for juvenile passage as an experiment. The Bonneville customer groups (Public Power Council, Northwest RiverPartners, PNGC Power, and Northwest Requirements Utilities) anticipated the recommendation for an experiment in increased spill and adamantly opposed it in their recommendations and comments (see #10 below). The Oregon

Department of Fish and Wildlife's recommendations and subsequent comments emphasized more generally the need for mainstem measures and objectives that will result in continued improvements in adult returns whatever the starting point or baseline. Oregon's recommendations and comments dovetailed with a broader set of recommendations and comments from a number of federal and state agencies, tribes, environmental and fishing groups and individuals that the Council's mainstem provisions incorporate an explicit focus on improving ecosystem function and restoring more natural river and floodplain functions and habitats, and more natural hydrograph, all along the mainstem from the headwaters through the estuary and plume. This recommendation included providing the flexibility to take advantage of any potential for improved flows and habitat for fish that may come from a modernized Columbia River Treaty. Of the "ecosystem function" recommendations and comments, the most extensive came from the Columbia River Inter-Tribal Fish Commission, the Upper Columbia United Tribes and the U.S. Geological Survey. And many of the state and federal agencies and tribes also included recommendations and comments on a set of topics with elements across the fish and wildlife program but each with a distinct mainstem element. These included recommendations regarding:

- lamprey (mainstem passage, operations, hydrosystem performance standards)
- sturgeon (passage and hydrosystem operations measures and assessments of effects)
- eulachon (assessing hydrosystem impacts and potential improvements)
- expanded and updated bird/fish/mammal predation provisions
- increased regard for the plume/estuary/near-shore environment and the flow effects on that environment
- toxic contaminants (recognize connection to hydrosystem and assess problems and potential improvements in the mainstem, led by an extensive recommendation from CRITFC and NOAA Fisheries, and also recommended by the environmental and fishing groups and individuals)
- climate change (review and adapt hydrosystem operations to anticipated flow changes)
- reintroduction and passage of anadromous fish above blockages (Grand Coulee and Chief Joseph in the mainstem, with quite specific provisions from the Spokane Tribe and the Coeur d'Alene Tribe – environmental and fishing groups and individuals particularly echo this recommendation)

Bonneville and the Bonneville customer groups in turn expressed concern, in recommendations and comments, with the idea of expanding the mainstem measures and objectives of the program beyond the collective set of mainstem measures agreed to in a broad collaboration as part of the FCRPS biological opinions and Columbia Fish Accords.

Finally, a number of the fishing and environmental groups recommended that the Council completely disconnect its Fish and Wildlife Program from the FCRPS

biological opinions as well as pursue additional flow and passage actions, including operating the John Day pool and other lower Columbia reservoirs at minimum operating pool. A set of these groups along with the Nez Perce Tribe recommended a new evaluation of the removal of the four dams in the lower Snake River.

On this record, in the 2014 Fish and Wildlife Program the Council embedded its mainstem water management, passage, flow and habitat measures and objectives as part of a explicit and broader program strategy to improve ecosystem function: “to protect and restore natural ecosystem functions, habitats, and biological diversity wherever feasible consistent with biological objectives in the program.” This program-wide emphasis is then reflected in the general strategy to which all mainstem water management and passage measures relate (“manage dams and reservoir operations to protect and restore ecosystem function and habitat, and to improve fish passage and survival through the hydrosystem”) and the general strategy to which all mainstem habitat measures relate (support for “increased investments in mainstem habitat improvements to increase the extent, diversity, connectivity, and productivity of mainstem habitats for mainstem spawning, rearing, and resting”). 2014 F&W Program, at 38-40, 42-43, 60-62, 64-65 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

As for the specific mainstem passage and water management measures, the Council began by recognizing as the baseline or starting point the hydrosystem actions and performance standards called for by the federal agencies and analyzed in the FCRPS biological opinions as well as the mainstem hydrosystem actions agreed to in the Columbia Basin Fish Accords. The Council’s decision is described at, among other places, *Id.*, at 22, 60-62, 110-12.

The Council first confronted the relationship of the Fish and Wildlife Program to the actions analyzed under the federal Endangered Species Act in the context of adopting the 2003 Mainstem Amendments to the Fish and Wildlife Program, after the federal agencies adopted the 2000 FCRPS Biological Opinion. In the findings for the 2003 amendments, the Council explained at length how and why it handled these ESA developments within the context of the Northwest Power Act’s protection and mitigation program. See http://www.nwcouncil.org/media/28433/2003_11b.pdf, pp. 58-66. The Council followed the same approach in its decision on the 2009 Fish and Wildlife Program. [See http://www.nwcouncil.org/media/29717/2009_09F.pdf, pp. 5-9. The Council remained consistent in its approach in developing the 2014 Fish and Wildlife Program, as described above and in the pages from the 2014 program cited above. Thus the explanations from the 2003 and 2009 findings also remain valid and are incorporated here.

To summarize: The Council has been careful not to adopt or incorporate the FCRPS Biological Opinions or the Accords themselves into the program. Nor is

the Council making any conclusion as to whether these actions or performance standards satisfy the requirements of the ESA, nor adopting or commenting in any way on the jeopardy analysis relevant to the ESA documents. Those matters are once again in litigation, and they are not within the Council's purview in any event. Instead, what the Council is recognizing and incorporating into the program are the specific hydrosystem actions and performance standards from the FCRPS biological opinions and the actions in the Columbia Fish Accords, as a starting point for the Council measures and objectives. These are already baseline implementation commitments of the federal agencies to address the needs of species adversely affected by the Columbia hydrosystem and in need of protection and mitigation under the Northwest Power Act – incorporating them into the program simply recognizes this basic point. No entity recommended or commented *not* to incorporate or implement these measures and objectives – the issue is and has always been whether the Council should include *additional* mainstem measures in the program. And the biological opinion actions are largely built on the mainstem planning and implementation work developed under the Council's program over its first 20+ years, and are consistent with and based in the program's general strategies and biological objectives. Perhaps most important, recognizing these actions and standards as the program's baseline mainstem measures and objectives is consistent with the recommendations and views of the large majority of the federal and state fish and wildlife agencies and tribes in the amendment process to which the Council owes deference under the Northwest Power Act.

Commenters also again questioned the Council's link in particular to the FCRPS salmon and steelhead biological opinion because it is the subject again of litigation. The context in 2003 and 2009 also included the possibility that a federal court might rule that the FCRPS biological opinion did not fully satisfy the requirements of the ESA, and remand or vacate that opinion, which is what in fact happened with the 2000, 2004 and 2008 FCRPS biological opinions for salmon and steelhead. We are in a possibly similar situation now – the federal district court has under review challenges to the 2014 FCRPS Supplemental Biological Opinion. The possibility that federal courts may find fault with some aspects of the ESA decisions associated with the 2014 FCRPS Supplemental Biological Opinion does not affect the Council's decisions here. As noted above, the Council has been careful not to adopt or incorporate the FCRPS biological opinions into the Council's program, nor make any conclusions with regard to the sufficiency of the biological opinion under the ESA. The Council is instead simply recognizing the *actions* reviewed in the opinion as baseline measures in the Council's program as well. These measures are now independently part of the Council's program. The Council has no reason to believe that these measures will not continue to represent the basic core of the mainstem actions implemented by the federal agencies and their partners in the near future for listed salmon and steelhead. It may again be that if the litigation is successful, the court or the federal agencies may reassess or order additional measures under the ESA to benefit salmon and steelhead in the mainstem, tributaries or estuary. But no party is arguing in the

litigation not to implement these actions, asking for a court order not to implement these actions, or arguing that they do not provide some benefit for listed species. To the extent the litigation produces a dramatically different context for action, the Council will need to revisit its program decisions.

Moreover, the Council included these elements in the program with explicit recognition that the “program is broader than the Endangered Species Act, both in terms of species affected by the hydrosystem and the ultimate objective of the program that goes beyond just delisting endangered species,” and the explicit condition that the federal agency commitments to implement the biological opinions and the Columbia Fish Accords “must not come at the expense of sufficient funding for other program priorities.” The program’s “[mainstem] strategy is thus designed to protect a broader range of species and their habitat.” Based on the recommendations and comments summarized above, the Council “add[ed] important considerations to the benefit of non-listed anadromous and resident species affected by hydrosystem operations” and provisions to “investigate the potential for additional gains in ecosystem function and floodplain connectivity.” 2014 F&W Program, at 60-61, 112

(<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). These additional measures include, among others:

- Continued reliable implementation of operations to protect spawning and emergence of unlisted and abundant fall Chinook in the Hanford Reach, consistent with the 2004 Hanford Reach Fall Chinook Protection Program Agreement, with periodic assessment as to whether these flow measures continue to be effective in protecting fall Chinook redds and juveniles from flow and river elevation fluctuations.
- A collaborative effort among the federal agencies, the Council state, federal and tribal entities to protect habitat and improve survival in the mainstem for important anadromous fish species that are not listed, including upper Columbia River summer and fall Chinook, upper Columbia sockeye, sturgeon, and lamprey, as well as important species of resident fish, including investigating whether the baseline flow and passage operations in the FCRPS biological opinions are optimum for the needs of these non-listed fish important to the Council’s program, as well as a specific measure to continue to investigate ways to reduce descaling in juvenile sockeye during dam passage.
- Continued investigations to refine operations at Libby and Hungry Horse dams that improve conditions for listed and non-listed resident fish near those reservoirs and do not adversely affect fish in the lower river, including continued discussion of proposals for adjustments to winter and spring operations and assessment of the impacts on the recovery of native fish species, food web, and fish and wildlife habitat restoration efforts.
- Investigation by the Corps of Engineers into infrastructure changes at Albeni Falls Dam and habitat enhancements in areas impacted by the dam, to benefit native resident and anadromous fish.

- A collaborative evaluation and report to the Council on alternative operations at Grand Coulee recommended again by the Spokane Tribe to benefit resident fish in the reservoir; coupled with a general measure calling for the action and fish agencies and tribes to explore the optimum operations at Grand Coulee to provide improved conditions and survival for all the fish important to the program, including salmon and steelhead migration and rearing needs in the lower Columbia River, Hanford Reach fall Chinook spawning and emergence, and resident species in the reservoir and above the reservoir, and a call to manage the reservoir and dam discharges to minimize fluctuations and ramping rates and produce steady flows across each season and each day, as much as possible within current operating constraints.
- Research, monitoring, evaluation and protection and mitigation efforts aimed at understanding and addressing the effects of mainstem flow regulation on survival and habitat conditions in the estuary and near-shore ocean plume, for all species of importance using the estuary and near-shore during some part of their life cycle.
- A set of flow, water management and passage measures to improve survival and habitat conditions in the mainstem for sturgeon and lamprey.
- A collaborative effort to assess and address the biological requirements of eulachon in the mainstem, including an inquiry into the relationship of those requirements to the current flow regulation and dam operation regime.
- A collaborative, phased effort to investigate the feasibility of reintroduction of anadromous fish above, and passage at, Grand Coulee and Chief Joseph dams in the upper Columbia mainstem (see Finding 6 below).
- A set of predation, climate change, water quality, and toxic contaminant measures aimed at investigating conditions in the mainstem related to each; assessing the relationship of each to hydrosystem development and operations and flow regulation; and addressing adverse effects through protection and mitigation activities.
- An ongoing, collaborative, adaptive management effort to investigate, develop, and implement flow and passage measures that will improve fish life-cycle survival, for listed and non-listed species alike.
- And related, a collaborative effort to investigate and adjust system water management and implement mainstem habitat measures to improve ecosystem functions in the mainstem, estuary, and plume, with an emphasis on improvements to reconnect and enhance floodplains and floodplain connections through both flow and structural measures, enhance plume and near-shore ocean habitat, reduce salt water intrusion during summer and fall, fewer and shorter hypoxia and acidification events in the estuary, lower summer water temperatures, and investigate alternative methods of flood risk management to reduce demands on river operations to provide this benefit to the detriment of ecosystem functions.
- An investment strategy for emerging program priorities, including additional funding to cover these priorities if not possible through savings – priorities that include a number of these key mainstem measures (e.g., to support

expanded management of predators, mapping and determining hotspots for toxic contaminants, investigation of blocked area mitigation options through reintroduction, passage and habitat improvement, implementation of additional sturgeon and lamprey passage and research measures, and continued efforts to improve floodplain habitats and connections, especially in the lower river).

Id., at 60-66 (mainstem passage and flow measures), 39-40 (general measures on improving and protecting ecosystem function, several with relevance to mainstem flow regulation and habitat conditions); 42-43 (mainstem habitat measures); 49-51 (predation measures, including in the mainstem); 54-56 (mainstem water quality measures as well as toxic contaminant measures that relate to the mainstem reaches and the mainstem hydroprojects); 57-58 (climate change provisions, including relevance to mainstem river flows, operations and conditions); 68-70 (estuary and near-shore ocean plume measures, including assessment of river flow regulation effects); 84-85 (measures to investigate the feasibility of reintroduction above and passage at Grand Coulee and Chief Joseph in the mainstem); 90-91 (sturgeon measures, including those focused on mainstem flow, passage and habitat conditions); 95 (lamprey mainstem flow, passage and habitat measures); 97-98 (eulachon measures that relate to mainstem flow regulation), 115-17 (funding and investment strategy for emerging program priorities, including several related to mainstem measures).

The Council received comments, especially from Bonneville customers concerned that the additional mainstem measures the Council called for might be inconsistent with or put at risk implementation of the FCRPS biological opinion actions in the mainstem. That is not the Council's intent, and it would not make sense if it was – the Council recognizes that the federal action agencies could not implement actions inconsistent with the biological opinions without further ESA inquiry. As noted above, many of the mainstem measures called for by the Council are in addition to and not directly inconsistent with what are the baseline mainstem measures taken from the FCRPS biological opinions, and are intended to benefit both listed and non-listed species consistent with the Council's protection and mitigation responsibilities under the Northwest Power Act. Principles and conditions for implementation of these additional measures are covered in, among other places, the program's implementation and investment strategies as well as the mainstem strategy. See *Id.*, at 60-62, 110-17. Inconsistency with implementation of the biological opinion-based measures is not an issue in these instances. And where measures intended to benefit non-listed species do or might conflict with the current biological opinion actions, the Council does not mean that the federal operating agencies should act contrary to the biological opinions in order to implement strategies in the Council's program. The Council intends instead that the federal operating agencies make every effort practicable to use the operational flexibility and adaptive management provisions built into the FCRPS biological opinions (and the flexibility of the ESA itself) to meet both the biological opinion requirements and implement the other strategies in the

Council's program to benefit non-listed anadromous and resident fish. The Council is confident these improvements can be made over time consistent with the flexibility built into the biological opinions without adverse effects on listed species and will lead to a more broad-based, sustainable, and cost-effective protection and recovery of fish and wildlife in the Columbia Basin. The Council expects the federal operating agencies and fish and wildlife agencies to consult closely in implementation with the Council, the states and tribes, and other important participants in this effort, including the Bonneville customers.

In summary, the Council concludes that the mainstem hydrosystem water management, passage and habitat measures included in the 2014 Fish and Wildlife Program are consistent with nearly all of the extensive recommendations received by the Council on the subject, particularly those from the federal and state fish and wildlife agencies and the region's Indian tribes, and especially as the Council integrated them into a coherent program and system approach. The program provisions and these findings also indicate appropriate consideration of the comments on the recommendations and on the draft program. The Council rejected the recommendation from a number of environmental groups and individuals to disconnect the program from the biological opinion actions for the reasons noted. The Council also did not accept the recommendation from the Nez Perce Tribe and the environmental and fishing groups to call for a study again of the possible removal of the four lower Snake River dams. No other state or federal fish and wildlife agency or tribe or federal action agency raised this issue in the amendment process. Snake River dam removal has been studied in the past, and that information remains available to the action agencies, fish and wildlife agencies, and tribes for future consideration. This includes information from the Council's Sixth Power Plan, in 2010, in which the Council analyzed the power system effects of a dam removal scenario. Mainstem dam removal issues are otherwise outside the scope of the Council's considerations in the fish and wildlife program under the Northwest Power Act. The Council also did not accept the recommendation of the environmental and fishing group coalition to call for operation of the John Day reservoir and other lower Columbia reservoirs at minimum operating pool. No state or federal fish and wildlife agency or Indian tribe recommended or supported this action at this time.

The Council also received recommendations to maintain the Fish Passage Center and its functions. The Council did so. *Id.*, at 62-63, 175.

The only key mainstem issue not addressed here concerns the recommendations for implementation of an experiment to increase spill for juvenile fish passage. This is addressed in a finding that comes next. Also note that the subject of the reintroduction of anadromous fish into blocked areas above dams, both mainstem and tributary, is the subject of a separate discussion below (#14).

(10) Proposed experiment to increase spill for juvenile fish passage

As noted above, the Oregon Department of Fish and Wildlife, the Nez Perce Tribe, the Pacific Fishery Management Council, a set of environmental and fishing groups, and a number of individuals recommended implementation of increased juvenile passage spill as an experiment. The Council also received a briefing from the Comparative Survival Study team that developed the proposal in September 2013 just as the amendment process was beginning. See <http://www.nwcouncil.org/news/meetings/2013/09/>; <http://www.nwcouncil.org/media/6877229/2.pdf>; http://www.nwcouncil.org/media/6925421/2013_09minutes.pdf (January 2013 Council meeting agenda, packet memo and meeting minutes). The hypothesis underlying the proposal was that significant further increases in spill targeted at passing juvenile salmon could lead to significant increases in smolt-to-adult returns. The Council received substantial oral and written comments in favor of the proposal, particularly from representatives of environmental and fishing groups, following the submission of the recommendation.

A set of the Bonneville customers and customer groups anticipated and adamantly opposed the increased spill experiment in their own recommendations to the Council, and later in oral and written comments to the Council. Bonneville also commented in opposition to the recommendation, arguing that an experiment at increasing spill was not warranted by the science, with a hypothesis dependent on unwarranted assumptions. Both Bonneville and the Bonneville customers placed emphasis on the fact that NOAA Fisheries itself did not support the spill experiment proposal at this time. In its draft 2014 FCRPS Biological Opinion issued in September 2013, and then in the final 2014 FCRPS Biological Opinion issued in January 2014, NOAA commented explicitly on the proposed increased spill experiment, explaining over several pages why the agency decided not to include the spill experiment in the biological opinion's hydrosystem passage RPAs. NOAA found that "several substantial weaknesses in the analysis exist that would need to be resolved prior to further consideration of any operational study of this magnitude," with extensive detail about its concerns. NOAA concluded that it was not "dismissing the results of these modeling efforts and appreciates the progress made in the CSS modeling," and agreed to continue to monitor the effects of project operations on juvenile survival and adult returns" as reported by the CSS team and others and to "continue to consider opportunities to make further improvements to hydrosystem operations or configurations." NOAA recommended that any future spill-test proposals explicitly address seven factors: legal requirements and permitting timelines; biological effects, especially with regard to dissolved gas effects; effects on the energy system that would affect the authorized project purposes; monitoring/information constraints; logistical constraints; comparison of adult returns with a number of factors, not just spill; and "[i]ndependent review of (a) data to address potential spurious correlations and (b) alternative experimental design proposals (by the ISAB or other qualified entities)."

2014 FCRPS Biological Opinion, at 380-82 (http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fcrps/2014_supplemental_fcrps_biop_final.pdf); see also http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fcrps/2013_draft_fcrps_biological_opinion_090913.pdf, at 355-56 (draft 2014 biological opinion).

