Northwest **Power** and **Conservation** Council

September 3, 2014

MEMORANDUM

TO: **Council Members**

FROM: **Council Staff**

SUBJECT: **Fish and Wildlife Program Amendments**

BACKGROUND:

Presenter: Council staff

Summary: The Council will consider revisions to the May 7th, 2014 draft fish and wildlife program. Attached are staff proposed revisions to the draft. The staff proposes to work through revised sections of the draft program, from beginning to end, at the September 8th and September 10th Council meetings with the goal of adopting and amended Columbia River Basin Fish and Wildlife Program at the October Council meeting. As the Council indicated in August, the Council will enter the "ex parte" period at the conclusion of the September Council meeting.

Relevance: Amending the fish and wildlife program is called for in the Northwest Power Act.

Workplan: This task is called for under Objective 2 (*Promote regional fish and wildlife recovery – implement Program and adopt new Fish and Wildlife amendments*), Action B (*Develop and complete 2014 program amendments*) of the Council's Annual Workplan for 2014.

Background: The written comments on the draft fish and wildlife program were complete on July 25th. Since then the Council has been considering possible revisions to its draft program. This work will continue at the September Council meeting.

Attached please find staff proposed revised language for the program. Staff proposes to discuss, confirm, modify or reject these revisions with the Council. The revisions are based on comments on the draft program (while cognizant of the original amendment recommendations) and some staff edits (the staff recommends that a more comprehensive edit for consistency and style occur between the September and October Council meetings). Changes from the September Council meeting will be captured by staff and a revised draft will be prepared in advance of the October Council meeting when the Council will consider adopting an amended fish and wildlife program.

On September 10 at the end of the day, the Council will enter into what has often been called the “ex parte” period. After that point, and until the final decision on the 2014 Fish and Wildlife Program, Council members and staff should have no more conversations with anyone outside the Council about the 2014 program -- about the provisions, recommendations, content, comments or the amendment process. Nor should any Council member or member of the Council staff read any new input on these subjects from any source. After this point the Council is to make its Fish and Wildlife Program decision based only on what has already been communicated and is in the administrative record.

Draft Columbia River Basin Fish and Wildlife Program
September 3rd, 2014 *working draft*

Notes for Council member review:
Revisions to sections from Council meetings on August 18th and 21st are accepted in this working draft document. These sections are: fish propagation, wild fish, wildlife, and eulachon.

Revisions are based on comments received on the draft program, while also being cognizant of original recommendations, and some staff editing. Areas of text that have blue shading reflect the presence of a staff comment which generally depicts the source of the comment that spurred a revision. See the electronic version of the document to view the comment. You can hover over the shaded area of text or view the document so that the comments appear in balloons on the side.

As discussed in August, staff revisions include revised measure language to improve clarity about who is responsible for certain measures. Staff also proposed revisions for consistency regarding directives in the measures (should/shall).

At the September Council meeting we will review revisions and confirm, reject or edit the revised sections.

Available staff discussed and came to a common understanding on most of the revisions reflected in the draft working document.

We are including the April version of the Message from the Council section should the Council decide to revise and include in the program.

DRAFT
Council Program Amendment Process
Working Draft - September 3, 2014

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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, 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. The basin produces, under normal precipitation, about half (16,200 average megawatts) of the electricity consumed 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, regionwide 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 towards 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, describe the changes in the environment and the biological performance that is needed to achieve the vision;
- The strategies guide and describe the measures that lead to the desired environmental and biological conditions;
- The scientific foundation and principles 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 guides what information needs to be gathered and evaluated through research and monitoring to assess progress towards 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 is illustrated in Figure 2, fish and wildlife program framework. 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 its projects: (1) the program is amended 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]**;** and, (3) reviews of program-funded projects by the 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.