Given this record, the Council, in December 2013, decided to also ask the Independent Scientific Advisory Board (ISAB) to review the spill experiment proposal. See http://www.nwcouncil.org/media/6925473/2013_12minutes.pdf, at 5-6 (minutes of December 2013 Council meeting). The ISAB issued its review report in late February 2014, "Review of the Proposed Spill Experiment," ISAB 2014-2 (<http://www.nwcouncil.org/media/6939290/ISAB2014-2.pdf>), and made a presentation on its review report to the Council at the Council's April 2014 meeting, see <http://www.nwcouncil.org/news/meetings/2014/04/>; <http://www.nwcouncil.org/media/6954971/9.pdf>. The ISAB concluded that the proposal for an increased spill experiment did not yet include a study design adequate to review or implement the proposed experiment, listing a number of elements that would need to be included to make a valid study design for a scientific experiment. The ISAB noted that information underlying the proposal indicated that the hypothesis about a relationship between increased spill and increased adult returns had "worthwhile merits," but also that the spill test may not result in increased smolt-to-adult ratios "as the justification for the proposed test is based on correlative models that do not establish causality." The ISAB noted that the spill test could instead result in a host of unintended adverse consequences for salmon survival, and the information was not yet adequate to justify the proposal "due to study design limitations and lack of a detailed study and monitoring plan." Besides the need for an adequate study design, the ISAB noted (as many others did as well) that the spill proposal could not be considered for implementation unless and until the water quality standards for total dissolved gas established by the states of Oregon and Washington under the Clean Water Act were modified by these states to allow for spill of the magnitude proposed, modifications that would also require concurrence by NOAA Fisheries and the US Environmental Protection Agency.

Based on this record, the Council, in the draft 2014 Fish and Wildlife Program, decided not to include a call for implementation of the proposed increased spill experiment as recommended. Instead, the Council included a provision that "continues to recognize the value of an experimental approach to salmon recovery in the Northwest," and "support[ing] the development of adaptive management experiments that address critical uncertainties related to species survival." The Council then detailed a set of requirements that proposals for such large-scale experiments would need to have to be eligible for consideration, a list essentially developed from the ISAB review reports and other reviews and comments on the spill experiment proposal. The Council then concluded, with specific reference to spill experiments, that "[f]urther work on proposals for mainstem spill experiments should fully engage the

technical expertise in the region, including scientists from NOAA Fisheries, universities in the Northwest, fish and wildlife managers, federal agencies, and private consultants. The Council is interested in seeing future proposals for improving spill and other mainstem operations that meet these criteria and contain all the elements of a viable experiment as identified by the ISAB in report 2014-2.” Draft 2014 Fish and Wildlife Program, at 63-64 (<http://www.nwcouncil.org/media/7076544/2014-3.pdf>).

Comment on the provision in the draft was comparatively muted compared to the debate on the spill experiment when the recommendations first came to the Council. The Oregon Department of Fish and Wildlife – one of the original recommending entities – supported the provision in the draft, “appreciate[ing] the Council’s call to continue development of experimental spill proposals and adaptive management experiments that address critical uncertainties related to species survival.” The Nez Perce Tribe, the only other entity from the group of fish and wildlife agencies and tribes that recommended the spill experiment, did not mention the issue in its comments on the draft program (even as the Tribe expressed a general concern that the Council, in the draft, had not advanced and supported hydro operations that would fully mitigate for the effects of the hydrosystem by relying too much on the FCRPS biological opinion actions). NOAA Fisheries commented in support of the provision on spill experiments in the Council’s draft. The US Fish and Wildlife Service commented on the provision simply to add the Service as one of the agencies that should be involved in any future work to develop spill experiment proposals. None of the other state fish and wildlife agencies or tribes commented in writing on this provision. Bonneville and the Bonneville customers and customer groups supported the way the Council proposed in the draft to resolve debate over the spill experiment recommendation. The main coalition of environmental and fishing groups did comment to oppose the provision in the draft, continuing to comment that the record showed that the increased spill proposal was just the type of promising step the Council and the region needed to implement to be able to achieve salmon and steelhead adult return ratios sufficient to meet the program’s goals and rebuild salmon stocks.

After consideration of this record, the Council retained the spill experiment provision in the final 2014 Fish and Wildlife Program, with only minimal editing from the provision in the draft (including adding in an explicit reference to the US Fish and Wildlife Service). 2014 F&W Program, at 65-66 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The Council thus did not adopt the spill experiment proposal as originally recommended. The Council concludes that what it did adopt is a modified version of the recommendation that is a more effective science-based approach to handling this and future spill experiment proposals and consistent with the best available scientific knowledge, given the information indicating that the spill proposal as recommended was not yet in a form to be reviewed and implemented as a scientific experiment, and faced substantial regulatory hurdles at this time as well. The support for the program provision from one of the main proponents of the proposal in the

recommendations – the Oregon Department of Fish and Wildlife – as well as the support or lack of objection from the other fish and wildlife agencies and tribes was also a key factor in the Council’s final decision.

(11) Estuary, near-shore ocean and freshwater plume, ocean

The Council received substantial recommendations to enhance the attention the program gives to the estuary, lower Columbia River, the river's freshwater plume, and the near-shore ocean environment. This included a coordinated set of recommendations from fish and wildlife agencies and tribes (Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, the Upper Snake River Tribes, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, NOAA Fisheries) to, in their words, fully incorporate the estuary, plume and near-shore ocean into the fish and wildlife program. Recommendations included matters such as:

- add language to the program to recognize the critical importance of the estuary, plume, and near-shore ocean to the Columbia river ecosystem and ecosystem functions and to the survival of salmon, steelhead and other important fish species; recognize how management of the hydrosystem directly affects the estuary, plume, and near-shore ocean environment; and recognize how releases of large numbers of hatchery fish for hydrosystem mitigation may have density dependent effects in this portion of the ecosystem
- continue basic monitoring to increase understanding of the role of estuary, plume and near-shore ocean habitats, functions and processes in anadromous fish survival, to assist inland management decisionmaking
- fund a collaborative forum of scientists and fish and wildlife managers to identify key management and research questions related to the estuary, plume, and near-shore ocean environments; existing research and monitoring relevant to these management questions; baseline monitoring and research priorities; opportunities for information sharing between scientists and managers; and ways to improve the usefulness of ongoing and proposed ocean, estuary and plume research
- ensure complete consideration of anadromous fish life cycle and critical habitat needs, including the estuary, plume and near-shore ocean, when making management decisions
- assess and integrate the effects of future climate change into knowledge and decisions about the estuary, plume and near-shore ocean; develop adaptation strategies to address effects
- based on evolving knowledge about the estuary, near-shore ocean and plume, plan and implement adaptive management experiments to improve survival of anadromous fish, including experiments on variable release timing and evaluation of stock-specific growth and survival in the ocean compared to freshwater management
- continue research on the effects of hydrosystem management on anadromous fish habitat, considering life histories and productivity
- continue and expand efforts to improve habitat conditions in the estuary, including improving and connecting floodplain habitats, and including

important habitat areas in the lower Columbia tributaries as well as mainstem portion of the estuary

- at the same time, continue to assess, address uncertainties in, and improve the effectiveness of estuarine restoration projects of varying habitat types and their contribution to juvenile survival and increased adult returns
- include the needs of lamprey, sturgeon and eulachon as well as salmon and steelhead in estuary, plume, and near-shore considerations
- key information needs include: estimates of residence time in rearing habitat; quantity and quality of rearing habitat; movement between rearing habitats; importance of habitat connectivity and spatial distribution quantity and quality of fish habitat; fish use of habitat by habitat type; distribution of habitat by type in the Lower Columbia River and estuary; status and trends of the ecosystem functions
- support research on the role and importance of forage fish in the lower estuary and near-shore area through a set of measures

Recommendations similar to some of the above if less detailed also came from the Lower Columbia River Fish Recovery Board, Nez Perce Tribe, Yakama Nation, Upper Columbia United Tribes, US Geological Survey (with particular emphasis on floodplain flows and habitats and on forage fish), and Pacific Fishery Management Council. Bonneville recommended the program particularly acknowledge that estuary habitat restoration actions have been shown to benefit to juvenile salmonids, and acknowledge the strategies, priorities, and benefits identified in the federal agencies' Columbia Estuary Ecosystem Restoration Program. The Native Fish Society recommended recognition of the importance of the estuary and near-shore in a coordinated strategy at habitat protection and restoration investments designed to maintain the chain of habitat requirements for each species of wild salmon and steelhead to complete their life history requirements in freshwater.

The Lower Columbia Estuary Partnership in particular provided an extensive set of recommendations for the estuary, in substance similar to what came from the fish and wildlife agencies and tribes and other agencies summarized above. This included:

- emphasis on the importance of the estuary, plume and near-shore ocean environments to the Columbia River ecosystem and healthy ecosystem functions for salmon, steelhead and other important species
- the need for biological objectives specific to the lower Columbia river salmon and steelhead on par with those above Bonneville Dam
- increased attention both to habitat restoration actions in the estuary and to needed improvements in evaluating the effectiveness of habitat actions
- an increased emphasis on providing normative hydrologic or environmental flows to the estuary and plume, including allowing overbank or flood flows

The Estuary Partnership, NOAA Fisheries and the Native Fish Society in particular also recommended to the Council the recommendations about the estuary that came from the Independent Scientific Advisory Board. These meshed in substance with the recommendations from the agencies and tribes:

- develop detailed strategies and a coordinated plan for the estuary in conjunction with the mainstem and ocean
- develop methods to measure the potential increase in survival of Chinook and steelhead that benefit from estuary restoration
- develop methods to monitor diversity in the estuary to track diversity over time
- develop a comprehensive plan for monitoring long-term effectiveness of estuary restoration for adaptive management
- reassess factors limiting production in the estuary, including contaminants, in light of new research
- update and peer review the Estuary Module developed during recovery planning
- consider redefining estuary boundaries to include the tidal regions at the mouth of tributaries draining into the estuary

With regard to the ocean in general, the coordinated recommendation from the fish and wildlife agencies and tribes included adding as the program's key "ocean strategy" to identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland management actions. They also recommended continued work to improve the forecasting of adult salmon and steelhead returns, including continued support for ocean research such as the work by NOAA Fisheries and Canada's Department of Fisheries and Ocean to develop ocean indicators to be used to improve salmon run forecasting.

NOAA Fisheries provided the most extensive recommendations regarding the ocean. NOAA recommended that the program be updated to reflect important recent advances in scientific understanding of the effects of ocean conditions on salmonid survival; recognize that the Columbia River and the ocean are linked ecosystems that together determine the survival and growth of anadromous fishes in freshwater and ocean; emphasize the importance of healthy Columbia River ecosystems during poor ocean condition cycles; and confirm and support the importance of monitoring and understanding ocean conditions and establishing management systems that can adapt accordingly. NOAA commended the Council for establishing the ocean and plume science and management forum and urged its continuance. A number of other commenters echoed that last point.

NOAA Fisheries, the Estuary Partnership and others also recommended to the Council the views of the ISAB with regard to the ocean as well as the estuary. The ISAB recommended to the program the following considerations about the ocean:

- emphasize in the program that the productivity of anadromous populations in all subbasins of the basin are affected by physical, biological, and ecological conditions in the ocean
- expand the program's primary strategy beyond the relation of the ocean to anadromous fish survival to include ocean effects on growth and viability (abundance, productivity, spatial structure and diversity) and recognize interaction effects among these processes.
- organize the program's ocean strategies to emphasize: a) first priority, to understand and isolate effects of ocean conditions on anadromous fish survival and growth to increase the power of analyses to detect the effects of restoration actions in freshwater; b) second priority, to determine limits to restoration potential or the effectiveness of actions taken in the basin given the variability of ocean conditions that affect anadromous fishes; and c) third priority, to predict future ocean conditions with a view to adjusting actions in the basin to achieve greater benefits and/or efficiencies

Many of these same entities also commented on the provisions in the Council's draft program to express continued support for the recommendations and to support provisions based on the recommendations. Of the more extensive comments, the Washington Department of Fish and Wildlife commented seeking stronger support for research into the impacts of system FCRPS operations on the plume and near-shore ocean environment, with the intent of eventually informing operational changes to increase survival of anadromous species and for Bonneville funding for operation and maintenance funding for salmon restoration projects in the estuary. NOAA Fisheries commented to appreciate the support for the Bonneville-funded plume and near-shore research program; to encourage further collaboration with the Council's ocean and plume forum; and to recommend the Council explicitly incorporate into the program the four "Management Uncertainties, Questions and Potential Actions" developed in the forum. The Lower Columbia Estuary Partnership called on the Council to integrate the Estuary Partnership's Comprehensive Conservation and Management Plan within the estuary section of the program, including the Estuary Partnership's quantifiable conservation targets and geographic priorities. And the US Geological Survey expressed support for the measures in the draft program to assess estuary habitat benefits resulting from modification of existing flood control structures and systems, such as through removal or alteration of levees, and for assessment of flow and other measures to improve the amount and connection of floodplain habitats and functions.

The Bonneville customer groups (Northwest RiverPartners, Public Power Council, PNGC Power, and Northwest Requirements Utilities) recommended and commented that the Council exclude from the program as outside the scope of the Northwest Power Act measures regarding the ocean in particular that have no relationship to the Columbia River basin and to addressing the adverse effects of the hydrosystem on fish and wildlife. This would include, in their view, most ocean-based studies; coded wire tagging for catch-sampling and harvest management;

ocean-based research; and provisions for mitigation, protection, or enhancement measures in or related to the ocean, including measures attempting to address ocean conditions such as acidification.

The Council developed final program provisions for the estuary, freshwater plume, near-shore and ocean based on the recommendations and comments. The program contains an estuary sub-strategy and a plume and near-shore ocean sub-strategy, as part of the overarching ecosystem function strategy. 2014 Fish and Wildlife Program, at 68-69 (estuary sub-strategy), 70-71 (plume and near-shore ocean sub-strategy) (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The program also has provisions scattered around in other topic areas relevant to the estuary, plume and near-shore ocean, either explicitly or because of the context. *Id.*, at 38-39 (ecosystem function strategy and measures, including recognition of estuary and near-shore and plume), 42-43 (mainstem habitat measures, including estuary), 49-51 (predator management), 55-58 (toxic contaminant and climate change measures, some with relevance to estuary), 60-61, 64-65 (mainstem water management and flow measures, with explicit relevance to ecosystem function and floodplain habitat in estuary and plume), 90-96 (sturgeon and lamprey measures, relevant in part in estuary), 97-98 (eulachon provisions specific to estuary), 108-09, 111 (subbasin plans, including lower Columbia and estuary plan as source of specific measures and objectives), 153-55 (program goals and objectives relevant to estuary), 173 (climate change impacts and estuary), 191 (estuary measures).

As is true in other areas of the program, the provisions adopted by the Council in this area may differ in wording from the recommendations, or are condensed and consolidated versions of disparate recommendations, or the recommendations have been adapted or modified in certain respects to be integrated into the program format. But the Council is comfortable the final program provisions are consistent with the substance of the recommendations.

The Council agrees with the Bonneville customer groups that all program measures must be relevant to helping the Council and the federal agencies fulfill their responsibilities under the Northwest Power Act to protect, mitigate and enhance fish and wildlife affected by the Columbia hydrosystem. The Council is comfortable that the program measures it has adopted are within the scope of that authority. The Council avoided adopting any measures that seek knowledge about the ocean for the sake of knowledge or to help agencies makes decisions about fish management unrelated to improving the protection and mitigation of fish and wildlife affected by the Columbia River hydrosystem.

(12) Wildlife mitigation

The Council received a substantial number of recommendations regarding the wildlife mitigation section of the program, nearly all of them from state fish and wildlife agencies, tribes and tribal groups, and Bonneville. As a general summary, many of the recommendations support completion of wildlife program mitigation, including support for the continued use of wildlife settlement agreements for that purpose, a call to ensure Bonneville properly funds long-term operation and maintenance needs, and continued support for a 2:1 crediting ratio for mitigation of the remaining unmitigated habitat units lost due to construction and inundation. Bonneville recommended that the program retire the use of habitat units, and rely on acres instead. Recommendations also called for the assessment of wildlife losses resulting from the operation of the hydrosystem, as well as secondary losses resulting from the elimination of anadromous and resident fish. Recommendations called for the Council to continue the use of the Wildlife Advisory Committee to advise on issues of wildlife policy and implementation, including assistance to the Council and Bonneville on the issue of operational and secondary losses. Some of the tribes recommend wildlife mitigation an appropriate substitute for anadromous fish blocked by the construction of dams. And many recommendations called for the funding of monitoring and evaluation including data management and reporting to assess the program's progress in meeting wildlife mitigation objectives.

What follows is a summary of recommendations and subsequent comments and how the Council responded in the final program. For the final wildlife mitigation strategy, see 2014 Fish and Wildlife Program, at 72-75 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). Further details on mitigation priorities; assessed habitat unit losses due to hydroproject construction and inundation; information on mitigation for these losses, and provisions on wildlife mitigation in FERC licensing proceedings, see *Id.*, at 145-47 (priorities), 148-51 (losses/mitigation), 152 and 164-65 (wildlife mitigation in FERC licensing). Provisions regarding mitigation crediting incorporated from the work of the Wildlife Crediting Forum are at 177.

The Idaho Department of Fish and Game, Washington Department of Fish and Wildlife, Montana Fish Wildlife and Parks, Coeur d'Alene Tribe, Upper Columbia United Tribes, and Bonneville all recommended support for the completion of wildlife program mitigation – and the resolution of outstanding issues with regard to wildlife mitigation – through negotiations to develop additional settlement agreements. This was something recommended in the Wildlife Crediting Forum report prior to the amendment process as well as encouraged already in the 2009 Fish and Wildlife Program. Idaho particularly called for the Council to reinforce the conclusions of the Wildlife Crediting Forum's report, including maintaining a consistent system for tracking and maintaining a wildlife mitigation crediting ledger. Bonneville also emphasized its support for the recommendations from the Wildlife Crediting Forum, especially encouragement for subregional efforts and

agreements to resolve the remaining areas where resource managers and Bonneville disagree on remaining mitigation. The Upper Columbia United Tribes commented in support of flexible, negotiated approaches to wildlife mitigation.

Consistent with the program amendment recommendations and comments – and the recommendations out of the Wildlife Crediting Forum – the Council continues to encourage Bonneville and the relevant fish and wildlife agencies and tribes to complete long-term agreements by 2016 as the basis for implementing wildlife mitigation to address the remaining construction and inundation losses included in the program and to resolve other issues. The program provides significant guidance on mitigation for wildlife losses and on what an appropriate long-term agreement must contain, while allowing the agencies and tribes and Bonneville the flexibility to develop agreements suited to particular areas and circumstances. *Id.*, at 72, 73, 74. The Council also endorsed and incorporated into the program the recommendations of the Wildlife Crediting Forum to determine who mitigation crediting occurs and is accounted for. *Id.*, at 72, 177.

The Idaho Department of Fish and Game, Coeur d’Alene Tribe, Spokane Tribe, and Upper Columbia United Tribes recommended that the program specify that wildlife habitat losses are fully mitigated only when mitigation agreements include operation and maintenance funding to protect these mitigation investments over the life of the project or in perpetuity. Bonneville recommended the program support the use of stewardship funding for long term O&M financing. Related, many of the agencies and tribes –Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Confederated Salish and Kootenai Tribes, Spokane Tribe, Nez Perce Tribe, Upper Snake River Tribes, Confederated Tribes of the Grand Ronde Community of Oregon, Cowlitz Tribe – recommended that Bonneville funding at levels adequate to complete and implement wildlife area management plans.

The program specifies that wildlife mitigation agreements must have provisions for management plans and long-term implementation and maintenance plans to sustain the credited habitat values for the life of the project. *Id.*, at 73, 74.

The Washington Department of Fish and Wildlife and the Burns Paiute Tribe urged the Council to maintain the program’s commitment to a 2:1 crediting ratio for habitat units remaining after 2000. In subsequent comments a number of the agencies and tribes expressed concern about what they saw as the erosion of the 2:1 ratio for wildlife losses resulting from wildlife settlements in many areas of the basin. Washington also recommended that the Council revise or remove language regarding unresolved “stacking” issues that negate 2:1 crediting.

The final wildlife strategy continues to endorse the 2:1 crediting ratio for the remaining habitat units. The reference to the “stacking” issue remains – the provision specifies its own method for resolving such issues to be able to retain the 2:1 crediting ratio. *Id.*, at 72, 177.

Another set of recommendations and comments concerned the use of – or transition away from the use of – habitat units and the Habitat Evaluation Procedure (HEP) to another assessment and crediting method. The Idaho Department of Fish Game recommended that as the use of HEP is phased out of the program in relation to construction and inundation impacts, the Council, with the wildlife managers and Bonneville, should investigate and adopt into the program alternative habitat assessment methodologies that better enumerate and define ecological functions and conditions necessary for sustaining healthy and resilient wildlife populations and habitats. Bonneville recommended transitioning to the use of acres and away from habitat units and HEP in mitigation agreements. The Northwest Habitat Institute recommended changing from the use of HEP to a particular different approach, the Combined Habitat Assessment Protocols. In subsequent comments the Northwest Habitat Institute opposed Bonneville's recommendation that the Council retire the use of habitat units and switch to using acres, as not based upon the best available science nor consistent with past independent science review reports. The Upper Columbia United Tribes commented in support of flexible, negotiated approaches to wildlife mitigation that can rely on any agreed upon metric or base.

The final wildlife strategy continues to endorse habitat units as the preferred unit of measurement for mitigation accounting and the HEP methodology as the preferred method for estimating habitat units lost and acquired. The long history of the use of HEP, including the fact that the wildlife loss assessments that are the basis for mitigation crediting represent an application of HEP, makes it unreasonable to abandon the methodology completely. Even so, consistent with recommendations and comments, the program also allows parties to a wildlife mitigation agreement to develop and use other metrics and methods for evaluating mitigation actions as long as the alternative mechanism takes into account both habitat quantity and quality adequate to mitigate for the identified losses. *Id.*, at 73. The program recognizes that some of the mitigation agreements have applied assessment and crediting methodologies that allowed the parties to quantify and mitigate for lost habitat units in acres of land. *Id.*, at 148. The Council also noted and endorsed standard operating procedures for future use of HEP recommended in the final report of the Wildlife Crediting Forum, *Id.*, at 177, while at the same time tasking the Wildlife Advisory Committee to provide recommendations on both the need for additional HEP reports and funding and on the diminishing need for HEP as Bonneville completes mitigation for construction and inundation losses and thus the proper transition to other methodologies, *Id.*, at 75.

Operational and secondary losses of wildlife were also a significant source of recommendations and comments. The Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Nez Perce Tribe, Confederated Salish and Kootenai Tribes, Spokane Tribe, Coeur D'Alene Tribe, Burns Paiute Tribe, Nez Perce Tribe, Upper Snake River Tribes, Confederated Tribes of the Grand Ronde Community of Oregon, and Cowlitz Tribe all recommended

operational impact and loss assessments by 2015, using methods that provide a systematic approach to characterize active physical and biological processes in watersheds and describes spatial distributions, histories and linkages among important ecosystem components. A few of these entities – e.g., the Confederated Salish and Kootenai Tribes and the Grand Ronde Tribe – called on the Council to use its Wildlife Advisory Committee to convene the wildlife managers and BPA to develop protocols for assessing operational impacts.

Another set of state fish and wildlife agencies and tribes – e.g., Washington Department of Fish and Wildlife, Confederated Salish and Kootenai Tribes, Nez Perce Tribe, Coeur d’Alene Tribe, and Upper Columbia United Tribe – recommended that Bonneville fund assessments of the ecological impacts and losses of wildlife resulting from the loss of anadromous and resident fish due to the development and operation of the hydrosystem. Washington noted that existing and future habitat actions implemented to benefit anadromous fish may be suitable mitigation and contribute towards crediting for some of these secondary impacts. The Upper Columbia United Tribes recommended priority for these assessments and funding for impacts in the blocked areas of Chief Joseph and Grand Coulee. In recommendations and subsequent comments, many of the state fish and wildlife agencies and tribes called for more specific or precise definitions in the program for operational impacts and secondary wildlife losses, and expressed a general opinion that operational and secondary losses remain unaddressed.

In comments Bonneville questioned the validity of the recommendations and draft program provisions on both operational and secondary losses. With respect to operational losses, Bonneville commented that mitigation is taking place for habitat losses due to construction and inundation up to full reservoir pool levels. This limits the operational impacts to exceptional pool operations and to effects at locations above or below reservoirs where operations contribute to habitat erosion or depletion – and the latter are already being addressed by a wide range of operational constraints, habitat actions, and other actions providing mitigation. Bonneville questioned what value would be added by separate operational loss assessments for wildlife. Bonneville also commented that the entire concept of “secondary impacts” is lacking supporting documentation, and also that most areas in the altered ecosystem are occupied by fish and wildlife species, gains that would have to be used to offset any secondary losses.

The final wildlife strategy retains the commitment to mitigate for operational and secondary losses to wildlife, not just mitigation for the construction and inundation losses. *Id.*, at 72. It may be that Bonneville’s comments prove accurate in that dam operations do not add significantly to the construction and inundation wildlife losses already assessed and in the process of mitigation, and thus further assessment of operational losses is not a program priority, at least not in a general sense. But the wildlife agencies and tribes disagree with Bonneville at this point, and it remains an open question to be investigated further. Recognizing all

the difficulties in addressing operational losses, the Council tasked the Wildlife Advisory Committee to examine the existing options for assessing and addressing operational losses – using what has been learned from pilot projects – and provide a recommendation to the Council by October 2015 for resolving the issues. *Id.*, at 75. The program also calls on Bonneville and the wildlife agencies and tribes to complete loss assessments for operational losses in circumstances where there is agreement on the priority and methodology. *Id.*, at 73. And the Council recognized that negotiated mitigation agreements can be used to settle operational losses and other wildlife issues in lieu of precise assessment of losses. *Id.*, at 72, 74. The Council did not further define what is meant by operational or secondary losses. The basic concepts seem well understood, and otherwise the Council left the Wildlife Advisory Committee free to develop a recommended approach.

The Council also received a set of recommendations from the state fish and wildlife agencies and tribes and others related to monitoring, evaluation, data management and reporting on wildlife mitigation. The main focus of the agencies and tribes' recommendations was for Bonneville to fund adequate monitoring, data management and reporting on wildlife mitigation, with varying details and priorities specified. A number of the agencies and tribes particularly recommended that the Council use the Wildlife Advisory Committee to identify and support specific monitoring and reporting requirements for wildlife and wildlife projects under the program. Another set of the agencies and tribes recommended that a programmatic evaluation of the wildlife element of the program take place before the next program amendment process, to assess the extent to which implementation of the wildlife measures is achieving the wildlife mitigation objectives of the program and Act. Recommendations of these types came from the Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Idaho Department of Fish and Game, Cowlitz Tribe, Nez Perce Tribe, Upper Snake River Tribes, Spokane Tribe, and the Coeur d'Alene Tribe. The Idaho Department of Fish and Game recommended the Council develop a broader integrated framework to address a range of related matters, including wildlife habitat improvement project needs, growing operation and maintenance needs, and monitoring and evaluation, data management and reporting requirements.

In related recommendations, the Washington Governor's Salmon Recovery Office recommended that the development of tools necessary for coordinated data management and reporting that included wildlife information and indicators along with anadromous and resident fish. The Northwest Habitat Institute recommended (and later supported in comments) that the Council call for compliance monitoring conducted by independent evaluators to avoid any possible conflict-of-interest. The Institute also recommended continued mapping of habitat condition and land cover and use throughout the Columbia River basin, to have an ongoing census of environmental conditions for key parameters and assess baseline habitat conditions in the subbasins. The Kalispel Tribe commented in opposition to the recommendations of the Northwest Habitat Institute, seeing no need for third party

assistance or centralized coordination of efforts. The Upper Columbia United Tribes similarly commented on the need for flexibility in determining what are the appropriate requirements for monitoring and evaluation of wildlife in particular areas, as long as the methods and protocols have been endorsed out of the independent scientific review, such as the UCUT Wildlife Monitoring and Evaluation Program (UWMEP) methods and protocols.

Consistent in a general sense with the recommendations and comments on this topic, especially of the agencies and tribes, the final wildlife strategy encourages the wildlife agencies and tribes to monitor and evaluate habitat and species response to wildlife mitigation actions, and to develop more standardized approaches to monitoring. *Id.*, at 73. The requirements for an appropriate mitigation agreement include provisions for periodic monitoring and evaluation of mitigation benefits and the annual reporting of results, including a periodic independent audit. *Id.*, at 74. The program's adaptive management provisions include ongoing efforts to develop indicators and regular reporting on the status of wildlife resources and wildlife mitigation achievements from a programmatic perspective. *Id.*, at 101. Beyond that, the Council concluded it would not be effective to be more prescriptive in the program as to the appropriate monitoring and evaluation requirements.

Remaining recommendations included a recommendation from Bonneville to include in the program the agreement with the State of Oregon on wildlife habitat protection and enhancement in the Willamette subbasin. The program recognized the agreement. *Id.*, at 148, *see also* #17 below.

In a different part of the basin, the Confederated Salish and Kootenai Tribe noted that the Hungry Horse and Libby wildlife impact assessments were completed using methods that were neither approved nor adopted by the program, and thus recommended that Bonneville fund the reassessment of wildlife impacts from construction and inundation at the Hungry Horse and Libby projects utilizing HEP methodology. The Salish and Kootenai Tribes raised the same issue in the 2009 program amendment process. At that time the Council concluded that this was too specific a measure for the basinwide wildlife strategy, and recommended instead that the Salish and Kootenai Tribes raise this issue with Bonneville, Montana and the other wildlife managers. 2009 Fish and Wildlife Program, Findings and Response to Comments, at 81 (http://www.nwcouncil.org/media/29717/2009_09F.pdf). The Council came to the same conclusion this time, especially given that the wildlife strategy is so strongly based in flexibility of approach and resolving issues with discussions and negotiations within subregions. To the extent there seems to be a need for assistance in addressing and resolving this point, the Council recommends that it be raised at the Wildlife Advisory Committee.

The Spokane Tribe and Upper Columbia United Tribes recommended that wildlife improvements should, under certain circumstances, be allowed as part of

compensation for anadromous fish losses in blocked areas. The blocked-area mitigation provisions recognize the use of wildlife enhancement as one of many tools available as part of a flexible approach to mitigation for anadromous fish losses in these areas. *Id.*, at 83, 84, see also #14 above.

A number of federal and state fish and wildlife agencies and tribes recommended a region-wide assessment of the site-specific and system-wide effects of renewable energy development on wildlife and fish. The Council did not adopt this recommendation, explained at #21 below.

The Washington Department of Fish and Wildlife and the US Fish and Wildlife Service recommended assessing and accounting for the ongoing wildlife impacts and losses from operating, maintaining and constructing transmission lines. The Council did not adopt this recommendation. Bonneville commented in response to the recommendation that the Council resolved this issue 25 years ago. In the 1987 Fish and Wildlife Program, the Council called on Bonneville to negotiate agreements with the states regarding transmission corridors and their impacts on wildlife. 1987 Fish and Wildlife Program, Section 1003(c), at 133 (<http://www.nwcouncil.org/media/6843101/1987Program.PDF>). During the program amendment process in 1988-89 to add the wildlife loss assessment and mitigation provisions to the program, Bonneville alerted the Council that it had completed these agreements with the states. Based on that fact, the Council decided not to add a provision to the 1989 wildlife mitigation amendments calling for assessments and mitigation relating to the transmission system. [add cite]

That has been the situation ever since. The impacts of transmission corridor development and maintenance on wildlife have been addressed through state siting and land use procedures and requirements, federal NEPA review of proposed transmission developments, and various FERC requirements. In its explanation in 1989, the Council noted that it could always review at any time how well these arrangements are working and what problems they pose, without committing to a particular approach in that event. The recommendations here did not detail that these other avenues are not adequately addressing the transmission impacts on wildlife. The Council concluded that the information it had at this time did not warrant a decision to devote program resources to a review of transmission impacts on wildlife. One avenue for further consideration is that the Council, in the Seventh Power Plan, will be considering the environmental impacts of renewable energy development, and that will include to some extent the effects of the transmission system developments related to those resources. See #21 below.

(13) Fish propagation and hatcheries, wild fish protection, strongholds, and quantitative objectives for anadromous fish

The Council's 2009 Fish and Wildlife Program recognized and supported the use of artificial production for certain purposes as necessary mitigation for system losses. It did so while also calling for artificial production to be implemented consistent with a set of principles intended to protect and even benefit the recovery of naturally spawning native fish in improved habitats. "Artificial Production Strategies," 2009 Fish and Wildlife Program, at 18-19 (http://www.nwcouncil.org/media/115273/2009_09.pdf). A number of the state fish and wildlife agencies, Indian tribes, the Columbia River Inter-Tribal Fish Commission, NOAA Fisheries (to a significant extent), the Pacific Fishery Management Council, Bonneville and others recommended continued support for the artificial production provisions of the program and for the continued use of artificial production as part of the program's mitigation strategies. This included recommended support for the use of artificial production to supplement depressed natural stocks, reintroduce extirpated stocks, and provide alternative and additional fisheries. The Columbia River Inter-Tribal Fish Commission and the Idaho Department of Fish and Game provided the most extensive recommendations and justifications for the value of artificial production and supplementation under the program as critical to mitigation for continued losses and to help recover and rebuild the basin's salmon runs.

Setting aside for the moment provisions relating to the Hatchery Scientific Review Group (HSRG), none of the state or federal fish and wildlife agencies recommended significant revisions to the language on artificial production in the 2009 Program. A number of the agencies and tribes did recommend *additional* language or provisions consistent with the existing provisions – see below. The Idaho Department of Fish and Game commented in particular on the soundness of the provisions on artificial production in the 2009 Program. NOAA Fisheries recommended a few relatively minor changes in the existing language, mostly to add language referencing consistency with recovery plans and other decisions made by NOAA and others agencies under the federal Endangered Species Act. NOAA's recommendations in this regard were echoed by other agencies and tribes, at least in part, seeking to make sure production programs included in the Council's program are evaluated for consistency with regional recovery plans as well as with the Council's subbasin plans. NOAA also recommended the Council replace a reference to "carrying capacity" with "ecosystem capacity," and revise a provision on "Harvest Hatcheries" to emphasize concerns about stray rates and harvest effects on weak stocks. And NOAA Fisheries along with many of the state and tribal entities recommended allowing for the use of artificial production to help replace extirpated salmon and steelhead anywhere, not just in blocked areas.

A number of the state fish and wildlife agencies and tribes and tribal organizations also recommended (and later commented in support of) the continuation and

improved implementation of and funding for specific production programs and facilities, including:

- Montana Department of Fish, Wildlife and Parks (Sekokini Springs and westslope cutthroat trout, along with provisions stating that hatcheries can be used appropriately to conserve remaining genetic diversity to help restore sensitive native fish species, including the protection of replicate populations for redundancy in case a key population is lost due to disturbance)
- Oregon Department of Fish and Wildlife (the SAFE program and other off-channel fisheries opportunities – a recommendation echoed by the Northwest Sportfishing Industry Association and Association of Northwest Steelheaders)
- Columbia River Inter-Tribal Fish Commission and its member tribes (Columbia Fish Accord production projects)
- Colville Confederated Tribes (Columbia Fish Accord production projects)
- Nez Perce Tribe (Clearwater and Salmon production projects)
- Spokane Tribe (Lake Roosevelt area production initiatives)
- Kootenai Tribe of Idaho (sturgeon and burbot conservation aquaculture program)
- A number of state and federal fish and wildlife agencies and tribes recommended expanding the role of artificial production to benefit lamprey and sturgeon

A number of the recommendations from the fish and wildlife agencies, tribes and others concerned review products from what is known as the Hatchery Scientific Review Group (HSRG) and review reports from the Independent Scientific Advisory Board. With regard to the work of the HSRG in particular, the Washington Department of Fish and Wildlife and a number of other Washington state agencies recommended that the Council adopt or in some way use the principles, strategies, and recommendations of the HSRG to guide the management of hatcheries in the program and in the basin in an adaptive management style. NOAA Fisheries recommended that the Council, in the program, call for consideration of the HSRG principles on a case-by-case basis in distinct processes that evaluate artificial production programs and reforms, such as through the development and approval of Hatchery Genetic Management Plans (HGMPs). The Columbia River Inter-Tribal Fish Commission and two of its member tribes recommended that the Council not adopt the HSRG recommendations into the program (as part of either the artificial production or harvest strategies), and that the Council, if it did decide to incorporate or make use of the HSRG recommendations in some way, ensure that artificial production strategies are also consistent with *US v. Oregon* management agreements, tribal trust and treaty rights, recovery plans and other legal obligations; do not discriminate against tribal programs; and are not imposed without the comprehensive review by and consultation with the fishery co-managers. These tribal entities also recommended that the Council defer instead to the process by

which the co-managers develop the HGMPs for review and approval by NOAA Fisheries. Bonneville also supported recognition in the program of the process in which the HGMPs are developed, noting that the HGMPs already incorporate consideration of HSRG principles as well as ESA and recovery needs. Bonneville also supported recognition of the production commitments and analyses in the *U.S v. Oregon* management agreements, Columbia Fish Accords, and biological opinions. The Idaho Department of Fish and Game recommended that the Council not force a decision to adopt or not adopt the recommendations of the HSRG into the Council's program – and simply delete references to the HSRG – noting that the artificial production principles already in the program capture the HSRG's key principles and recommendations, and that specific metrics and objectives from the HSRG are already being integrated where appropriate into operations and evaluations by production managers.

The Native Fish Society and Wild Steelhead Coalition, Trout Unlimited, and Bonneville customer groups (Public Power Council, Northwest RiverPartners, PNGC Power, and Northwest Requirement Utilities) endorsed the incorporation of the HSRG recommendations into the program and their implementation at hatcheries in the basin. So too did the Independent Scientific Advisory Board. In its review report on the Council's 2009 Fish and Wildlife Program, the ISAB recommended the development of quantitative objectives for each artificial production program based on HSRG recommendations. *Review of the 2009 Fish and Wildlife Program*, at 26-34, ISAB No. 2013-1 (March 2013) (available at <http://www.nwcouncil.org/fw/isab/isab2013-1/>). The entirety of the ISAB's views on artificial production in that report were recommended to the Council for inclusion in the program by the Washington Department of Fish and Wildlife along with Trout Unlimited and the joint recommendation from the Native Fish Society and Wild Steelhead Coalition.