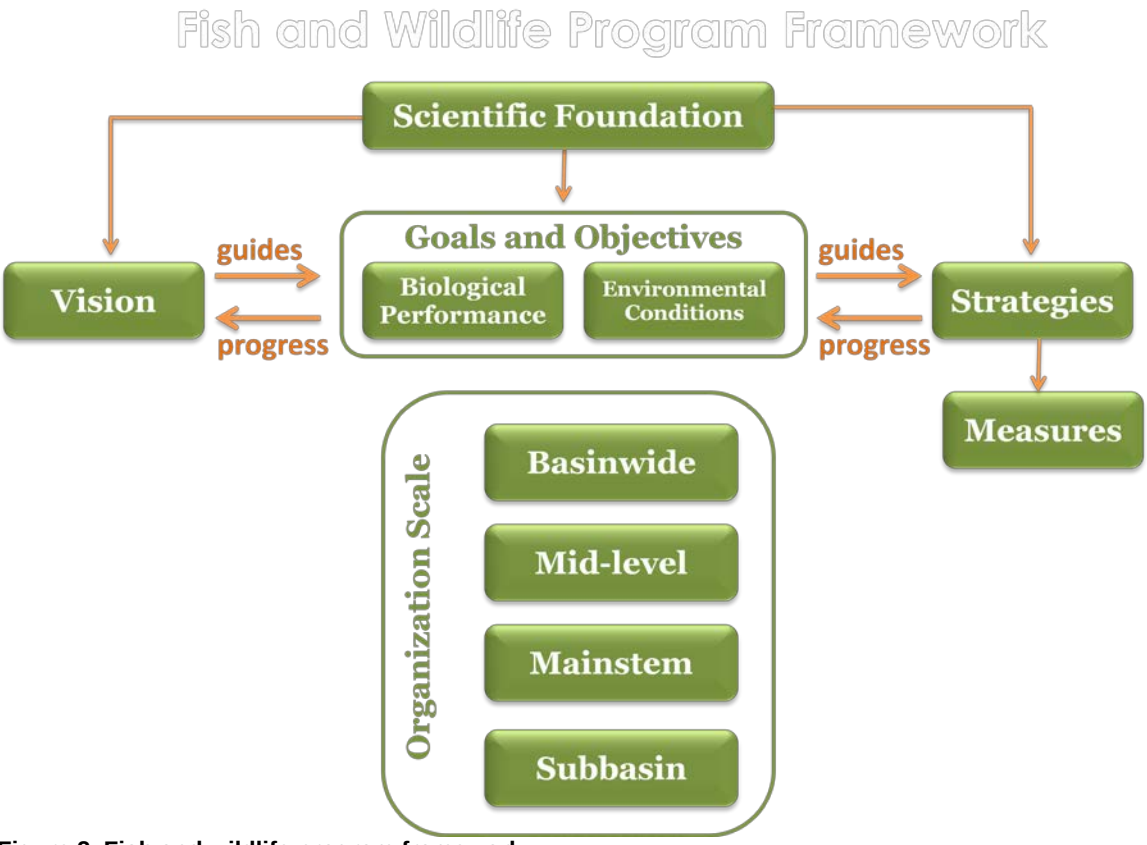

Figure 2. Fish and wildlife program framework

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 emphasizes the relationships among the framework elements at each of these four levels. The four levels are:

1) Columbia River Basin (Basinwide): This level addresses the entire basin of ~~more than~~ about 25~~9~~0,000 square miles, which includes 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 (ESU’s) for listed anadromous fish, or other common geographic reference areas or management units to conduct its work, as appropriate.