In its report on the program, the ISAB expressed particular concern about carrying capacity and density-dependence issues that, in the ISAB's view, could cause artificial production to limit the system's capacity to support natural production and have adverse effects over the long term on the recovery and sustainability of natural populations. Based on these conclusions, the ISAB recommended implementing the HSRG principles as noted above, as well as:

- explicitly addressing carrying capacity for juvenile salmonids when integrating and prioritizing plans for artificial propagation and habitat restoration
- conducting empirical investigations and developing bioenergetic models to estimate demands on food supplies by native and non-native competitors of juvenile salmonids
- evaluating whether the multiple objectives of recovering ESA-listed species, establishing healthy natural populations, and mitigating harvest opportunity using artificial production can be reconciled and address any trade-offs explicitly

- quantifying the cumulative impacts of artificial production on natural production and ecosystem processes at population, subbasin, and basin scales
- treating integrated supplementation (for conservation) and harvest as distinct programs requiring their own standards of operation
- specifying that segregated artificial production requires removal of hatchery fish before they reach spawning grounds to maintain the genetic integrity of local populations
- committing to establishing more empirical evidence concerning the effect of supplementation on rebuilding natural populations and improving integration between artificial production supplementation and habitat restoration programs
- evaluating limiting factors by life-stage, including density-dependent effects of artificial production fish on production of natural-origin adult fish
- developing quantitative goals and basin-scale monitoring for artificial production.

The Columbia River Inter-Tribal Fish Commission in turn cautioned in its recommendations that the ISAB's views about the risk of hatchery programs to natural production are not quantified and do not consider all the risks facing salmon across their life-cycle. The ISAB also did not recognize the extent to which these principles are already being considered and embedded in individual programs, as programs are reviewed. The Commission concluded that the ISAB's view are too broad to apply the same in every situation, and thus should not be incorporated generally into the program, and instead considered on a case-by-case basis.

Dovetailing at least in part with the ISAB's views, the Idaho Department of Fish and Game, the Washington State Governor's Salmon Recovery Office, and the Upper Columbia Salmon Recovery Board recommended that the Council be cautious especially about the long-term use of supplementation. These recommendations noted the importance of using supplementation to address imminent demographic risks in the short-term, but also that the growing opinion in the scientific literature is that the benefits are not sustainable long-term, pose risk to natural spawning recovery over the long-term, contribute to carrying capacity and density dependence problems, and need to be combined with and yield to other recovery strategies for long-term recovery. NOAA Fisheries similarly recommended an additional strategy for the program recognizing that significant critical uncertainties remain about the effects of integrating hatchery fish with wild populations, which must be addressed in a prioritized manner on a species to species and case-by-case basis. NOAA also recommended that the Council include the testing of different integration strategies across the basin; require that artificial production decisions be made within the context of objectives and strategies at different scales, including species, major population groups, and populations; and identify and prioritize research, monitoring and evaluation to address knowledge gaps that contribute to the policy disagreements about the

effects of artificial production on the viability of listed species. The US Fish and Wildlife Service also recommended the need for additional research on the relative contribution of hatchery and naturally-spawning populations to steelhead production in the Clearwater River in particular.

The recommendations from a number of the environmental and conservation groups incorporated the same concerns about the potential adverse effects of hatchery production on natural production and species recovery. Trout Unlimited recommended to the Council both the ISAB and HSRG recommendations (as noted above), and then TU added specific recommendations that echoed the ISAB's concerns. American Rivers, Conservation Northwest and a number of allied individuals similarly and briefly recommended that the Program and fish managers focus on habitat protection and restoration and improvements to dam operations to increase and sustain wild populations and thereby reduce the need for hatcheries, and ensure that hatcheries that do continue to operate are run in such a manner that minimizes negative effects on wild fish populations.

The Native Fish Society and Wild Steelhead Coalition provided the most extensive set of recommendations along these lines. Along with recommending the ISAB and HSRG recommendations to the Council in their entirety, the Native Fish Society and Wild Steelhead Coalition recommended:

- developing a conservation requirement for every subbasin and wild salmonid stock based on an estimate of habitat capacity and full utilization of that habitat by natural spawners
- provisions for evaluating the effects of and limiting artificial production that might interfere with meeting these conservation goals
- determining ecological and genetic impacts on natural production from releases of hatchery fish
- genetic and life history inventories and baselines and stock transfer policies that maintain genetic and ecological integrity for natural production
- ramped-up efforts to determine the hatchery impacts on wild salmonids and set appropriate standards for different types of hatcheries to maintain genetic, life-history and ecological integrity of locally-adapted natural populations
- including at least one watershed for each population group that is managed solely for wild fish and excluding hatchery fish
- designation of larger hatchery-free watersheds (including Wind River, Asotin Creek, Joseph Creek, John Day River, and Molalla River)
- determining through empirical evidence the effect of supplementation on actually rebuilding natural populations
- setting stray rate standards that are protective of wild salmonids, using the assistance of independent science panels
- develop quantitative objectives for natural production and improved basin-wide monitoring and evaluation of the effects of hatchery production on natural production

- completing cost evaluations, cost-effectiveness assessments, and economic review of the benefits of hatchery programs, including evaluating the fishery contribution of hatchery steelhead

Besides endorsing the HSRG recommendations, the Bonneville customer groups recommended that the Council promote hatchery production that supports and does not conflict with conservation and recovery objectives; explicitly incorporate adaptive management strategies for program-funded hatchery programs; support additional selective harvest methods and policies to reduce incidental catch of ESA-listed fish and increase catch of hatchery fish; and call for an assessment of the extent to which harvest slows recovery of naturally-reproducing populations, and implement adaptive management harvest strategies.

Finally with regard to artificial production, a number of the state agencies and tribes recommended identical language for the program calling on Bonneville to fund comprehensive hatchery effectiveness monitoring and reporting for Columbia basin hatcheries. The Idaho Department of Fish and Game and Washington Department of Fish and Wildlife specifically recommend that the Program push for the funding and implementation of what is known as the CHREET project to establish basinwide monitoring, evaluation and reporting standards for hatchery effectiveness, IDFG noting that the CHREET concept evolved out of the work of the Ad Hoc Supplementation Workgroup and that the Council needs to provide guidance to get this effort moving forward. Bonneville similarly and more generally recommended support for the development of a basinwide programmatic approach to hatchery research, monitoring and evaluation.

And finally with regard to concerns about wild native fish and habitats, a number of agencies (e.g., NOAA Fisheries and Montana Fish Wildlife and Parks) and conservation groups recommended that the program retain and expand its support for the recognition, designation and protection for “stronghold areas” that emphasize the preservation and restoration of habitat for wild native fish. Subsequent comments of support came from the Wild Salmon Center and the conservation group coalitions. Significant support for the stronghold concept also came from other state fish and wildlife agencies and from a number of tribes, along with cautions about the need for collaboration with and agreement by the states and tribes in the identification and management of stronghold areas, and support for stronghold and wild fish policies that work with and do not undermine production strategies necessary for effective mitigation for hydrosystem losses.

Based on these recommendations – and similar comments on the recommendations – the Council proposed two strategies in the draft fish and wildlife program. One was a revised version of the artificial production strategy (renamed a hatcheries strategy), and the other a wild fish strategy (along with a proposed “stronghold” strategy). The draft hatcheries strategy retained the support for the use of hatchery production as a tool to help meet the mitigation

requirements of the Northwest Power Act, and also retained a basic set of principles to guide production decisions and implementation that have been in the program since 2000. The draft expanded on the artificial production strategy included in the 2009 program by being more detailed and specific about the principles and general measures to guide the use of hatcheries for three different purposes (segregated programs devoted to fisheries, integrated programs, and for the purpose of reintroduction), mostly aimed at ensuring that production programs do not adversely affect naturally spawning populations and the capacity to increase natural populations. The draft hatcheries strategy also included a set of measures for comprehensive research, monitoring, assessment and reporting on hatchery effectiveness. The Council did not call in the draft for changes in any particular production program. The separate wild fish strategy in the draft emphasized the need to protect and enhance native, wild and naturally spawning fish and the ecosystems they rely on, including limits or constraints on the use of hatcheries (and harvest) to that end. Draft 2014 Fish and Wildlife Program, at 75-83 (<http://www.nwcouncil.org/media/7076544/2014-3.pdf>), with a proposed strongholds strategy at 43-44. The draft program also included a set of provisions intended to produce quantitative program objectives in the near future for adult naturally spawning salmon and steelhead and similar objectives for hatchery salmon and steelhead. *Id.*, at 31-32.

The hatcheries and wild fish strategies and the provisions regarding anadromous fish objectives in the draft program generated a significant amount of comment and controversy, raising particular concerns among representatives of a number of the tribes and fish and wildlife agencies that manage salmon and steelhead. The concerns expressed from the agencies and tribes (and from individuals and non-profit organizations with the same concerns) emphasized that, in their view, the Council had been too prescriptive in terms of the requirements for implementing and reporting on hatchery performance; divided production programs into a couple of “purposes” in a manner that did not account for a much broader range of actual hatchery and fish management, practices, purposes and contexts in the basin; failed to recognize and give effect to the case-by-case assessments of production programs already under way that integrated the latest concerns and science on hatchery effectiveness and effects on natural production; called for the reporting of information that was either already reported (although perhaps in a different way) or would be difficult or expensive to report, without clarity on the value of the information sought; and in general encroached too greatly on the management responsibilities of the agency and tribes with authority to manage salmon and steelhead.

The concerns about the draft expressed by tribal and agency representatives spawned an on-going consultation under Section 4(h)(5) of the Northwest Power Act between Council members and staff and these agency and tribal representatives that began in May 2014 after the release of the draft and continued until a meeting at the Council’s offices on September 8, 2014, just prior to a September Council meeting to begin considering final program amendments.

The state and federal fish and wildlife agencies and tribes also began working together to see if they could develop and submit to the Council a consensus approach on these matters for the final program.

Written comments on the draft program thus included a joint submission from nearly all the agencies and tribes that manage salmon and steelhead intended as a complete replacement for the sections in the draft program containing the hatchery and wild fish strategies, the salmon and steelhead quantified objectives and reporting requirements, and a description of “program challenges” concerning the use of hatcheries. Entities supporting the comments (either completely, or with certain minor reservations) included the Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, Yakama Nation, Columbia River Inter-Tribal Fish Commission, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife; Washington Department of Fish and Wildlife, and NOAA Fisheries. The tribes and agencies’ proposed replacement used the provisions in the Council’s draft as a base, but then revised those provisions substantially in line with the concerns expressed already, especially with regard to what they renamed a “propagation” strategy as well as the provisions for anadromous fish quantitative objectives. The US Fish and Wildlife Service commented in support of revisions to the draft program similar to what the others presented. And the Kootenai Tribe of Idaho commented to make sure that the hatchery and wildlife fish provisions in the draft would not inadvertently limit the Kootenai Tribe’s implementation of the Conservation Aquaculture portion of its programs. Bonneville, representatives of the Bonneville customer groups, and others such as the Northwest House Republicans, commented to support the efforts of the Council and the agency and tribal representatives to work out the differences over the draft, with particular emphasis on allowing the case-by-case consideration of the best conservation and hatchery practices and native fish and protection, such as through the development and review of HGMPs. The Native Fish Society and Wild Steelhead Coalition, on the other hand, commented in support of – and to strengthen, in their view – the provisions in the draft program.

The Council returned to its review and discussion of these sections of the program at special Council meetings on August 18 and 21 devoted to the fish and wildlife program, having reviewed and considered all of the recommendations and the comments received on the draft, including the replacement provisions jointly submitted by the tribes and agencies. The Council decided to begin its work on these provisions for the final program by accepting as the starting base the replacement provisions submitted jointly by the agencies and tribes. The Council then worked through the propagation and wild fish strategies of the replacement section, making certain working edits in the propagation strategy in particular and one in the wild fish strategy, edits the Council considered largely for clarity, coherence and emphasis without materially changing the substance of the provision submitted by the tribes and agencies. This included making clear the need for continued research, inquiry and reporting on the effectiveness of

production programs and their effects on natural production, and considerations for the use of hatcheries for supplementation and conservation in areas of good native fish habitat.

As of early September 2014 the Council had yet to work through the companion sections on anadromous fish objectives and “program challenges.” The Council central and state staff, working in coordination with individual Council members, developed in late August and early September proposed edits to the tribes and agencies’ replacement section on objectives and program challenges, for consideration by the Council at its regularly scheduled Council meeting Sept 8-10. Concerned by certain aspects of the working and proposed edits to the propagation, wild fish and objectives provisions, representatives of the agencies and tribes requested a further consultation with the Council on the morning of September 8, and provided the Council members with another joint set of comments on September 5 in preparation for that meeting. The joint comments were submitted on behalf of the Oregon, Washington and Idaho fish and wildlife agencies, NOAA Fisheries, and the Columbia River Inter-Tribal Fish Commission and its four member tribes. The agency and tribal comments raised a small set of issues with the working edits to the replacement propagation and wild fish strategies that the Council had discussed in August, seeking mostly clarity, refinements, and revised emphasis. At the same time, the agency and tribal representatives made it clear that the proposed revisions to, especially, the section on anadromous fish objectives would, in their view, represent a repudiation of the joint submission of the agencies and tribes, burden the agencies and tribes with substantial reporting obligations the purposes of which were unclear to them and without the promise of the needed financial and staff resources, separate anadromous fish into two categories for the purposes of objectives and reporting (hatchery and non-hatchery) that does not match agency and tribal research and management realities and was biased to hatchery risk.

The Council and agency and tribal representatives met on the morning of September 8 in a long consultation and working session at the Council central offices in Portland. The Council members listened to the concerns of the agencies and tribes, responded with their own concerns especially about the need for significant program objectives and oversight to ensure that progress on the mutually agreed-to goals of mitigation, hatchery effectiveness, and wild fish protection and rebuilding are taking place – what to many Council members seemed an appropriate role for the Council under the program. While the differences between Council and the fish and wildlife agencies and tribes included matters of substance, it became clear the remaining disconnect was more about whether and how new monitoring and reporting demands and burdens might be placed on the agencies and tribes, what information concerning hatcheries and wild fish protection made the most sense to collect and who was to decide, and how that information might be used and by whom to establish performance indicators and objectives. The Council members and agency and tribal representatives discussed further possible revisions to the various provisions that

could satisfy both perspectives, especially with regard to the section on anadromous fish objectives. The agency and tribal representatives submitted the results of that conversation to the Council on September 10 as the consensus language of the fish and wildlife agencies and tribes on anadromous fish objectives.

As the Council completed its final work on the fish and wildlife program, it incorporated into the program with certain minimal edits the results of this evolving consultation with the agencies and tribes that manage anadromous fish – a consultation process that also sparked a significant level of consensus agreement among these managers – on the propagation and wild fish strategies and the anadromous fish objectives. The resulting strategy on the use of “fish propagation including hatchery programs” combined the continued recognition of and support for the use of hatcheries in a myriad of ways to help meet the mitigation goals of the Northwest Power Act with a requirement for consideration and implementation on a case-by-case basis of the best possible practices for hatchery effectiveness and for protection for rebuilding of wild and naturally spawning fish populations. This section also included an extensive set of measures for comprehensive research, monitoring, assessment and reporting on hatchery effectiveness, contributions to mitigation and recovery, and protection of natural-origin fish. The new wild fish strategy is of particular importance on this record simply for recognizing explicitly that native wild fish and the ecosystems they rely on must be protected and enhanced as an important and genetically diverse biological resource for the basin, especially given that protecting and enhancing ecosystem functions and fish and wildlife habitat is a core strategy in the program. The final provisions in the program regarding quantitative objectives for anadromous fish began by recognizing that information on and objectives for healthy and harvestable populations already exist to a great extent. The Council will work with the state and federal agencies and tribes to review and report on those existing quantitative objectives by the end of 2015. The Council will then define a method for tracking the region’s progress on enhancing salmon and steelhead population status in the context of the quantitative objectives defined in the final report, with reliance by the Council on the agencies and tribes to identify “best source” locations of population status information. The Council will also work with the agencies and tribes to identify specific indicators for hatchery programs that could be tracked and reported on to inform progress on meeting program objectives. This includes possibly tracking adult contributions to hatchery spawning; natural spawning and harvest; in-hatchery survival (egg to smolt); juvenile production/releases; hatchery smolt-to-adult returns and hatchery recruits per spawner. The Council also included reporting requirements for Bonneville related to the monitoring of propagation projects consistent with the program’s goals and objectives, and called on Bonneville to provide sufficient support to the managers of these programs so they have the capacity to collect the data and support for regional efforts to standardize the data, facilitate reporting, and make the information publicly available. See 2014 F&W Program

(<http://www.nwcouncil.org/media/7148624/2014-12.pdf>), at 22-24 (program challenges with regard to habitat and hatcheries and anadromous fish objectives), 31-33 (refining program goals and quantitative objectives, including objectives for adult salmon and steelhead); 38-41 (ecosystem function strategy and habitat sub-strategy); 44-45 (“strongholds” areas strategy to designate and conserve stronghold habitats and populations of native, wild and natural-origin fish); 76-79 (strategy on fish propagation including hatchery programs); 80-81 (wild fish strategy); 102-03, 105, 180-81 (monitoring and reporting principles and measures).

The Council made its final program decisions on these portions of the program giving appropriate weight and deference to the recommendations, comments, expertise and management responsibilities of the state and federal fish and wildlife agencies and tribes. And it did so in consideration of the entire record on these matters, including the recommendations and comments and views of others such as the Native Fish Society and Wild Steelhead Coalition, Trout Unlimited, and Bonneville and its customers, and the host of scientific and policy analyses and reviews of artificial production that have occurred over the past 25 years (referenced in the program itself – see 2014 F&W Program, at 76 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>; <http://www.nwcouncil.org/fw/program/2014-12/hatchery-reviews>)). The Council obviously did not adopt each of the recommendations of the Native Fish Society and Wild Steelhead Coalition, nor each recommendation on artificial production from the ISAB’s review of the 2009 program that had been recommended to the Council. To the extent the Council did not, it is because the Council decided to give greater weight to the consensus views of the fish and wildlife agencies and tribes that developed over the amendment process as to the best way to resolve these issues. But the Council did so only after it was satisfied that the provisions developed for the program incorporated significant measures intended to help improve hatchery effectiveness and assess, conserve and protect native wild and naturally spawning fish. Perhaps the best indication of this is the fact that the Washington Department of Fish and Wildlife, the agency expressing the most concern with production policy and recommending to the Council both the HSRG and ISAB principles, also fully supported the eventual program measures jointly developed by the agencies and tribes and then further revised and incorporated into the program through the consultation process with the Council.

(14) Anadromous fish mitigation in blocked areas, including anadromous fish reintroduction and passage

The Council's fish and wildlife program has always had a policy and provisions for mitigation in areas where dams have blocked anadromous fish from historic habitat. This portion of the program and policy has been called "Resident Fish Substitution," representing the concept that mitigation for anadromous fish losses in these areas would take place through (or largely through) enhancement of resident fish populations. See, e.g., 2009 Fish and Wildlife Program, at 23-24. This has been true even though since 2000 one of the general measures in this portion of the program has been to "[i]nvestigate reintroduction of anadromous fish into blocked areas." *Id.*, at 24. Program measures implemented in the blocked areas so far have largely involved mitigation for anadromous losses through resident fish enhancement measures of various types.

In the program amendment process this time, the Council received extensive recommendations addressing both concepts: (1) recommendations calling on the Council to strengthen or increase the program's efforts at mitigation in the blocked areas through an array of mitigation strategies, including resident fish enhancement measures, including (2) a significant set of recommendations to advance the concept of investigating reintroduction of anadromous fish into a more detailed, higher priority and implemented element of the mitigation efforts in these areas. The recommendations and comments especially focused on the idea of reintroduction of anadromous fish into the upper Columbia mainstem above the combined blockage of the Grand Coulee and Chief Joseph dams.

A significant number of the basin's Indian tribes and state fish and wildlife agencies recommended more specific, detailed and strengthened program measures for mitigation in blocked areas. Measures, objectives, and principles recommended by some or all included:

- revising the name of the policy and/or the introductory language to make clear the underlying principle is mitigation for anadromous fish losses, in part through resident fish substitution;
- explicit recognition that the loss of anadromous fish in blocked areas has not been and is not being adequately mitigated through program actions so far;
- emphasizing three objectives for mitigation in the blocked areas (investigate and take action to reintroduce anadromous fish in blocked areas where feasible; restore and increase abundance of native resident fish when appropriate conditions exist; and develop and administer opportunities for consumptive and non-consumptive resident fisheries);
- Bonneville is to provide adequate funding for projects such that these objectives are achieved
- Council is to work closely with the fish and wildlife agencies and tribes to clarify the program's goals and objectives and the methodology for

addressing anadromous fish losses through resident fish substitution, in order to evaluate the implementation and effectiveness of this portion of the program

- measures for investigation and implementation of passage and reintroduction of anadromous fish above dams that block passage, either recommended generally for all blocked areas, or specifically targeted at certain dams (e.g., a detailed, phased approach at Grand Coulee and Chief Joseph dams in the upper Columbia mainstem; the Willamette River headwaters projects; the Hells Canyon Complex); or both

The most extensive set of recommendations for strengthening the blocked area mitigation program came from the Spokane Tribe, Coeur d'Alene Tribe, and Upper Columbia United Tribes. A relatively coordinated set of recommendations similar to if less extensive than what came from these upriver tribes came from the Upper Snake River Tribes, Nez Perce Tribe, Burns Paiute Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, Cowlitz Tribe, Washington Department of Fish and Wildlife, Washington State Governors Salmon Recovery Office, and Oregon Department of Fish and Wildlife.

Additional recommendations particularly focusing on the specific element of anadromous fish reintroduction came from the Columbia Inter-Tribal Fish Commission, Yakama Nation, U.S. Fish and Wildlife Service, and Kalispel Tribe (focused on bull trout passage at Albeni Falls, not anadromous fish). Reintroduction and passage recommendations also found strong support from American Rivers and other conservation groups and from dozens of individuals.

Related to these recommendations were a set of recommendations from a number of the agencies and tribes calling on the Council to maintain and assure implementation of the allocation of 15% of the Bonneville fish and wildlife budget to "resident fish" mitigation (part of the fish and wildlife program since 1994), at least a significant portion of which is in essence a geographic allocation to the blocked areas for their suite of mitigation measures. The Spokane Tribe, the Coeur d'Alene Tribe, and the Upper Columbia United Tribes recommended that adequate funding for blocked area mitigation become a much higher priority for the program and Bonneville, and include sufficient funding for native fish enhancement, anadromous fish reintroduction, and fisheries and harvest opportunities as program priorities. They also recommended that the entire amount allocated to "resident fish" be used to fund mitigation in the habitats above the blocked areas until harvest opportunities in the blocked areas are commensurate with combined anadromous fish and resident fish harvest opportunities in non-blocked areas, and that the program allocate not 15% but at least 45% of program funding for the geographic area above Chief Joseph and Grand Coulee dams, based on argument that this is an area in which 40% of documented losses have occurred and nearly 50% of the federal system's electricity is produced.

In written comments on the recommendations and then written and oral comments on draft program provisions, the tribes and fish and wildlife agencies reiterated their support for the blocked area mitigation and reintroduction recommendations. With regard to the reintroduction of anadromous fish into blocked areas, so too did a number of the conservation groups, individually (such as the Deschutes River Conservancy, with experience at passage and reintroduction at Pelton/Round Butte) and in joint comments (e.g., a comment submitted by American Rivers and signed by 15 environmental and fishing organizations, many of them coalitions of dozens more). Many individual commenters added their support for reintroduction, as did a resolution from the Spokane City Council.

NOAA Fisheries and the Upper Columbia Salmon Recovery Board took no particular position on whether the program should include the reintroduction provisions recommended by the other agencies and tribes. But they did emphasize that reintroduction actions must be guided by science and careful investigations aimed at better understanding the feasibility and benefits of passage and the role that reintroduced species will play basinwide in terms of effects on the efforts to recover listed species, on harvest, and system operations, and on other protection and mitigation measures.

Bonneville, the Bureau of Reclamation (the agency responsible for operating Grand Coulee Dam), a number of the Bonneville customers and customer groups and other utilities, and a few other entities expressed caution and serious concerns with or outright opposition to additional provisions on reintroduction in the program. Bonneville, the Bureau of Reclamation, and nearly all of the utilities, utility groups and others who commented on this topic (e.g., Public Power Council, PNGC Power, Northwest Requirements Utilities, Northwest RiverPartners, Seattle City Light, Flathead Electric Cooperative, Western Montana Generating and Transmission Cooperative, Fall River Electric Cooperative, City of Cheney, Washington, Northwest U.S. House Republicans) emphasized the fact that reintroduction of anadromous fish above Grand Coulee inherently raises the issue of reintroduction into a foreign nation (Canada) *and* that the issue of reintroduction and passage at Chief Joseph and Grand Coulee dams had been the subject of recent policy recommendations from federal agency, state, and tribal representatives to the State Department out of the U.S. Columbia River Treaty Review – the Treaty Review recommendations called for the United States to explore with Canada a joint effort at reintroduction of fish to Canadian spawning grounds, with the work and costs shared. In the view of these commenters, reintroduction into the upper Columbia above Grand Coulee is an international issue that should be dealt with by the federal government in diplomatic discussions with Canada and that it was wrong and premature of the Council to become involved through the fish and wildlife program. The comments submitted under American Rivers' name on behalf of more than a dozen conservation groups also noted that the issue of passage into the blocked areas overlaps with the recommendations out of the Columbia River Treaty review, but emphasized an opposite conclusion from that fact: They celebrated the policy recommendation to

pursue seriously the issue of reintroduction and passage, and urged the Council to do the same – that is, to join in and work with the Treaty processes and participants to make passage and reintroduction a reality.

A number of the utilities and utility groups (e.g., Mason County PUD #1, Mason County PUD #3, Washington PUD Association, Grand Coulee Project Hydroelectric Authority, Power and Light, Northwest RiverPartners, Northwest Requirements Utilities) also commented that provisions calling for the reintroduction of anadromous fish exceeded the authority and responsibility of the Council and Bonneville under the Northwest Power Act and would require Congressional authorization. These comments were echoed by representatives of the City of Cheney, Washington, and a collection of Republican members of the U.S. House of Representatives from the region. The Bureau of Reclamation added that “[a]ll congressionally mandated fishery mitigation activities for Chief Joseph and Grand Coulee Dams are already being implemented by the federal Action Agencies making additional mitigation activities discretionary and potentially subject to additional congressional authorization and/or appropriations.”

Bonneville emphasized that decisions and implementation efforts at upper Columbia reintroduction and passage at Grand Coulee should be understood to be a responsibility of either the agencies that manage Chief Joseph and Grand Coulee dams (the Corps of Engineers and Bureau of Reclamation) or the nation as a whole – and of both nations sharing this border – and certainly not a financial responsibility that Bonneville and its ratepayers should be expected to bear. This was especially so, Bonneville commented, because the fish and wildlife program and ratepayers were already heavily invested in efforts to remove barriers throughout the basin and to enhance and reintroduce important species of fish in areas where populations had been seriously degraded or extirpated. A number of the utilities and utility groups echoed that it is not appropriate to expect funding to come from Bonneville for this work, and also that that the costs would be impractical and expensive and far outweigh the biological benefits. (e.g., Northwest RiverPartners, PNGC Power, Mason County PUD #1, Mason County PUD #3, Washington PUD Association, Grand Coulee Project Hydroelectric Authority, Power and Light, Idaho Irrigation Pumpers Association, Bureau of Reclamation). Chelan PUD and Northwest RiverPartners commented that passage efforts at other dams in the region should be assessed first before any further investments are made, especially major investments at Grand Coulee Dam passage and upper Columbia reintroduction.

The Spokane Tribe, the Upper Columbia United Tribes, the Columbia River Inter-Tribal Fish Commission, the conservation group coalition, and others responded to counter the comments of the Bonneville customers, Bonneville, Reclamation and others with regard to issues of authority and responsibility. In their view, the recommendations at issue – including those calling for an investigation into reintroduction – were squarely within the authority of the Council under the Northwest Power Act to include in the program as measures to protect, mitigate

and enhance fish affected by the development and operation of the hydrosystem. They also commented that Bonneville and the other federal action agencies had authority to implement these provisions; that the system's ratepayers should bear a significant responsibility for the costs of these measures, given they had benefitted from the power produced from the dams blocking passage; and that Congressional approval or authorization was not needed before the investigation could begin.

On this record, and in particular respecting and giving appropriate weight to the essentially consensus recommendations and views of the fish and wildlife agencies and tribes, the Council adopted a section of the program on "anadromous fish mitigation in blocked areas" that represented a significant revision of what had been the resident fish substitution provisions in previous programs. 2014 Fish and Wildlife Program, at 83-86 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). This strategy emphasizes the importance of mitigation for the huge loss of capacity for salmon and steelhead in upper Columbia and other blocked areas. Flexibility in approach is important, and all mitigation tools should be used in this effort, in appropriate and prudent fashion, including habitat improvements, resident fish enhancements, anadromous fish reintroduction efforts, harvest opportunities, wildlife enhancements, and hatcheries. The Council calls on Bonneville and the other federal action agencies, in collaboration with the state fish and wildlife agencies and tribes, to provide sufficient funding and implementation for mitigation of anadromous fish losses in the blocked areas, "including strategies relying on habitat improvements, reintroductions, hatcheries, harvest opportunities, and other mitigation." *Id.*, at 84. And the Council identified blocked area mitigation actions, including investigation of reintroductions, as an emerging program priority for the investment strategy, accompanied by certain expectations for Bonneville funding, *Id.*, at 115-17. The Council maintained the program funding allocation of 70% for anadromous fish programs, 15% for resident fish, and 15% for wildlife, while also committing to "evaluate the distribution of funding to provide fair and adequate treatment across the program. *Id.*, at 115.

With regard to the specific issue of the reintroduction of anadromous fish, the Council included mitigation through passage investigations and reintroduction of anadromous fish as an equal element of the strategy and measures for mitigating the loss of anadromous fish in all blocked areas. *Id.*, at 83, 84 ("Restoration of anadromous fish to blocked areas should be investigated as mitigation for the impacts of hydropower dams that blocked historic passage of adult and juvenile fish. The abundance of native fish species should be restored throughout blocked areas where original habitat conditions exist.").

With regard to the blocked area in the upper Columbia above Grand Coulee and Chief Joseph dams in particular, the Council noted that a number of agencies and tribes recommended that "the region intensify its efforts to explore the possibilities

of reintroducing anadromous fish,” *Id.*, at 83, and then based on the recommendations, the Council adopted a set of provisions specifically focused on that area, *Id.*, at 84-85. Based on consideration of all the recommendations and comments, including the cautions and concerns, the Council adopted a careful, science-based phased approach to considering the issue of the reintroduction of anadromous fish above Grand Coulee dam. Phase 1 is to involve investigating habitat suitability and availability and survival potential above Grand Coulee; investigating the scientific feasibility and possible cost of upstream and downstream passage; the evaluation of information from passage studies at other blockages and past assessments at Grand Coulee and Chief Joseph; and broad discussions with others in the region on the purpose and scope of possible reintroduction and progress on the investigation into its feasibility. Only if the results of this first phase of investigation are promising will the Council, in collaboration with the other participants, recommend that effort proceed to the next phase.

The Council called on Bonneville and the other federal action agencies, in collaboration with the fish and wildlife agencies and tribes, to begin the Phase 1 investigation with regard to the possibility of reintroduction into the mainstem reaches and tributaries within the United States. Cognizant of the comments about the international, transboundary aspect of reintroduction, the Council added a provision mirroring the recommendations of the federal, state and tribal representatives in the U.S. Columbia River Treaty Review, calling for the United States to pursue a joint program with Canada, with shared costs, to investigate in a phased approach the possibility of reintroduction of anadromous fish on the mainstem Columbia to Canadian spawning grounds. *Id.*, at 85.

The Council also included a provision of support for implementing the anadromous fish passage measures already in the Willamette River biological opinion, as recommended and supported in comments by the Oregon Department of Fish and Wildlife, the Confederated Tribes of the Grand Ronde Community of Oregon, and others. *Id.*, at 86. The Council did not include specific reintroduction provisions relating to any of the federal and non-federal dam blockages, relying instead on the general measure included that reintroduction is to be considered as one of the possible mitigation options to be considered in all blocked areas. *Id.*, at 84.

Although largely following the recommendations of the fish and wildlife agencies and tribes with regard to blocked area mitigation and anadromous fish reintroduction, the Council appreciates and gave careful consideration to the comments and concerns of Bonneville, the Bureau of Reclamation, the Bonneville customers and others. Section 4(h) of the Northwest Power Act and the Council’s fish and wildlife program are premised on the idea of mitigation for the loss of anadromous and resident fish due to the development and operation of the federal and non-federal hydroelectric facilities, including of course Grand Coulee and Chief Joseph dams. There is no legal reason that the investigation and, if warranted, implementation of reintroduction and passage measures cannot be

considered one of the many tools in the program's mitigation, protection and enhancement toolbox, to be evaluated and used where appropriate to meet the mitigation obligations under the Act. Thus the Council concludes that provisions of this nature are appropriate and within the authority of the Council to include in the fish and wildlife program and the general authority of Bonneville and the other federal agencies to implement. Precisely how the provisions are to be implemented, funds made available, and responsibility decided upon and shared were not subjects for the amendment process but for follow-on implementation discussions and decisions. The Council agreed that it is important to proceed carefully, prudently, in a cautious step-wise, and science-based fashion in making decisions to invest program resources in what could be an expensive and difficult reintroduction and passage effort. Congressional authorization and appropriations are always welcome and encouraged, and may be necessary for certain elements and phases (such as major passage modifications to federal dams). On the other hand, the Council did not see any indication that it was legally necessary that Congress has to act before at least Bonneville and possibly other federal agencies can fund and begin the reintroduction and passage investigations in the first phase. At the same time, the Council agrees that responsibility for the complete investigation and implementation of passage and reintroduction at these major blockages is ultimately a major policy decision for the region and nation and a shared responsibility that should not fall just on Bonneville and the ratepayers.

Finally, the Council shaped its reintroduction provisions with full understanding of the parallel considerations that had taken place in the Columbia River Treaty review and the resulting recommendation to explore a joint effort with Canada on reintroduction into Canada. The Council does not see how this recommendation and the possibility of those international discussions bars inclusion of provisions on reintroduction in the basin's fish and wildlife mitigation program or the beginning of investigations on the domestic aspects of reintroduction. The Treaty review recommendations are policy recommendations, not a legal decision that changes anything about how under the Northwest Power Act the Council is to consider the recommendations of the fish and wildlife agencies and tribes and others and develop program measures in response. In sum, the Council is confident that a careful collaborative effort that involves the fish and wildlife agencies, tribes, Bonneville and the other federal actions agencies, the Bonneville customers and other affected utilities, and the broader public can allow for the implementation of these mitigation provisions in a lawful, cost effective, scientifically sound, and prudent fashion.

(15) Resident fish mitigation, assessments, settlement agreements and crediting

Issues relevant to mitigation for resident fish impacts are addressed in the explanations for other topics above and below, including mainstem water management, passage, non-native and invasive species, blocked area mitigation, species-specific recommendations, and climate change. The state fish and wildlife agencies and tribes also submitted a coordinated set of recommendations about the program's general approach to mitigation for resident fish losses. In part the recommendations simply called for existing measures in the program to be maintained and implemented, with continued Council and Bonneville support and prioritized funding to address a host of limiting factors affecting the survival and productivity of resident fish affected by the hydrosystem. Added to that were recommendations that Bonneville fund the agencies and tribes to develop a methodology for and complete resident fish loss assessments, proposing that a framework for this be in place in 2015. Coupled with that were recommendations to maintain, expand and implement program provisions allowing for the use of long-term funding and settlement agreements, crediting mechanisms, long-term operation and maintenance funding, and multi-year funding commitments for projects to address resident fish mitigation losses in particular areas. Recommendations also included expanded use and funding of mechanisms for perpetual land protection of habitat, including conservation easements, land purchases and other long-term measures.

Recommendations of this nature came from Montana Fish Wildlife and Parks, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Confederated Salish and Kootenai Tribes, Upper Snake River Tribes, Burns Paiute Tribe, Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, although not every agency or tribe submitted each facet of the coordinated recommendation. Most of these entities reiterated support for these recommendations in subsequent comments on the recommendations and draft program, with additional general support from the Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and the Columbia River Inter-Tribal Fish Commission. Bonneville recommended that the program continue support for the planning and review processes needed for Bonneville to be able to make final decisions on substantial resident fish mitigation projects, including resident fish artificial production facilities currently in the proposal or planning stages.

The Council adopted final program provisions consistent with the recommendations and supporting comments. This includes provisions recognizing clearly the importance of protection and mitigation for resident fish impacts and losses due to the construction and operation of the hydrosystem; the continuation of a diversified approach to mitigation for losses; and provisions relating to loss assessments, long-term settlement agreements, and the use of land acquisitions

in appropriate circumstances. 2014 Fish and Wildlife Program, at 87-89, 178-79 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

Two issues require further discussion. The Council did not specify precisely as recommended that Bonneville is simply to fund the agencies and tribes to complete resident fish loss assessments, with a target for the development of a unified approach in 2015. The Council recognizes the potential value of quantified losses in particular areas. They also may be difficult, expensive and resource intensive to undertake, so when and how an assessment occurs depends greatly on particular circumstances and priorities. On this basis, the Council called for the formation of a workgroup of agency, tribal and Bonneville representatives to:

“develop a standardized methodology for habitat loss assessments to assist areas that currently do not have the capacity to complete this assessment and do not have a mitigation settlement agreement, and to ensure a consistent level of accuracy across the basin. This task force shall consider past efforts and will report to the Council quarterly on its progress toward developing a methodology.” *Id.*, at 88.

This and the following provisions on settlement agreements makes it clear the Council would like to resolve this outstanding issue, but without dictating a particular approach to funding and completing resident fish loss assessments.

The second issue is that a number of the agencies and tribes (Montana Fish Wildlife and Parks, Washington Department of Fish and Wildlife, Confederated Salish and Kootenai Tribes, Upper Snake River Tribes, Burns Paiute Tribe, Cowlitz Tribe, Confederated Tribes of the Warm Springs Reservation of Oregon, Columbia River Inter-Tribal Fish Commission) commented on the draft program that the Council ought to specify that where property acquisitions are being used to mitigate for loss of important resident fish habitat, mitigation should be in a 2:1 ratio of habitat acquired to habitat lost. The commenters proposed this as a parallel to the provision in the wildlife portion of the program in which the Council calls for mitigation of remaining lost habitat units on a 2:1 basis. The wildlife provision has a long history particular to the circumstances of the program’s efforts at implementation of mitigation for wildlife losses (nearly all of it by land acquisitions), and it is bound up in the concept of assessing and then mitigating for lost “habitat units.” The program recognizes a number of methods or tools for the protection and mitigation of resident fish impacts, of which property acquisitions to replace lost habitat are but one. And whether the same approach to crediting is automatically appropriate for those limited circumstances in which property acquisitions are one element of the approach to resident fish mitigation is not known at this time. It may be that crediting of replacement habitat at something greater than 1:1 in acreage may be appropriate, but that is still to be determined, and it may not be determined as a general rule. For this reason, the Council specified only that when property acquisitions are an appropriate tool to

replace lost habitat that has been quantified, crediting should occur “at a *minimum* ratio of 1:1.”*Id.*, at 87, 88, 178.