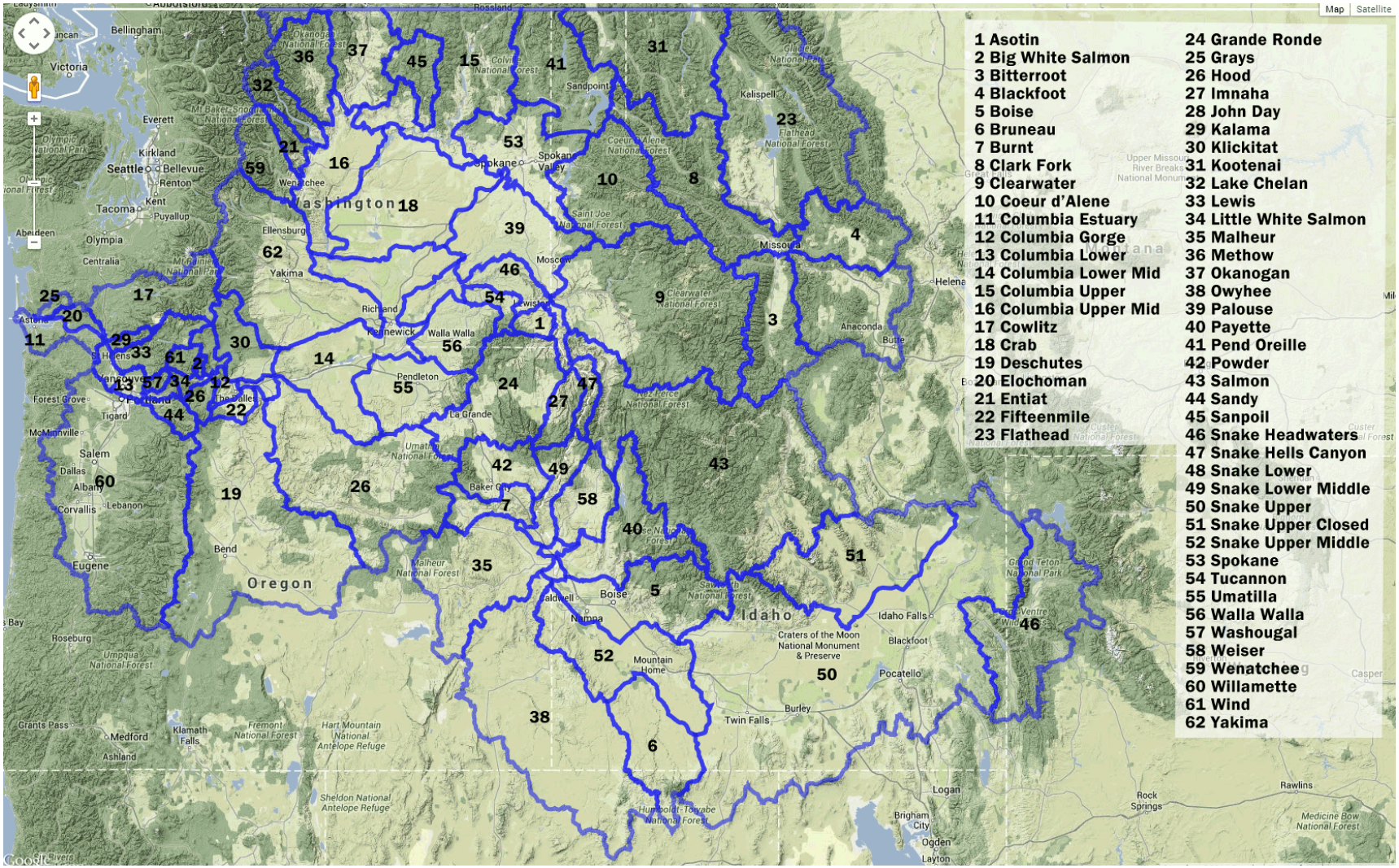

Figure 3. Columbia River Basin Fish and Wildlife Program Subbasins.

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) are 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 ~~These~~ include ~~most of~~ 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" and "reliable" power supply, an "efficient" power supply, and an "economical" power supply will be found here. These are the four elements of the AEERPS requirement.

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 ~~about~~ how Bonneville reports the costs of the fish and wildlife program, published in ~~from~~ 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, to further improve the efficiency of fish and wildlife program implementation. These latter recommendations are an important consideration for the program, even as not part of the formal conclusions required by the statute as to the efficiency of the power supply.

For the reasons given in the longer discussion, the Council concludes that it may adopt the protection, mitigation and enhancement measures in the ~~[draft]~~ 2014 Columbia River Basin Fish and Wildlife Program while assuring the region an adequate, efficient, economical and reliable power supply. ~~The AEERPS conclusion is necessarily preliminary because of what happens next.~~ Under the Act, after the Council completes ~~follows~~ 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 ~~in this (and every other) fish and wildlife~~

~~program decision recognizes and~~ assumes that the Council will continue to follow the requirements of the Power Act in reviewing and revising the power plan, including approving~~e~~ 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 and challenges

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 2400 river miles of habitat, resulting in hundreds of thousands of naturally spawned 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% to 1.9% preserving tens of thousands of naturally spawned juvenile salmon.
- Supported efforts to increase Snake River fall Chinook from less than 1,000 fish in the 1980's to over 56,000 fish in 2013.
- Supported critical funding to help save Snake River sockeye salmon from ~~extinction~~extirpation, and supports efforts to move beyond conservation towards 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 ~~replace~~ 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 over 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:
  - Yakama Nation fisheries biologists are working to reintroduce the ~~once-extinct~~ 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 which 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:

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 ~~approximately 70 percent of program funding to anadromous fish, 15 percent to resident fish, and 15 percent to wildlife. None of the habitat expenditures has been directed to improve anadromous fish habitat in historic spawning areas now blocked by dams, such as above Chief Joseph and Grand Coulee dams on the Columbia River~~. 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 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 naturally spawning 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.*

~~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.~~ 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 have associated risks to natural production, the most significant being dilution or loss of genetic diversity. In this respect, hatcheries funded through the Council's program have the potential to threaten the program's biological objectives. Moreover, the presence of unmarked hatchery fish in the river system makes it difficult to accurately assess survival of naturally spawning populations and distinguish hatchery fish. Without this information, it is difficult to know where and whether program investments are successful.