(16) Specific species other than salmon and steelhead, especially sturgeon, lamprey and eulachon

The Council received a coordinated set of recommendations from the fish and wildlife agencies and tribes calling for an expansion of the program's protection and mitigation measures addressing white and green sturgeon and Pacific lamprey, and for the Council to set these apart from the program's general provisions on habitat and production perceived as too oriented toward salmon and steelhead. The Council also received another relatively coordinated set of recommendations seeking to add measures to the program for the protection and mitigation of eulachon, newly listed under the Endangered Species Act. Recommendations of this nature came from the Oregon Department of Fish and Wildlife (sturgeon, lamprey, eulachon); Washington Department of Fish and Wildlife (sturgeon, lamprey, eulachon); Montana Fish Wildlife and Parks (sturgeon); Lower Columbia Fish Recovery Board (sturgeon, eulachon); Kootenai Tribe of Idaho (Kootenai River white sturgeon); Confederated Tribes of the Umatilla Indian Reservation (lamprey); Yakama Nation (lamprey); Columbia River Inter-Tribal Fish Commission (sturgeon, lamprey, eulachon); Colville Confederated Tribes (sturgeon); Spokane Tribe (sturgeon); Confederated Tribes of the Grand Ronde Community of Oregon (sturgeon, lamprey, eulachon); Cowlitz Tribe (sturgeon, lamprey, eulachon); NOAA Fisheries (lamprey, eulachon); and US Fish and Wildlife Service (lamprey, sturgeon). Many of the same entities commented to the same effect in subsequent stages of the amendment process, including comments in support of provisions in the draft fish and wildlife program while seeking further refinements in the language.

Measures recommended relative to sturgeon, lamprey and eulachon included habitat improvements; dam operations and passage improvements; review of water management and flow measures; water quality considerations; hatchery considerations; monitoring of populations and habitat conditions; research into population conditions, habitat needs and potential, and how hydrosystem development and operation has affected survival, growth and migration. The recommendations were based to a large degree in developments that occurred in the years immediately preceding the amendment process, during planning and project review processes. This included the development of the 2013 White Sturgeon Planning Framework; the Kootenai white sturgeon and Libby Dam biological opinions and the Kootenai Tribe's integrated habitat, ecosystem and aquaculture plans; the Tribal Pacific Lamprey Restoration Plan, Conservation Agreement for Pacific Lamprey, and the comprehensive review and synthesis of Pacific lamprey work in the project review process; and the listing decision and other ESA assessment work with regard to eulachon.

While not going into the details here, the Council adopted expanded program measures for lamprey and sturgeon, and a new program section specifically for eulachon, based on the recommendations and comments and all in sub-strategies of their own. 2014 Fish and Wildlife Program, at 90-98

<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The Council also called out the implementation of “additional sturgeon and lamprey measures (passage and research)” as one of the emerging program priorities in the investment strategy. *Id.*, at 116. The Council also included a provision stating the Council will work with the fish and wildlife agencies and tribes to survey and organize what quantitative objectives exist already for white sturgeon, lamprey, and eulachon (and various species of trout), assess whether it might make sense to adopt or revise or expand program objectives and goals for these species, and conduct an amendment process to that end if warranted. *Id.*, at 34.

There was little comment or controversy in the amendment process about whether all these actions were good things to do for these species. Bonneville and Northwest RiverPartners did express concerns about whether it made sense to expand the program and its investments in these and other emerging areas at the risk of diluting available resources and the program’s core set of work to date. With regard to lamprey, Bonneville commented that lamprey actions consistent with the program are already being funded by Bonneville, the Corps of Engineers and Reclamation, largely through the Columbia Basin Fish Accords through 2018, a linkage that should be expressly noted. Bonneville questioned the need in that light for further expanded lamprey provisions, and also commented that a principle in the draft program noting that “[l]amprey throughout their historic range should be self-sustaining and harvestable” is broader than mitigation for hydrosystem effects, given that lamprey are affected by the altered state of the environment in the basin resulting from many actions, not just hydropower development and operation.

The Council recognized in other sections of the program that the actions in the Accords are measures in the Council’s program, and this includes the lamprey measures. *Id.*, at 61-62, 94-96, 110-11, 191-98. The principle that lamprey should be self-sustaining and harvestable throughout their historic range seems no different than the vision and goals in the program for all key species in the basin adversely affected by the hydrosystem. Although not caveated expressly in the lamprey section itself, the program makes clear elsewhere that protection and mitigation to address effects and compensate for the losses resulting from the development and operation of the hydrosystem remains the legal touchstone for measures in the program and actions implemented under the program. The development and operation of the hydropower system is only one factor in the loss of fish and wildlife (including lamprey) in the Columbia River Basin, albeit a major factor. Improving conditions for fish and wildlife in the Columbia Basin and providing funding is a responsibility that the Council, its program and Bonneville shares with citizens, private entities, and government agencies throughout the region. E.g., *Id.*, at 14-15. The Council concluded that the program measures regarding lamprey – and implementation of the program measures for lamprey to date – have not gone outside those boundaries.

Bonneville and others also expressed particular concern with whether the hydrosystem (and thus Bonneville and the ratepayers) bore much if any responsibility for the degraded population status of eulachon. Given these comments, the geographic location of eulachon when in the river system, and how early the agencies and tribes are in even understanding the problems with eulachon and how to address those threats, the eulachon measures the Council approved are limited to assessing how eulachon and its habitat in the lower river have been affected by the development and operation of the hydrosystem and then identifying what measures might be available to address those impacts, with the help of a science/policy forum organized by the Council in collaboration with the federal action agencies and the fish and wildlife agencies and tribes. And as noted above (in #9), Northwest RiverPartners and other Bonneville customer groups also expressed concern about whether any of the measures calling for consideration of how current mainstem dam operations and flows affect these and other species and whether other flow and passage measures might be inconsistent with or put at risk implementation of the FCRPS biological opinion actions in the mainstem required under the Endangered Species Act. The Council responded to those comments above, in #9.

The Council also received recommendations from a few of the agencies and tribes for program measures and program emphasis for other species, including bull trout, freshwater mussels, and burbot. See recommendations of US Fish and Wildlife Service (bull trout, burbot); Oregon Department of Fish and Wildlife (bull trout); Kalispel Tribe (bull trout passage at Albeni Falls); Columbia River Inter-Tribal Fish Commission (mussels); Confederated Tribes of the Umatilla Indian Reservation (freshwater mussels); Spokane Tribe (mussels); Kootenai Tribe of Idaho (burbot).

With regard to bull trout, the final program recognizes the importance of mitigation for bull trout losses and the need to collect, assess and possibly improve the quantitative objectives and goals in the region for bull trout mitigation, protection and recovery. 2014 Fish and Wildlife Program, at 29, 34, 87 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). Most of the recommendations and comments with regard to bull trout were to make sure the species' needs are considered and addressed in mainstem system operations, flow measures, and dam passage. The mainstem water management and passage strategy recognizes bull trout as one of the key species to benefit from these measures. The program recognized the actions in the FCRPS biological opinions for bull trout, salmon and steelhead, and Libby Dam are the baseline or starting measures for the mainstem operations, and that includes reservoir operations intended to be of benefit to bull trout. The program also recognizes the continuing need to assess whether mainstem operations are optimum for important species other than salmon and steelhead, including resident fish generally with bull trout as one of the key native species in particular. This includes flow measures, reservoir operations, passage facilities at run of the river

projects, and passage investigations at Albeni Falls. *Id.*, at 60-62, 63, 64. The program also generally recognizes in the basinwide provisions on resident fish mitigation the need for a broad array of mitigation and protection measures for bull trout in the mainstem and tributaries. *Id.*, at 87, 139. Specific strategies and objectives relating to bull trout in specific locations are in the subbasin plans, maintained in the 2014 program.

With regard to freshwater mussels, the recommendations were essentially to recognize the importance of freshwater mussels to ecosystem diversity and function, provide a framework to allow for assessment and improvement where appropriate, and ensure that the existing mussel projects are maintained and allowed to evolve. The program recognizes freshwater mussels as one of the key species to be addressed through the array of resident fish mitigation measures. *Id.*, at 87, 137. Specific strategies in subbasin and mainstem reach plans have been maintained. The Council's decision does not affect or hamper the specific projects underway. Specific measures recommended with regard to freshwater mussels are recognized as part of the program as with other recommended measures (see the discussion of measures at 110-12, 191 and at #19 below).

With regard to burbot, the program again recognizes the importance of burbot and burbot fisheries as part of resident fish mitigation and in particular as an important element of blocked area mitigation *Id.*, at 84, 87.

The resulting program provisions are not precisely as recommended. But the Council concluded that the program is substantively consistent with the recommendations and comments received on these topics.

(17) Willamette River subbasin issues

The Willamette River subbasin got particular attention in the recommendations. Recommendations from the Confederated Tribes of the Grand Ronde Community of Oregon, Oregon Department of Fish and Wildlife, NOAA Fisheries, and US Fish and Wildlife Service included:

- incorporating the actions and performance standards in the two biological opinions on the Corps of Engineers' Willamette River Basin projects, one from NOAA Fisheries (salmon and steelhead), one from the Fish and Wildlife Service (bull trout and Oregon chub) as program measures and objectives
- incorporating the detailed actions in the Upper Willamette Recovery Plan as program measures
- incorporating the ESA delisting goals and broader goals in the Upper Willamette Recovery Plan as program objectives
- program support for funding and implementation of actions in the NOAA Fisheries biological opinion, including the capital investments in passage facilities and other structural measures and long-term operation and maintenance funding for the passage facilities, collection facilities, hatcheries and other structures
- continued recognition in the program of population, habitat and production measures recommended for and included in the 2009 program (including measures for Pacific lamprey reintroduction; evaluating the effects of hydrosystem operations on lamprey spawning and rearing; evaluating the re-programming of anadromous fish production in Willamette westside tributaries; coordination funding; and reintroduction of anadromous fish in blocked areas)
- incorporate the Willamette River Basin Memorandum of Agreement Regarding Wildlife Protection and Enhancement into the wildlife section of the program

Bonneville recommended the last measure. In subsequent comments, Bonneville noted that numerous plans cover the mitigation work in the Willamette subbasin, including the Wildlife Memorandum of Agreement. If the recommendations seek *additional* funding for habitat acquisitions or operations and maintenance funding for habitat acquisitions, those recommendations would be inconsistent with the Agreement. Bonneville also commented that past program measures provided the underpinning for the project operations and other measures in the biological opinions, which now represent the federal hydrosystem's full implementation of the Northwest Power Act's protection and mitigation requirements in the Willamette subbasin as well as ESA compliance.

The final program provisions included the following with regard to the Willamette subbasin recommendations: The Council recognized the actions and performance standards in the two Willamette biological opinions as part of the program's

baseline measures and objectives for hydrosystem operations to benefit fish. 2014 Fish and Wildlife Program, at 60-62, 62 fn.5 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>) (see #9 above). The program's investment strategy urges the action agencies to meet their obligation to implement the Willamette biological opinion, including not to let actions go unfunded because of competing priorities between the Columbia and the Willamette, *Id.*, at 115, and to support and implement anadromous fish passage measures consistent with the biological opinion, *Id.*, at 86 (see #14 above). The program also recognizes the Willamette biological opinions, the Upper Willamette Recovery Plan, and the recommended measures from the agencies and tribes all as sources of program measures for possible implementation in the Willamette subbasin, subject to all the conditions regarding implementation of measures noted in the program and consistency with the Willamette subbasin plan. *Id.*, at 110-13, 191, and at 108-09, <http://www.nwcouncil.org/fw/subbasinplanning/willamette/plan> (Willamette subbasin plan). Finally, the Council continued to recognize that settlement agreements are an appropriate vehicle for mitigation to address wildlife losses, *Id.*, at 72-74, with specific recognition of the agreement reached in the Willamette, *Id.*, at 148.

The Council did not directly recognize the ESA-delisting and broader goals in the Upper Willamette Recovery Plan, as recommended by the Oregon Department of Fish and Wildlife and the Confederated Tribes of the Grand Ronde Community of Oregon. As discussed above (see #13), what to do about the program's quantitative objectives for anadromous fish was a source of controversy during the amendment process, for the basin as a whole and not just the Willamette subbasin. Working with a collective group of fish and wildlife agencies and tribes, the Council agreed to final provisions for collecting, organizing and reporting on existing quantitative objectives for anadromous fish (one source of which will be the Upper Willamette Recovery Plan) and then for resident fish. At that point the Council will consult with the agencies and tribes (and others) on whether and how to incorporate additional quantitative objectives in the program in the future. *Id.*, at 33-34. The Council concludes its final program measures are an effective resolution of this matter, and one that is more reflective of the views, recommendations and comments of the fish and wildlife agencies and tribes as shaped through the amendment process consultation process, than the original recommendation regarding goals for the Willamette specifically.

With regard to Bonneville's comments, the Council is comfortable at this time with program implementation in the Willamette subbasin based on the biological opinion measures to benefit fish and the Willamette wildlife agreement. The Council is not deciding at this time, however, whether the biological opinion measures also "fully implement" the protection and mitigation responsibilities under the Northwest Power Act in the Willamette subbasin, as Bonneville commented. The program contains strategies and measures for the Willamette subbasin that are recommended by the state fish and wildlife agencies and tribes

for the protection, mitigation and enhancement of fish species, measures that are not necessarily in the biological opinions. It is also entirely possible that the mitigation goals and objectives under the program may transcend the actions needed to fulfill the goals and objectives of the biological opinions. Those questions are not and need not be settled in this amendment process.

(18) Adaptive management, including monitoring, evaluation, research, reporting, and data management

The Council received a substantial set of recommendations with regard to the monitoring, evaluation, research, data management and reporting elements of the program. Most came from the state and federal fish and wildlife agencies, tribes, tribal groups, and other state and federal resource agencies, some extensive, some focused on a small set of specific issues. Recommendations include those from NOAA Fisheries, US Fish and Wildlife Service, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Idaho Department of Fish and Game, Montana Fish Wildlife and Parks, Columbia River Inter-Tribal Fish Commission, Nez Perce Tribe, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Kootenai Tribe of Idaho, Spokane Tribe, Coeur d'Alene Tribe, Upper Columbia United Tribes, Confederated Salish and Kootenai Tribes, Burns Paiute Tribe, Upper Snake River Tribes, Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, US Geological Survey, US Environmental Protection Agency, Pacific Fishery Management Council, Washington State Governor's Salmon Recovery Office, Upper Columbia Salmon Recovery Board, Lower Columbia Fish Recovery Board, Yakama Basin Fish and Wildlife Recovery Board, and StreamNet. Bonneville was another source of recommendations, as were the Bonneville customer groups – Northwest RiverPartners, Public Power Council, PNGC Power, and Northwest Requirements Utilities. And conservation, fishing and environmental groups and others also provided recommendations relating to monitoring, evaluation, research and related matters, including the Native Fish Society, Wild Steelhead Coalition, Save Our Wild Salmon coalition, American Rivers, Trout Unlimited, Northwest Sportfishing Industry Association, Association of Northwest Steelheaders, Northwest Habitat Institute, and Snake River Salmon Solutions. A number of the fish and wildlife agencies and tribes and conservation groups also recommended the Council follow the recommendations on these topics from the Independent Scientific Advisory Board – from the ISAB's review of the 2009 Fish and Wildlife Program and other ISAB review reports.

Many of the recommendations called for research, assessments, studies, evaluations and monitoring linked to specific substantive topics of interest. These have been addressed in other topics above and below, including non-native and invasive species (#4); predator management (#5); toxic contaminants (#7); climate change (#8); mainstem water management and passage (#9), including the proposed experiment at increasing spill for juvenile fish passage (#10); estuary, plume and ocean considerations (#11); wildlife mitigation (#12); anadromous fish propagation, hatcheries and wild fish (#13); anadromous fish reintroductions above blockages (#14); resident fish assessments and mitigation (#15); research, assessments and monitoring for specific species such as lamprey, sturgeon, eulachon and freshwater mussels (#16); and assessments of the effects of renewable energy development on wildlife and fish (#21).

Another set of recommendations related to the goals and biological objectives for the program. This is a topic addressed above in the discussions of program goals and objectives (#2) and fish propagation and wild fish strategies (#13), the latter regarding the specific issue of quantitative objectives for naturally spawning and artificially produced adult salmon and steelhead, and associated monitoring and reporting.

The focus here is on the program elements and recommendations regarding monitoring, evaluation, research, data management, reporting, and indicators more generally. As noted in the discussion of program goals and objectives (#2 above), the Council asked an ad hoc committee of its members to organize and consider the recommendations on the research, monitoring, and evaluation elements of the program and on the goals and biological objectives. The Council relied on the work of this committee and its Fish and Wildlife Committee in shaping the draft program provisions. The Council also considered the comments received on the draft program provisions before settling on the final provisions.

What became an important aspect of this review involved a coordinated set of recommendations from a number of the state fish and wildlife agencies and tribes to emphasize adaptive management as the principle or purpose for linking together the different elements of the program framework. This included an emphasis on how information and insights from monitoring, evaluation and research should be managed and reported and then used to inform and improve decisions on substantive habitat and production measures. Many who were not part of the coordinated recommendation similarly recommended that the Council reorganize and restructure these program elements to link in a better way the program's biological objectives, monitoring and evaluation, research, data management, reports and indicators. The purpose would be to better inform the region about program progress, and describe more clearly how the results will be used to improve decisionmaking.

Based on these recommendations and related recommendations, comments and considerations, the Council integrated an adaptive management strategy into the program framework (see also the discussion of the program framework above, at #1). As part of this effort the Council reorganized and revised the monitoring, evaluation, research and related elements of the program into an overarching and explicitly titled Adaptive Management strategy. The purpose is to guide how the work done under the program to research key questions and monitor and evaluate progress is reported effectively to the region and feeds back into decisions to refine the program's substantive objectives and measures. The Adaptive Management strategy includes principles and general measures with regard to monitoring, effectiveness, research, data management, reporting, evaluation, and the use of a risk-uncertainty matrix. 2014 Fish and Wildlife Program, at 10-11, 101-07 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). Council high-level indicators are further discussed in an appendix, *Id.*, at 162, and a list and description of reporting requirements and reports in is another appendix, *Id.*, at

180-82. The program's scientific foundation and principles and the provisions on goals and biological objectives are also part of the program's adaptive management approach. *Id.*, at 27-36, 153-61 (see #1 and #2 above).