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.

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, ~~aspirational in nature,~~ 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. ~~The Council intends to adopt over time biological objectives that reflect a measure of habitat capacity (present and potential) to ensure that habitat is appropriately utilized by naturally spawning and hatchery fish.~~

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, and is updated regularly.

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.

~~The Fish and Wildlife Program addresses the Act mandate for Bonneville and other federal agencies to mitigate, protect, and enhance resident fish, anadromous fish, wildlife (program focal species) and their habitat impacted by the development and operation of the hydrosystem [see species, wildlife loss assessment]. Recognizing that the status and trend of the Columbia River Basin's species and habitat are affected by more than the hydrosystem, the program tracks the status of these focal species and their habitats to provide an understanding of their condition and to provide context for the program's work and progress. To obtain a holistic perspective of the status across the basin, the program relies on information gathered through development of subbasin plans, program-funded projects, as well as information gathered by federal and state fish and wildlife agencies, tribes, and other entities in the basin. 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. The Council's dashboards and High Level Indicators web-report are updated regularly to keep the information current and relevant.~~

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 and for 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 are 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 ~~restoring~~ enhancing habitats and biological systems.

Existing reports[1] 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 are 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 achieving 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. The ability of the region to achieve these goals will depend on the coordinated actions of many parties to improve fi sh 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 program 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 [see subbasin plans].

Achieving these quantitative objectives depends on the coordinated actions of many parties.

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[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

The program goals and quantitative objectives are guided by the following principles:

- Consistent with the Program vision statement.
- Achieve the ecosystem functions necessary to restore healthy, self-sustaining and harvestable populations of native fish and wildlife in the Columbia Basin.
- Measure program success by achieving the program's fish species and population abundance, productivity, spatial distribution and diversity objectives.
- Implement sufficient monitoring and evaluation, and provisions for adaptive management, to ensure that progress towards objectives can be tracked, and that future management can respond to new information and strategies.

Themes for program goals and objectives[2]

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*
Theme Five*: Accessibility of Program data*

[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 (agencies and tribes) ~~managers~~, 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

[3] Objectives achieving the four criteria are referred to as SMART objectives.

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.

The process to identify potential quantitative objectives (and program goals) should consider existing relevant Columbia River Basin documents[4] 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 Resident Fish 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 naturally spawning salmon and steelhead

Step 1

For population segments of salmon and steelhead species listed under the Endangered Species Act (ESA), NOAA Fisheries (working with ~~-~~fish and wildlife ~~managers~~ agencies and tribes and other federal agencies) has identified ~~two tiers of biological objectives for survival and recovery of wild fish, or natural spawners: avoiding jeopardy and achieving recovery~~delisting criteria for ESA-listed salmon and steelhead. The federal agencies that manage, operate, and regulate the Columbia River Basin hydropower facilities share some of the responsibility for achieving ~~those objectives~~delisting under ~~both~~ the Endangered Species Act. The Council ~~accepts~~ recognizes ~~these~~ the ESA ~~objectives~~ delisting criteria and will ~~report~~ track NOAA Fisheries' progress towards delisting decisions.

Step 2

Beyond delisting populations, the same federal agencies share the responsibility for enhancing fish abundance under the Northwest Power Act. The Council's program shares in the region's broader vision of naturally spawning salmon and steelhead populations across the basin that are diverse, robust over time, and sufficiently abundant to allow substantial opportunities for tribal and non-tribal harvest [see ecosystem function strategy and other strategies]. The Council intends to track the region's progress on the NWPA objective of enhancing salmon and steelhead ~~abundance~~status.

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 and review these quantitative objectives, and will identify the non-ESA natural populations that lack objectives. This effort 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 the population needed to achieve the recovery and harvest related goals~~because this goal may not be achievable for some upriver stocks~~. This can be done by identifying productivity objectives for indicator stocks that reflect the productivity of stocks throughout the Columbia River Basin.

By the end of 2015, the Council will decide which ~~of these~~ objectives are adequately defined and which need further work. ~~to the program objectives and if further work is required.~~ The Council will conduct a program amendment process if it is determined that adopting the objectives should be considered.

b. Objectives for hatchery salmon and steelhead

The program recognizes a number of purposes for producing salmon and steelhead in hatcheries. Objectives for adult returns, juvenile releases, and the proportion of hatchery fish to naturally spawning fish are important for all these purposes. These objectives should be established in relation to but not as a substitute for achieving population objectives for healthy naturally spawning populations that contribute to harvest.