Within this framework, the Council received dozens and dozens of recommendations from the entities noted above with regard to specific elements and features. Recommendation topics included, among many others:

- priorities for monitoring
- standardization (or not) of monitoring and data management
- monitoring methods
- incorporating monitoring guidance from other sources
- evaluate existing and new methods for monitoring fish population performance
- continue monitoring and evaluation of fish populations status and trends
- update information on population status and trends
- monitor, assess and report on natural-origin and hatchery salmon steelhead and on their interaction
- monitor and evaluate juvenile anadromous fish carrying capacity
- expand monitoring for different species of anadromous and resident fish
- ecosystem and habitat monitoring, status and trends, effectiveness and indicators
- hatchery monitoring, effectiveness and indicators
- continue and expand monitoring and evaluation of hydrosystem survival
- develop and implement ways to monitor and evaluate food webs
- monitor sediment transport
- monitor large woody debris recruitment
- contaminant monitoring
- monitoring of estuary restoration
- wildlife response monitoring and indicators
- harvest monitoring
- innovative tools and methods for research
- research on uncertainties with regard to habitat effectiveness, fish population status, artificial production, hydrosystem survival, and harvest
- assessing levels of uncertainty and the evidence needed to resolve uncertainties
- assessing the relevance of and prioritizing all research, and ceasing the less relevant research projects
- revising the program's research plan
- develop and evaluate models for effectiveness evaluations
- develop and assess methods for evaluating effectiveness of habitat restoration and population response, hatchery performance, and anadromous fish migration and survival through the hydrosystem
- develop and employ methods for life-cycle evaluation and life-cycle effectiveness
- continue to fund Coordinated Assessments

- expand Coordinated Assessments to cover other fish species
- continue to develop, evaluate and adapt high level indicators
- expand indicators for other fish and wildlife species, including non-salmonid anadromous fish
- incorporate guidance on data management from other programs
- coordinate data management
- develop or connect to networks for data sharing
- evaluate viability of long-term data sets
- evaluate minimum sets of data needed for specific issues
- fund database maintenance and updates
- support data management for indicators
- develop new databases and indicators for hatcheries, fish and wildlife genetic data, lamprey, sturgeon
- refine priorities for data management
- data sharing agreements
- recommended reports and reporting requirements
- support for funding of reporting efforts
- develop information and report on the economic benefits of fishing
- inventory, organize and regularly report project information
- use of science-policy workshops and forums
- increase public education and citizen participation
- support for adequate and sustained funding for monitoring, data management and related functions
- scrutinize and reduce the costs of program monitoring and evaluation, including through more rigorous efforts to prioritize and streamline program monitoring and evaluation
- increase efficiency and effectiveness of program monitoring and evaluation
- clearly define and estimate the costs of current research, monitoring and evaluation efforts, and work to reduce costs

With regard to the latter points, the Bonneville customer groups in particular recommended that while the Council should work to ensure a robust and efficient research, monitoring and evaluation portion of the program, the Council should also work to reduce the overall costs of this portion of the program. Prioritizing the most effective and relevant monitoring, evaluation and research, and ceasing the less relevant, is critical.

Specifics of these recommendations and the program response are not detailed here. Information on each topic can be found in the administrative record. The Council certainly did incorporate the specifics of every recommendation in the final program. In essence, the recommendations all called for more specificity and measures in the program – more monitoring and evaluation and funding, expanded monitoring of species and their habitat, more methods to evaluate program effectiveness, more data gathering and more coordinated data sharing and management, more prioritizing and streamlining in order to reduce costs of

research, monitoring and evaluation, and so forth. Through the assistance of especially the agencies and tribes and Bonneville, and the other participants as well, the Council shaped the adaptive management section (*Id.*, at 101-07) to provide sufficient guidance and principles for monitoring, program effectiveness, research, data management and reporting. This section incorporates the substance of the program recommendations and comments and should help to ensure program accountability and cost-effectiveness while maintaining the flexibility to incorporate new information and changes in methods and scientific understanding. The Council concluded that it revised the adaptive management provisions of the program in a way consistent with the key themes in the recommendations and comments.

(19) Subbasin plans

After an intensive and expensive planning process that ran from 2002-05, the result was the inclusion of nearly 60 subbasin management plans as part of the program, including plans for the estuary and mainstem reaches as well as many dozens of tributaries. The subbasin plans are the home for the program's specific objectives and habitat and production measures (except for the specific water management and passage objectives and measures for the Columbia and Snake rivers). In the 2009 Fish and Wildlife Program, the Council continued to recognize the subbasin plans as part of the program. The Council also included in the program hundreds of quite specific measures for implementation recommended by agencies, tribes and others, presumably consistent with the strategies of the subbasin plans and subject to implementation under certain conditions. 2009 Fish and Wildlife Program, at 28-30, 58-61, 91-95 (http://www.nwcouncil.org/media/115273/2009_09.pdf).

One of the issues going into this amendment process was whether, when and how to update, revise and replace the subbasin plans, as they grow older and possibly stale. One thing that became clear in the recommendations and comments is that no one had much interest in another full-blown subbasin planning process or any distinct planning process to update or revise the subbasin plans. This is in part because a significant amount of additional planning has taken place in the basin in the last decade, just in other forums or for other purposes, including recovery plans developed under the ESA, other plans specific to certain species such as lamprey, sturgeon, Kootenai white sturgeon, plans specific to certain subjects such as a regional toxics reduction plan, and others. On that basis, the program amendment recommendations and comments (not detailed here by recommending entity) included matters such as:

- incorporate the ESA recovery plans into the fish and wildlife program, either as replacements or in addition to the subbasin plans
- incorporate into the program others types of plans, such as the Tribal Pacific Lamprey Restoration Plan, on similar terms
- continue to recognize the subbasin measures recommended for the 2009 Program and advocate for their implementation
- additional measures for implementation consistent with the subbasin plans
- development and funding of multi-year implementation plans in those subbasins without Columbia Fish Accords, or long-term implementation plans in all basins that go beyond ESA requirements and represent full mitigation plans under the Northwest Power Act
- regular reporting on the progress in implementing the subbasin plans or in implementing the program's subbasin measures
- support for future planning to address the ISAB's recommendations regarding the importance of food webs and landscape scale approaches to conservation

- support for revising or developing new subbasin plans only in areas that have undergone significant change, such as in White Salmon River subbasin following the removal of Condit Dam
- funding and implementation of projects in the newest subbasin plans, for the Blackfoot and Bitterroot subbasins
- better organization and display of the key elements of the subbasin plans and subbasin measures

The Council maintained the subbasin plans as a key component of the program, as the planning foundation for implementation of measures in the subbasins, mainstem reaches and estuary. The Council also retained the specific subbasin implementation measures from the 2009 program and added those measures recommended in this amendment process, subject to the same procedures and conditions for implementation. As sources for these specific measures, the program recognizes the ESA recovery plans, biological opinions, Columbia Fish Accords, and other plans such as the tribal lamprey plan. The Council recognized, in its investment strategy, that there is a bank of subbasin measures to be considered for implementation. The Council also recognized that rather than a general approach to updating subbasin plans, circumstances may dictate the need to update a particular subbasin plan in a certain subbasin. The Council will work with the fish and wildlife agencies and tribes and others to identify what plans are priorities for updating. The Council determined that funding to update a plan in those circumstances should be a priority. Finally, the Council has developed and is improving a set of “subbasin dashboards” on its website, for the purpose of more useful display of information about the subbasin plans, limiting factors, subbasin measures, and projects that implement subbasin measures. 2014 Fish and Wildlife Program, at 11-12, 108-09, 110-13, 116, 183-84, 191-98, (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>; <http://www.nwcouncil.org/fw/subbasinplanning/home/>; <http://www.nwcouncil.org/ext/dashboard/species.asp?9>).

The Council did not actually adopt or incorporate the recovery plans themselves (or the other plans) as part of or as replacements for the subbasin plans – just recognized the actions in these other plans as program measures. Given the specific planning process that resulted in the program’s subbasin plans – management plans linked to limiting factors identified in technical assessments, subject to independent scientific review – and given the different underlying purpose and scope of plans developed under the program and the Power Act as compared to plans developed under the ESA, it is difficult simply to plunk the entirety of recovery plans into the program as replacements for the subbasin plans. More important, it does not seem necessary. What the subbasin plans did was provide a sound planning foundation to justify implementation of specific measures. The Council recognizes that recovery plans and certain other plans have been developed under similar circumstances, and that many are based on the Council’s subbasin planning effort or were spurred into development by topic syntheses generated out of project reviews under the program. The program

recognizes that these other plans have been developed to provide sound planning foundations similar to the program's subbasin plans. Also, in many cases these other plans are more recent or up-to-date than the program's subbasin plans and largely if not completely consistent with what is in the subbasin plans. This justifies the inclusion of the actions in these plans as program measures with a sound planning foundation.

(20) Implementation procedures, including program funding, program scope and funding priorities; long-term funding for operation and maintenance; “in lieu” expenditures; project review; and program and regional coordination

Recommendations and comments raised a set of other issues with regard to program implementation and funding. A number are addressed here in summary fashion:

Program funding, program scope and funding priorities. In recommendations and subsequent comments, nearly every state fish and wildlife agency, tribe, and tribal group had something to say about program funding. Without detailing the specifics here, recommendations and comments called for the program to receive adequate funding for implementation, ranging from making just the general point to specific recommendations about program areas that need funding and implementation. This included ensuring that funding stays strong for on-going production and habitat work to ensuring adequate funding for program measures not yet implemented, resident fish mitigation, blocked-area mitigation, long term operation and maintenance, emerging program areas such as invasive species, toxic contaminants, anadromous fish reintroduction, climate change, and other topics. Many recommendations also called for the Council to establish priorities for Bonneville funding, often focused on specific topical or geographic areas. Some recommendations focused on making sure the program continued to emphasize funding and implementation of the current biological opinions and Columbia Fish Accords to assist in recovery for listed species. Others focused on having the Council make sure the program places a similarly high priority on funding and implementation of important program areas not covered by biological opinions and accords, including many of the topic and geographic areas noted above. Some entities recommendations asked the Council continue the principle that calls on Bonneville to allocate 70 percent of the available funding for anadromous fish, 15 percent for resident fish, and 15 percent for wildlife. No one suggested less of an allocation to the non-anadromous categories; the Council did receive recommendations to increase the allocation of program funding to blocked areas (see #14 above). A proposed “investment strategy” in the draft program received support from a number of these same agencies and tribes. Fishing and conservation groups also provided recommendations or comments in support of many of these same points.

Bonneville and Bonneville’s customer utilities and utility groups also submitted extensive recommendations and comments related to program funding. The main point was to encourage the Council to continue the same general scope and scale of the program, with emphasis on implementing the actions committed to by the federal agencies in current biological opinions and Columbia Fish Accords and the other ongoing areas of an already large mitigation and protection program. The Council should amend the program to add additional measures only in ways that clearly address unmet needs of fish and wildlife directly affected by the federal or

non-federal hydroelectric projects. The Bonneville customer groups in particular emphasized that the region's ratepayers shoulder a significant burden of costs for the region's fish and wildlife mitigation and protection – one-third of Bonneville's wholesale power rate, with a program budget that has nearly doubled in a decade –and that in their view the program is close to or at its fiscal, management and legal capacity in terms of full implementation of efforts at mitigation for the effects caused by the hydrosystem. Financial resources are not infinite, and given a finite program budget, the Council has an obligation to carefully consider new measures proposed in the amendment process, and to prioritize measures to select those offering the greatest benefit to fish and wildlife, retiring measures and finding savings when work is less effective or has outlived its usefulness. The Council should establish a methodology to prioritize potential projects and areas of the program, and reach agreement on the projects of highest priority prior to recommending them to Bonneville. New work and new priorities should be funded from savings. The Council should also work harder to maximize program benefits and cost-effectiveness and minimize process costs. Bonneville and the Bonneville customers particularly urged the Council to include only those measures that have a clear connection or nexus to mitigating for the impacts of the federal hydropower system, so that Bonneville customer funds are not diverted or used for actions that will not achieve the goals of the Act and that are inconsistent with the law. Particular concerns about moving away from a hydrosystem nexus were noted with recommendations and draft program provisions that would move program funding and implementation more deeply into issues about toxic contaminants, invasive species, species such as eulachon, broad-scale objectives for rebuilding populations affected by many factors, and more. A number of the agencies and tribes and conservation groups provided counter legal and policy comments to argue that these program areas were within the authority of the Council and Bonneville to address under the Act.

Based on its consideration of these recommendations and comments, the Council included an extensive "investment strategy" in the final program, with a goal of assuring that funding will match identified program priorities in order to maximize the biological response from measures funded by ratepayer and cost-shared investments. 2014 Fish and Wildlife Program, at 114-17 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). In that section and in an introductory section of the program, *Id.*, at 14-16, the Council recognized the Northwest Power Act's legal requirements and limitations on funding to protect, mitigate and enhance fish and wildlife affected by the development and operation of the basin's hydroelectric facilities, including both what are the ratepayers' responsibilities and the fact that this responsibility is shared with the region as a whole. The Council called on Bonneville to fulfill its commitments to provide adequate funding to meet all of its fish and wildlife obligations, with program funding levels designed to take into account the level of impacts caused by the federal hydrosystem and the authority and need for both direct measures and off-site protection and mitigation measures to address those impacts. The Council recognized that the program already represents a substantial investment by the

ratepayers and citizens of the northwest, that funding and implementation capacity is not unlimited and cannot address every protection and mitigation need for fish and wildlife at once, and that basic controls on spending and vigilance is important to maximize biological response and cost-effective investments. Based on ongoing efforts by the Council and recommendations from the Independent Economic Analysis Board, the Council included a discussion as to the steps that the Council has taken and recommendations for additional steps to improve the cost-effectiveness of individual fish and wildlife measures and the program as a whole. *Id.*, at 212-14.

The Council also recognized that Bonneville had made substantial long-term commitments to funding certain areas of the program, especially prioritizing work to address ESA-listed species, and that Bonneville also funds elements of the program to address non-listed species as well. At the same time, the existing budget commitments limit the flexibility to fund important new work, constrain the expansion of ongoing work, limit the capacity to maintain past investments, and may limit the funding of the priorities of state and federal fish and wildlife agencies and tribes expressed through the amendment process. The Council then identified a set of principles and expectations for and guidance to Bonneville and others on program funding and implementation. This includes a description of the Council's funding priorities for the program, some of them long-time priorities that have developed over the decades of the program's development and implementation and some of them emerging priorities that need to be integrated over time into the program funding commitment. *Id.* at 114-17.

The Council also carefully considered the issues of authority and links to hydrosystem impacts raised in the comments. The Council is comfortable that all of the program areas included in, for example, the list of emerging priorities, *Id.* at 116, are within the authority of the Council to include in the program under the Northwest Power Act and for Bonneville and the federal action agencies to share in the responsibility to implement under the Act. This is not the same as concluding that the ratepayers bear full responsibility to address these matters, and the levels and limits of responsibility and authority and opportunity under the Act may differ in the different contexts. The Council provided brief explanations as to how the Council understands these matters of authority in a general sense, *Id.*, at 14-15, 114-16, while specific issues will need to be addressed on a case-by-case basis by Bonneville and the Council and others. Specific issues about authority, responsibility and funding priorities raised in this program amendment process have been addressed in discussion on specific topics and program areas above. See among others the discussions of non-native and invasive species (#4); predator management (#5), toxic contaminants (#7); climate change (#8); mainstem water management and passage (#9); estuary and ocean (#11); blocked-area mitigation and anadromous fish mitigation (#14); specific species such as eulachon measures (#16).

Long-term operation and maintenance funding. One specific issue about program funding received a significant amount of attention. The Council received a coordinated set of recommendations from fish and wildlife agencies and tribes recommending that the Council ensure that adequate long term funding for operation and maintenance be available for fish screens, hatcheries, wildlife area management plans, and other major program investments and capital improvements for resident and anadromous fish. Underlying the recommendations were views that operation and maintenance budgets have become stagnant and are not adequate. A number of the recommendations invoked a “stewardship” concept, asking the Council and Bonneville to develop a better approach to long-term stewardship of the program’s protection and mitigation investments. Many of the recommendations described specific infrastructure investments made to date and recommended that Bonneville and the Council work with the fish and wildlife agencies and tribes to create a process for maintenance and refurbishment over the next ten years. Recommendations also called for a Council-sponsored forum to address this topic. Recommendation on this topic of various types came from, among others, the Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Washington State Governor’s Salmon Recovery Office, Upper Columbia Salmon Recovery Board, Confederated Salish and Kootenai Tribes, Coeur d’Alene Tribe, Kootenai Tribe of Idaho, Spokane Tribe, Upper Columbia United Tribes, Upper Snake River Tribes, Nez Perce Tribe, and the Confederated Tribes of the Grand Ronde Community of Oregon.

Comments supporting the same points came from many of the same entities and others (such as the US Fish and Wildlife Service) in later stages of the amendment process, including support for provisions in the draft program identifying this as the highest of emerging priorities for the program. The comments included a concern about the absence of identified funds dedicated to program maintenance or stewardship. No comments opposed the recommendations to address long-term operation and maintenance funding needs. But Bonneville and the Bonneville customer utilities did express concern in comments about the Council becoming too prescriptive in its investment strategy, and calling for more flexibility in the approach to solving some of the emerging program priorities. Some of the customer utilities in particular expressed concerns about the overall costs of the program and the burden on ratepayers, called for spending to be better controlled and effective, and called for new priorities, including increased attention to funding operation and maintenance needs, to be funded out of savings from cuts in other areas of the program and not new expenditures.

Based on the recommendations and comments, the Council recognized a growing need to protect or upgrade the substantial investments in a fish and wildlife protection and mitigation that have been made by the ratepayers and others over the last three decades. 2014 Fish and Wildlife Program, at 114 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). Thus one of the

principles guiding the program's investment strategy became providing adequate funding for ongoing operation and maintenance costs associated with existing investments and securing long-term maintenance of program investments. *Id.*, at 115. The Council identified providing for long-term maintenance of the assets that have been created by prior program investments as the top emerging priority for the program. *Id.*, at 116. The program then contains a set of measures for how to go about assuring adequate long-term maintenance of these investments. *Id.*, at 199-200. The principles and measures also recognize that ratepayer funding for the fish and wildlife program is already substantial and needs to be used efficiently and effectively, and that there are not unlimited funds to address all needs all at once – needs that include continuing ongoing habitat, production and passage programs; initiating new or expanded work identified in the recommendations; providing for substantial program monitoring and evaluation; and ensuring long-term operation and maintenance funding. *Id.*, at 114, 116. Among other matters the Council called for Bonneville to fund the emerging program priorities and new fish and wildlife obligations from savings identified within the program that do not compromise productive projects, and from new expenditures only as necessary. *Id.*, at 116-17.

“In lieu” expenditures. Another funding topic that received attention involved what is known as the “in lieu” provision of the Northwest Power Act. Section 4(h)(10)(A) of the Act provides that Bonneville’s expenditures to protect, mitigate and enhance fish and wildlife in a manner consistent with the Council’s program “shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law” A coordinated set of recommendations – from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Montana Fish Wildlife and Parks, Burns Paiute Tribe, Cowlitz Tribe, Kootenai Tribe of Idaho, Upper Snake River Tribes – called on the Council to clarify and even establish the policy for the program as to when and how the “in lieu” restrictions apply to limit expenditures. The recommendations also called on the Council to review “in lieu” decisions by Bonneville in a public process to ensure to critical mitigation efforts receive the necessary funding from Bonneville for successful and timely implementation and also that the in-lieu provisions do not work to prevent project sponsors from establishing equitable cost-share arrangements with other entities that are responsible for similar on-the-ground actions.

Bonneville commented in response to the draft program that further elaboration in the program of the Council's views on Bonneville’s funding authorities – including the “in lieu” provision – appears unnecessary, considering Bonneville remains willing to continue engaging the Council and others when Bonneville must make these decisions and considering that Congress directed Bonneville to make decisions to ensure that Bonneville’s mitigation expenditures do not run afoul of the in lieu restrictions as a legal matter, decisions that necessarily must be made on a case-by-case basis. Northwest RiverPartners commented similarly that the

“in lieu” provisions of the Act are intended to ensure that Bonneville’s customers do not pay for the mitigation responsibilities of others. In lieu determinations are legal decisions for Bonneville to make under the Act, decisions not subject to concurrence by the Council. It is appropriate for Bonneville to notify and discuss with the Council and the public when a measure may be subject to an “in lieu” determination. But Bonneville is not responsible for working with the Council on an appropriate application of the “in lieu” provision. The Oregon Department of Fish and Wildlife and others commented favorably on provisions in the draft program that explicitly address the topic of “in lieu expenditures” and present a clear definition and process for reviewing “in lieu” determination.