Step 1

The Council will work with the state and federal agencies and tribes to survey, collect, and organize the following quantitative objectives for each Bonneville Power Administration (Bonneville) -funded hatchery:

- hatchery broodstock needs
- juvenile releases
- adult fish contribution to harvest
- percentage of hatchery fish ~~and~~ in naturally spawning populations

After collecting and reviewing the existing information, the Council will identify an initial set of objectives for hatchery fish by the end of 2015.

As part of this review, the Council will consider how program goals and indicators link to these hatchery objectives, and how these objectives relate to natural production and the overall effort to satisfy the mitigation obligation of the Power Act. Collecting similar information about all hatcheries in the Columbia, not just Bonneville-funded hatcheries, may be necessary.

Step 2

The Council will decide whether there is a need to modify the program goal statements, objectives, and indicators, or a need to identify other quantitative objectives for hatchery fish. The Council will conduct a program amendment process if it is determined that adopting the objectives should be considered.

c. 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 aims to mitigate for these losses and to track, using indicators, the progress toward meeting program goals and objectives [see program strategies]. The program also recognizes wildlife losses and mainly relies on acquiring habitat units as mitigation.

Step 1

Once the process to produce objectives for hatchery salmon and steelhead is completed, the Council will work with the fish and wildlife ~~managers~~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.

d. 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 [see ecosystem function strategy]. The program requires goals, objectives, and indicators that track progress toward these mitigation efforts

Step 1

The Council will identify measureable 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 ~~managers~~ 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 ~~managers~~ agencies and tribes to identify quantitative biological objectives.
- Work with the fish and wildlife agencies and tribes ~~managers~~ 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.

e. 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 province level.

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 program understands that it 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, lamprey, wildlife**.** 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 recruit-per-spawners 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 Accords and FCRPS BiOp. Habitat actions can have 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, ~~and~~ 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 shall support~~s~~ increased investments in mainstem habitat improvements to increase the extent diversity, connectivity, and productivity of mainstem habitats for mainstem spawning, rearing, and resting. Primary mainstem habitat measures that the Council shall support include:

- Coordinating~~e~~ actions with the flow measures intended to improve ecosystem function in the mainstem
- Enhancing~~e~~ the connections between the mainstem sections of the Columbia and Snake rivers and floodplains, side channels, and riparian zones
- Continuing~~e~~ 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 enhanceing mainstem riparian areas and wetlands to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels

Additional mainstem habitat actions that the Council shall support ~~to consider~~ include:

- Identify, protect, enhance, and restore the functions of alluvial river reaches in the mainstem
- Excavate, create and reconnect additional backwater sloughs, alcoves, and side channels to the main channel
- Dredge/excavate lateral channels that have silted in
- Create more shallow-water habitat
- Identify, protect, restore, and manage thermal refugia for salmonid use during high water-temperature periods
- Acquire and protect lands adjacent to the mainstem critical to protecting habitat areas and local water quality
- Where feasible, reconnect protected and enhanced lower tributary habitats to protected and enhanced mainstem habitats, especially in the area of productive mainstem populations
- Increase 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 naturally spawning 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 naturally spawning populations of fish. Based on current understanding, establishing reserves may be critically important to protect the remaining viable wild or naturally spawning fish populations and to restore habitat with the potential to re-establish core populations at strategic locations in the basin.

Principles

Strongholds areas should have the following characteristics;

- Be designated by the states and ~~supported by~~ tribes in the state in which they are located;
- The ability to manage for wild or naturally spawning fish while minimizing impact of hatchery fish, except where state and federal fish and wildlife ~~managers~~agencies and tribes (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 naturally spawning stocks;
- Relatively intact habitat;
- Opportunity to create genetic strongholds with adequate buffers to shield them from non-native, invasive species;
- A reasonable chance of eradicating non-native, invasive species;
- 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;
- 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 shall:

- Request states to identify stronghold areas
- Consider for stronghold recognition areas designated by states and ~~supported by the~~ tribes

- Work with fish and wildlife ~~managers~~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 actions implemented within strongholds and track these actions using ~~Council~~ a high level indicator~~s~~
- Support actions that prevent introduction of non-native and invasive species from stronghold areas or actions to eradicate them

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 ~~salmon~~ populations relate closely to our wild fish, resident fish, hatchery, 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 which 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 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) ~~may~~ 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 shall encourage~~s~~ 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/or 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. **~~and, if established, support removal and eradication efforts~~**
- **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 ~~full~~ mitigation of 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 ~~will~~ shall be managed to maximize the use of available existing and improved habitats and 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 ~~A~~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 ~~M~~minimize non-native fish impacts to native fish species by using appropriate invasive fish-removal methods (e.g., gill net, ~~piscicides~~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

- ~~Priorities for controlling non-native fish impacts to native fish species are to address predation first, competition and hybridization second, and then other threats.~~
- The agencies and tribes shall p~~P~~rioritize 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, ~~and~~ develop and implement strategies to reduce competition from non-native fish species with juvenile and adult salmonids
- **Regional coordination**
  - The Council ~~will~~ shall continue to be a regional leader coordinating 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 regional hydropower system. The Council ~~will~~ shall continue to assist with regional communication, coordination and public outreach efforts in the Columbia River Basin, and will facilitate regional science-policy forums on non-native invasive species issues, as appropriate.
  - The Council shall support~~s~~ the collaborative work of the PSMFC 100th Meridian Initiative-CRB Team and requests 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~~ shall 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 ~~control~~ 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, bird predators such as Caspian terns, ~~and~~ 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 River 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 ~~control~~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-~~control~~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-~~control~~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 ~~will~~ shall report to the Council annually on their respective predator ~~control~~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
- **Fish predator ~~control~~management**
  - 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 effectiveness of focused pikeminnow removals for these expanded dam angling efforts and implement as warranted. Scoping of focused pikeminnow removals at other mainstem dams ~~or~~ in the lower Columbia River ~~and estuary~~ will be based on evaluations and adaptive management principles with input from NOAA Fisheries and the fish and wildlife agencies and tribes~~manager~~s 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 strategies systemwide to manage and reduce non-native fish species that compete and feed on native fish (both anadromous and resident species) in the basin.

~~Prior to reintroducing salmon above Grand Coulee Dam, the federal action agencies should evaluate the size of non-native fish populations to determine the potential effect of predation and implement a predator management program for Lake Roosevelt, if warranted.~~

- **Bird predator ~~control~~management**
  - The Council shall encourage~~s~~ more aggressive efforts by the Corps and others to make the fullest possible use of their existing authority to remove or manage avian predation~~rs~~ that is~~are~~ 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 avian predation 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
- **Seal and sea lion predator ~~control~~management**

- 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 fish losses through seal and sea lion management in the lower Columbia River and estuary
- State and federal fish agencies conducting ~~L~~lethal take to ~~control~~ manage seal and sea lion predation, consistent with state and federal law, ~~is appropriate~~ shall continue this work when non-lethal methods of control are not successful and the adverse impacts to salmonids or other native fish species are significant

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.

This strategy also includes a set of standards to protect fish and wildlife for the Federal Energy Regulatory Commission, Bonneville and other agencies to apply to the development and licensing of hydroelectric facilities outside of 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.

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.

General measure
The Council expects the Federal Energy Regulatory Commission, in the exercise of its licensing authority under the Federal Power Act, ~~to~~ shall take the Council's hydroelectric development standards and protected areas designations into account to the fullest extent practicable. 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

The Council supports providing flows and habitat conditions of adequate quality and quantity for improved survival of anadromous and native resident fish populations ~~at and between hydroelectric facilities~~ on the mainstem Columbia/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 mainstem 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 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, in cooperation with the Environmental Protection Agency 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); and
  - 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~~ should 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~~ shall also assist regional parties in advancing public education and information on toxics issues
- The federal action agencies, in cooperation with the Environmental Protection Agency 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) and s~~Support implementation of the regional 2010 Columbia River Basin Toxics Reduction Action Plan. Both the WQP and *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~~

shall 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 ~~water temperatures, TDG and~~ 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, particularly in the middle and upper Columbia reaches and in the Snake River
- The federal action agencies should partner with and support federal, state, tribal and regional agencies to implement monitoring strategies for contaminants of emerging concern (CECs) as identified in the 2014 report entitled "Columbia River Toxics Reduction Working Group: Strategy for Measuring, Documenting and Reducing Chemicals of Emerging Concern."
- The federal action agencies should partner with and support federal, state, tribal and regional agencies to evaluate which toxic contaminants, or the synergistic effects of multiple toxic contaminants, most limit the reproductive success of native fish.
- The Corps of Engineers and the Bureau of Reclamation should partner with and support federal, state, tribal and regional agencies to evaluate reservoirs to determine whether seasonal anoxia and trapped mercury in reservoir sediments contributes to mercury methylation, which bioaccumulates in the food web, affecting the reproductive health of native fish and causing fish contamination and fish consumption advisories in the Columbia River Basin. If mercury methylation problems are identified in these reservoir evaluations, work collaboratively to develop and implement remedial actions to reduce the contamination.
- At each hydropower project, federal and non-federal project operators in the Columbia River Basin should ~~continue to~~: a) monitor and report ~~for~~ 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 shall~~to~~ provide funding, similar to the funding of 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; and
  - 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 ~~program in 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 ºC 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; and
- 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 ~~would be~~is the appropriate way to respond to changes in climate