The final program contains a provision on “in lieu expenditures, in a section explaining the legal and social context of the program. 2014 Fish and Wildlife Program, at 15-16 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The Council recognizes that “in lieu” determinations are legal decisions assigned by the Act to Bonneville to make, not the Council, and that the provision is an important protection to ensure that program expenditures accomplish additional protection and mitigation and do not simply substitute for the expenditures of others. At the same time, the Council had to grapple with the concerns of many in the fish and wildlife agencies and tribes about how and why “in lieu” determinations are made and explained by Bonneville. So the Council stated its understanding and expectations for how Bonneville should apply the “in lieu” provision and asked Bonneville to continue to inform and discuss with the Council in lieu considerations before making final decisions.

Project review. The Council did not receive recommendations to fundamentally change the project review provisions of the program, presumably because those provisions largely follow the requirements of the statute. Still, the Council did receive a number of recommendations and subsequent comments related to the project review process, largely from fish and wildlife agencies and tribes but also from Bonneville, the Bureau of Reclamation, and the Bonneville customer groups. Recommendations included:

- Council should work with the fish and wildlife agencies and tribes and with Bonneville and the other federal action agencies to develop jointly the new project review process
- streamline the project review process generally – standardize and simplify the information requested and coordinate the information request with information needs of other entities
- jointly develop a review process that treats new and ongoing projects differently – well-established and often-reviewed projects, including established Columbia Fish Accord projects, need significantly less review less often; project recommendations following review of established projects should cover the project for multiple years before review is needed again

- especially for established projects and ongoing habitat work, take advantage of project review that occurs through existing subregional review frameworks and umbrella processes, such as what Bonneville and the fish and wildlife agencies and tribes have evolved for review and selection of habitat work within existing project areas
- support Bonneville’s approach to habitat project selection as a way to move from opportunistic habitat work to more strategic implementation
- take advantage of annual or regular project management and technical conferences and workshops that report on and discuss progress with regard to existing projects
- review current projects to ensure their resiliency under climate scenarios
- focus the regular ISRP review mostly or solely on new projects or expanded project proposals
- Council should solicit for, review and recommended new projects for parts of the basin and parts of the program that are not covered by accords or biological opinions and have not been able to initiate new work for some time – both as a general principle and with specific emphasis on new work in the area above Chief Joseph and Grand Coulee dams
- direct the ISRP to focus its review and comments on the science elements of projects and avoid policy issues
- continue to provide a rigorous scientific review of all measures under the program, as the program’s credibility is supported in large measure by rigorous scientific review of each project funded by Bonneville
- establish a methodology to prioritize potential projects and reach agreement on the projects of highest priority prior to recommending them to Bonneville
- initiate a collaborative multi-party discussion about how the independent science review function can best serve the needs of the program

The Council revised the project review provisions of the program in minor ways responsive to the recommendations and comments. 2014 Fish and Wildlife Program, at 119-20 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>). The Council continues to agree that rigorous project review, including the use of the Independent Scientific Review Panel, is not only required by the Act but does in fact improve the quality of the projects implemented and the results achieved, and thus bolsters the program’s credibility significantly. The Council also agrees that the program is a collection of different project types that will benefit from different types of review, with different levels of scrutiny and frequency of review, and with different questions asked of a long-established program and a new proposal, or a habitat project and a data management project. The Council committed to work with Bonneville, the fish and wildlife agencies and tribes and project sponsors and others in the development of the next project review processes. Multi-year project recommendations for established projects have already been a part of the project review process, and will be again. The Council also agreed to use existing subregional organizations and their frameworks and annual science workshops to assist with project reviews, and in general streamline review processes as much

as possible. Finally, for the program areas that do not yet carry long-term Bonneville funding commitments, the Council will work with Bonneville, the sponsors and others to develop targeted solicitations for new work. Any solicitations for new program work should take into account the priorities described in the investment strategy, see *Id.*, at 114-17.

Program and regional coordination. The Council received a coordinated set of recommendations on program coordination from state and federal fish and wildlife agencies, other state and federal agencies, and tribes and tribal groups. The main focus of the recommendations – and subsequent comments – was that the Council needed to do something to fill the vacuum in regional program coordination created by the dissolution of the Columbia Basin Fish and Wildlife Authority. Most recommended that the Council commit in the program to convene an annual forum of the state, tribal and federal representatives to discuss current issues in program development and implementation, including matters such as an annual work plan and priorities for program implementation; coordination of work to improve and standardize monitoring and evaluation, data management, research, coordinated assessments, and reporting; coordination of efforts on habitat project effectiveness; discussion of issues in the implementation of emerging program areas such as toxics, and non-native and invasive species; progress on addressing long-term operations and maintenance costs; ocean and estuary issues; and sponsoring and convening science/policy workshops. Entities also sought to ensure continued Bonneville funding for program coordination. Recommendations, supporting comments, or (in most cases) both came from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Montana Fish Wildlife and Parks, Washington State Governor’s Salmon Recovery Office, Columbia River Inter-Tribal Fish Commission, Nez Perce Tribe, Yakama Nation, Upper Columbia United Tribes, Coeur d’Alene Tribe, Kootenai Tribe of Idaho, Confederated Salish and Kootenai Tribes, Cowlitz Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, Upper Snake River Tribes, Burns Paiute Tribe, NOAA Fisheries, Pacific Fishery Management Council, and the Pacific States Marine Fisheries Commission. Support also came in the recommendations of the Northwest Sportfishing Industry Association and the Association of Northwest Steelheaders.

The section on program coordination in the final fish and wildlife program is based on the recommendations and comments. Among other things, the program provides that the Council will convene an annual forum of regional coordination representatives and others to discuss issues of regional significance in program implementation. Without detailing the specific issues raised in the recommendation, the issues identified for the coordination forum cover the range of subjects provided in the recommendations. The Council also retained the provisions for program coordination funding. 2014 Fish and Wildlife Program, at 121 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

The Council received recommendations on the need for increasing coordination with other regional programs, agencies and organizations involved in work in the Columbia basin that affect or work to protect and improve fish and wildlife and habitat. The Columbia River Inter-Tribal Fish Commission in particular recommended that the Council develop a system for tracking the activities of, and similarities and differences between, the plans and actions of other agencies in the basin and in particular subbasins. The point would be to increase our ability to identify, cooperate with and integrate program mitigation actions and funding with similar efforts being implemented by other organizations. A related recommendation came from the Regional Fisheries Enhancement Group Coalition in the State of Washington and from other entities involved in recovery and enhancement work in that state and elsewhere. The Council continued a provision from the 2009 program on regional coordination that covers these recommendations. *Id.*, at 121-22. The challenge will be to implement this provision effectively.

Finally, the Clark Fork Coalition recommended that the Council establish a framework for supporting local organizations in Montana that are working to achieve habitat improvements and ecological outcomes that overlap with the objectives of the Council's fish and wildlife program. The Council did not adopt that recommendation. The Council and Bonneville did not maintain any of the ad hoc subbasin organizations formed to coordinate the activities of many participants to develop the program's subbasin plans. In a perfect world it would be useful to maintain ongoing coordinating entities or frameworks in every subbasin or region to do as the Clark Fork Coalition recommends. But the program resources just do not sustain such a level of subbasin organization, at least not without diverting resources from other, priority needs. Instead, the Council relies primarily on the coordination functions provided by its program partners – the state fish and wildlife agencies and other state resource agencies and tribes and tribal groups. The Coalition should look to those entities to fill the supporting function described in the recommendation. If significant enough in a regional sense, this could also become an issue for discussion at the annual coordination forum.

(21) Renewable energy development and the effects on wildlife and fish

The Washington Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation, Upper Snake River Tribes, and US Fish and Wildlife Service submitted a coordinated recommendation to include in the program provisions for assessing and reducing the impacts of renewable energy development (and associated transmission) on terrestrial and aquatic resources.

In more detail, these agencies and tribes recommended that the Council develop and Bonneville fund:

- programs and processes to evaluate the impacts of fish and wildlife resources of all renewable energy sources (past, proposed and potential) and associated transmission infrastructure
- a region-wide assessment of suitability for siting of terrestrial (e.g., wind and solar) and aquatic (e.g., wave energy) renewable energy projects, in which possible sites for development are prioritized and then examined for potential site-specific and system-wide impacts to wildlife and fish (e.g., effects on sage grouse)
- outputs from the region-wide assessment should include a map of priority power generation development sites and power generation exclusion zones or protected areas, akin to the Council's protected areas provisions for new hydropower development
- explicit evaluation of transmission system expansion and its potential to impact fish and wildlife as part of assessing the effects of renewable energy development
- identification, assessment and analyses of appropriate fish and wildlife mitigation, where development has occurred or is allowed to occur in the future

These agencies and tribes reiterated support for the recommendation in subsequent comments. The Columbia River Inter-Tribal Fish Commission and Yakama Nation added their support in comments. The Commission attached to its comments its 2013 Energy Vision for the Columbia River to underscore, among other things, the importance of the need for creative and protective thinking regarding the effects of the region's energy development on fish and wildlife, on the basin's ecosystem functions, and on the hydropower system, including renewable energy development, the use of the hydropower system for peaking and to balance the output from intermittent energy sources, the environmental effects of the expanded development of natural gas for generation, and the transport of oil, natural gas, and coal.

Bonneville commented in response that protection and mitigation for the development of new renewable resources (other than hydropower) and their integration into the regional transmission grid was beyond the scope of the

Council's fish and wildlife program intended to address the effects of the development and operation of hydropower facilities. Bonneville also commented that renewable energy development is already governed by environmental protection, energy regulatory, and land use siting laws, procedures, and agencies. It was unclear what value the Council would add through its program and plans. Bonneville also noted that it complies with similar environmental laws and procedures when it works with energy resource developers to assess and decide on whether and how to integrate a new resource into the regional transmissions system.

The Council decided not to amend the program as recommended. Under the Northwest Power Act, the fish and wildlife program is to consist of measures to protect, mitigate and enhance fish and wildlife affected by the development and operation of the hydropower facilities. Bonneville is then to use its fund for the same purpose, in a manner consistent with the program. As noted elsewhere in the program and in these findings, in certain circumstances it is appropriate for the Council to include measures in the program – and for Bonneville to fund implementation of those measures – that enhance fish or wildlife by addressing problems *not* caused by the hydrosystem, as offsite mitigation to compensate for hydropower losses. That is not what was asked of the Council here. Instead the recommendations called for the Council to use the fish and wildlife program to embark on what would be essentially a parallel comprehensive program to assess region-wide the impacts on fish and wildlife from the development and operation of non-hydro renewable energy resource, and then develop and include protection and mitigation measures related to those losses in the program, with expectations that Bonneville would fund the assessment and the mitigation and protection measures. The Council concludes that such recommendations are outside the scope of the fish and wildlife program called for by Congress in Section 4(h) of the Act.

The subject matter underlying these recommendations is appropriate for consideration when the Council develops the regional conservation and generation power plan under Sections 4(d-g). The power plan provisions of the Act direct the Council to assess and compare the total system costs of different new resources that might be added to the region's power system. The estimated system costs of a resource must include whatever environmental costs and benefits can be quantified. And when the Council develops the power plan's conservation and generation resource strategy, it must do so with due consideration for "environmental quality", "compatibility with the existing regional power system", and "protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat." Northwest Power Act, Section 4(e)(2). Under those standards, the Council will need to consider the effects of possible new energy resources (including renewable generating resources) on the environment and on wildlife and fish when developing the Seventh Power Plan. The Council will work with the fish and wildlife agencies and tribes and others to that end, even if not through the specific measures recommended here.

(22) Determination as to the power supply's adequacy, efficiency, economical nature, and reliability, including information on the costs of the fish and wildlife program

Section 4(h)(5) of the Northwest Power Act provides that the Council's fish and wildlife program is to consist of measures to protect, mitigate, and enhance fish and wildlife affected by the development, operation and management of the river's hydroelectric facilities "while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply." As it has in the past, the Council's explained its determination in this regard as part of the program itself, although not required to by the Act. 2014 Fish and Wildlife Program, 18-19 and App R, 204-18 (<http://www.nwcouncil.org/media/7148624/2014-12.pdf>).

The "AEERPS" determination in the draft fish and wildlife program drew comments from the environmental and fishing group coalition and from Ed Chaney in his capacity as the Northwest Resource Information Center, Inc. These commenters did not object to the Council's determination that the region can maintain an adequate, efficient, economical and reliable power supply while implementing the measures in the amended fish and wildlife program. What they objected to is the Council's consideration of one set of information in making this determination. They objected in particular to the way in which the Council relies on the information reported by Bonneville on its costs of implementing the fish and wildlife program, believing that Bonneville overstates its costs.

As explained in the AEERPS determination itself, one aspect – but just one aspect – of the determination as to whether the Council can approve the program's measures while assuring the region an economical power supply is to collect information on what costs the fish and wildlife program imposes on the power system. *Id.*, at 215-18. Pursuant to Section 4(h)(10) of the Northwest Power Act, Bonneville is the agency largely responsible for funding the implementation of the fish and wildlife program. Bonneville reports annually on its costs for implementing the program. This is the only source of most of the information on fish and wildlife program costs – any other reporting of the bulk of fish and wildlife program costs (and the Council does not know of any) would be derivative of and based on what Bonneville reports, as the agency actually incurring the costs. So it make sense that the Council uses what Bonneville reports on fish and wildlife program costs as one input into assessing whether the program can be implemented and still assure the region an economical power supply.

What the commenters particularly object to is that Bonneville includes in its costs a "foregone revenue" amount, an amount that represents hydropower sales revenue that is foregone because of dam operations that benefit fish but reduce hydropower generation or shift generation to a time of less value compared to the system if it were operating without such constraints and optimized for power generation and revenue. Because a decision by Bonneville to implement system operations to optimize power generation and revenue (the basis for the foregone

revenue calculation) would violate Bonneville's obligations under the Northwest Power Act and the Endangered Species Act, and because the power system has adapted over time to each incremental reduction in generation and revenue resulting from an increase in operations to benefit fish and wildlife, in the commenters' view it is wrong for Bonneville to include the total amount of foregone generation and revenue as an annual "cost" of the fish and wildlife program. Doing so, the commenters conclude, overstates the costs of the fish and wildlife program. (Bonneville reports a foregone revenue amount of \$150 million in Fiscal Year 2012. The financial effects of operations can fluctuate significantly from year to year depending on runoff conditions and electricity market prices, and so the foregone revenue amount can range significantly higher in certain years. *Id.*, at 215-16.)

Others, most notably Bonneville and its utility customers and customer groups, commented that the reduction in generation and revenue is a real cost to the system and its ratepayers, even if operations to benefit fish and wildlife are required by law. This is not different, in their view, from Bonneville's direct expenditures to benefit fish and wildlife, measures also required under law but which also impose costs, annual costs that are reported by Bonneville. And so it is appropriate to report the total costs of both kinds.

This dispute over foregone revenue is not new to the Council or the region. And it is not hidden in the reported costs. If an entity or person believes in the value of reporting on foregone revenue in the way Bonneville does, and in considering that total amount as part of annual fish and wildlife costs, the number is visible and reported. If an entity or person does not believe the foregone revenue amount represents a real annual cost to the power system, as the commenters do not, the foregone revenue value is separately itemized in the report and can be discounted. No one is misinformed, especially as the issue has been debated in the region for decades.

The Council acknowledged the controversy over how Bonneville reports the costs of the fish and wildlife program in the Council's discussion of the "economical" power supply aspect of its AEERPS determination. But the Council also explained why the controversy is *not* relevant to the Council's determination:

"The Council realizes that how and why Bonneville reports forgone revenue is controversial with some. The controversy is not relevant here, because as noted below the Council concludes that even as the fish and wildlife costs are reported by Bonneville, the region's power supply remains affordable. The Council has not limited the measures in the program based on either the costs of individual measures or on the basis of total program costs." *Id.*, at 216.

The fish and wildlife program contains substantial measures to protect, mitigate and enhance fish and wildlife, based mostly on the recommendations of the fish and wildlife agencies and tribes as expected under the Act. The program

acknowledges that these measures impose significant costs on the region's ratepayers. The program also recognizes that it is expected and appropriate under the Northwest Power Act for the ratepayers to bear the costs of a substantial fish and wildlife program. The Council then considered the question of the affordability of the power system – which includes costs from many sources, not just fish and wildlife – from a number of perspectives, including that of the regional economy and certain sectors of the regional economy in addition to the financial health of the agency that bears the bulk of the costs of implementing the program. The Council concluded that the region's power system remains economical in the broad sense that power rates remain affordable within the context of the region's economy. *Id.*, at 216-18; *see also* at 116-18.

The determination the Council was required to make is not whether Bonneville has used the correct method to report the costs of the fish program, or whether there are other or better ways for Bonneville to account for and report the costs of implementing the fish and wildlife program. Instead, what the Council is required to determine is whether the financial and physical effects of implementing the program to benefit fish and wildlife can be absorbed by Bonneville, the ratepayers and the regional economy so as to maintain an economical – that is, affordable – power supply from a regional perspective. Many factors go into that assessment and determination, not just the projected costs of the fish and wildlife program. Using a fish and wildlife program cost estimate that is *lower* because of the absence of the foregone revenue amount would not alter the Council's determination that the power system remains economical.

The commenters assume that if the Council considered a lower cost estimate for implementing the fish and wildlife program than what Bonneville reports, the Council would include additional fish and wildlife measures in its program, and Bonneville would have to fund those additional fish and wildlife measures. There is nothing in the record to indicate that this is true – that the Council limited the scope and scale of the recommended measures it decided to adopt into the program based on the magnitude of the program's projected costs or the possible costs of any particular measure. The Council developed the program almost wholly out of the measures and objectives recommended by the state and federal fish and wildlife agencies and tribes and an assessment of their expected benefits to fish and wildlife, not based on an assessment of the costs of individual or collective measures.

The commenters particularly called for the removal of the four lower Snake River federal dams as necessary to rebuild salmon runs in the Columbia basin. They imply here that one reason the Council has not agreed to adopt this measure in the program is because of the way the Council has accepted Bonneville's method of reporting of the costs of the fish and wildlife program and does not want to add the significant costs of Snake River dam removal. There are a number of reasons the Council has not included in the program a measure calling for removal of the four lower Snake dams (*see, e.g.*, the discussion in topic #9 above). The Council

did *not* make that decision based on the projected costs of the measure, nor on the basis of the projected total costs of the program without that measure. And the Council certainly did not make a decision not to include a measure calling for the removal of the dams – or make a decision on any other recommended measure – based on the *method* that Bonneville uses to account for and report its costs of implementing the fish and wildlife program.

The NRIC comments also argued that the region’s power supply is actually uneconomical. This is not because of the costs to implement the fish and wildlife program but because of the economic value of the salmon and steelhead and other fish and wildlife harmed by the development and operation of the existing hydroelectric system, costs that should be calculated and added to the total estimate of the costs that the system bears and which, in the commenter’s views, would make the power supply substantially uneconomic compared to elsewhere in the nation. That is a policy position and perspective of the commenter not shared by anyone else in the amendment process. The comment does not change or inform the Council’s responsibilities under Section 4(h) for considering and either incorporating into the program or rejecting the recommendations of the agencies and tribes and others, nor how the Council is to do so while assuring the region retains an adequate, efficient, economical and reliable power supply. In the Power Act Congress assumed, in the face of the system’s adverse effects on fish and wildlife, that the region’s power supply was economical in the context of the region’s overall economy. The obligation Congress put on the Council and its partners is to develop and implement measures to protect, mitigate and enhance the fish and wildlife affected by the hydrosystem while retaining for the region an affordable power supply from that regional economic perspective. That is what the Council has done here.