General measures

The federal action agencies, in coordination and collaboration with others, ~~will~~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 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
- ~~I~~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 shall support~~s~~ the need for studies and assessment methods to prepare the tools for this task, and requests federal action agencies and others do the same

- The Council shall convene a series of science-policy workshops on climate change effects in the Columbia Basin, including panels of climate change scientists, to develop an overarching climate change strategy for the Columbia Basin.
- The Council shall continue 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 shall continue 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 ~~and are well accepted in the region~~. 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 ~~P~~provide streamflows with appropriate timing, quantity, and water quality to promote productive populations of anadromous and resident fish and provide reservoir conditions to promote productive populations of native fish and wildlife. Manage water to protect and improve habitat conditions for all fish affected by the hydrosystem, not just listed species.
- The federa action agencies, in collaboration with state, federal, and tribal fish agencies, shall ~~D~~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. 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, in collaboration with state, federal, and tribal fish agencies and the utilities, shall ~~I~~implement 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 [see sturgeon and lamprey strategies]. The Council ~~may~~ should 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, and if not, recommend modifications that, if possible, provide improved protection to these other fish while maintaining the survival benefits to listed species needed to meet the Endangered Species Act requirements.
- Following the principles of adaptive management, the federal action agencies, in collaboration with state, federal, and tribal fish agencies and the utilities, shall continue to investigate, develop and implement flow and passage measures that improve ~~juvenile, adult, and~~ fish life-cycle survival,. ~~This includes taking advantage of~~ including any potential modifications in storage reservoir and flow operations ~~to the benefit of fish and the ecosystem generally~~ that may result from the review by the U.S. and Canada of the Columbia River Treaty ~~review.~~

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[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)(I)(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 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.

  The FPC Oversight Board ~~will~~ shall 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 PUDs, shall c~~C~~ontinue 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 ~~R~~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 shall continue~~s~~ 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 shall encourages the action agencies to remove any reference to these operations as "experimental" in future biological opinions. The Council shall 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~~, including the Corps, the Bureau of Reclamation (the Bureau), Bonneville, NOAA Fisheries, the U.S. Fish and Wildlife Service, the Kootenai Tribe of Idaho, the Confederated Salish and Kootenai Tribes and the Idaho Department of Fish and Game~~ to discuss proposals for adjustments to winter and spring operations at Libby and Hungry Horse dams~~. This includinges consideration ofing~~ 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~~ shall assist in these discussions as necessary. Any significant findings or proposed changes should be reported to the Council.

- **Albeni Falls Dam.** The Corps should ~~i~~Investigate changes in operations at Albeni Falls Dam to reduce downstream temperatures to benefit native fish or identify and undertake other temperature mitigation measures.
- **Grand Coulee Dam operations**. The Council shall calls on the Bureau and NOAA Fisheries to work with the Spokane Tribe, Colville Confederated Tribes, ~~and~~ Washington Department of Fish and Wildlife, Bonneville, and other relevant agencies and tribes and utilities to evaluate alternative operations recommended to the Council again in 2013 by the Spokane Tribe. [see alternative operation]. 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.
  - Refill 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~~ shall 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. As part of the FERC proceeding, FERC shall investigate possible options for reducing water temperatures in discharges to improve downstream habitat conditions, particularly for fall Chinook salmon spawning.

- **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 c~~C~~ontinue 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 improve and increase ~~take advantage of~~ 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 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 Public Utility District 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.

- o 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.
- o 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.
- o Install new, fish-friendly turbines or optimize turbine operations to improve juvenile fish survival.
- o ~~As a priority, c~~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 shall continue~~s~~ to recognize the value of an experimental approach to salmon recovery in the Northwest. The Council shall support~~s~~ the development of adaptive management experiments that address critical uncertainties related to species survival.

  Proposals for such experiments ~~must~~ shall 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, ~~universities in the Northwest,~~ state fish and wildlife agencies, tribes,

managers, U.S. Fish and Wildlife Service, other federal agencies, the independent science panels, and othersprivate 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.

- **Juvenile fish transportation.** The Council shall recognizes the need to transport migrating juvenile salmon and steelhead under certain river conditions. The Council shall 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 impact 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 and/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
  - Investigate and report on how adult bull trout use existing passage routes and the potential need for alternative routes of downstream fish passage

Power system considerations

- The Council will shall work with federal and non-federal operating agencies, federal and state fish and wildlife agencies and tribes to review, update, and implement procedures thatto accommodate power system and dam operation

emergencies with the least impact on listed and non-listed fish and with consideration of protection~~long-term conservation~~, mitigation and recovery objectives.

- Fish survival emergencies may require operations that temporarily reduce or curtail power production, which ~~must~~ shall be implemented in the most cost-effective manner possible by the federal action agencies and non-federal operating agencies
- The Council ~~will~~ shall 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 ~~by 9 percent and spring Chinook~~, sockeye, and steelhead ~~by 6 percent, improvements possibly unequaled by tributary habitat actions~~.

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 ~~will~~ shall implement in partnership with fish and wildlife agencies and tribes ~~managers~~ and other organizations:

- Removal and/or lowering of dikes and levees that block access to habitat, or install fish-friendly tide gates for habitat reconnection, protection and restoration of riparian areas and off-channel habitat
- Continue to ~~i~~identify and assess candidate floodplain habitat types in the estuary that could be reconnected using levee modification
- 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; the program ~~will~~ 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~~, near-shore ocean plume characteristics,~~ and salmon and steelhead productivity, abundance, and diversity

The Council ~~will~~shall:

- 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. In March 2015, receive from Bonneville and the Corps, a summary report on the results of action-effectiveness, status, and trend monitoring and research uncertainties. The report ~~must~~ shall provide information to help improve and substantiate th*e effectiveness of* habitat actions implemented in the estuary by parties that do not monitor their own habitat actions [see adaptive management (reporting) strategy].

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

The Council supports monitoring of 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 shall support 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 e~~E~~valuate the effects of flow regulation on near-shore plume characteristics and salmon and steelhead productivity, abundance, and diversity
- The Council shall support 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 ~~will~~ shall allow for adjustments to inland actions and may lead to increased survival benefits.

- The Council shall support coordination between ocean scientists and state fish and wildlife agencies and tribes to identify key uncertainties and opportunities to improve inriver management activities based on current ocean conditions.
- The Council shall support 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 ~~managers~~agencies and tribes. The Council ~~will~~ shall consider recommendations from the forum when making recommendations to Bonneville regarding implementation of this strategy.
- The Council shall encourage~~s~~ 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-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 the fish mitigation projects as much as possible and 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 shall encourage~~s~~ wildlife agencies and tribes ~~managers~~ to monitor and evaluate habitat and species responses to mitigation actions
- Bonneville and the fish and wildlife agencies and tribes ~~managers~~ shall 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 ~~managers~~ and Bonneville shall 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 shall continue to endorse habitat units as the preferred unit of measurement for mitigation accounting and the Habitat Evaluation Procedure methodology as the preferred method for estimating habitat units lost and acquired. Parties to a wildlife mitigation agreement ~~may~~ should 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 ~~H~~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 Habitat Evaluation Procedure 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

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.

Link to resolving uncertainties and tracking progress

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.

B. Fish Propagation Including Hatchery Programs

Core strategy

The Council supports using hatchery programs as tools to help meet the mitigation requirements of the Northwest Power Act. 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 U.S. v Oregon.

Rationale

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. These reviews have included:

- Pacific Salmon and Artificial Propagation under the Endangered Species Act (NMFS) (1992)
- Regional Assessment of Supplementation (RASP) (1992)
- Integrated Hatchery Operations Team (IHOT) (1994)
- Artificial Production Review (APRE) (1999)
- NOAA Policy on the Consideration of Hatchery-Origin Fish in ESA Listing Determinations (2005)
- Ad Hoc Supplementation Work Group (2008)
- Hatchery Scientific Review Group (2009)
- Review of U.S. Fish & Wildlife Service Hatcheries in Washington, Oregon, and Idaho (201~~3~~1)
- State conservation and federal ESA recovery plans
- ISAB 2005 Report on Harvest Management of Columbia River Salmon and Steelhead~~reviews (2008 steelhead and others)~~

The Council is committed to an adaptive management approach that uses research and monitoring data to understand, at multiple scales, how hatcheries are performing.

As a result of research and monitoring funded pursuant to this Program and by others, 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 hathery strategies to address the specific population mitigation and other management objectives in each watershed in the basin.

In 2009, the 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 encourages the managers to consider HSRG guidelines. Managers should decide which guidelines, including the HSRG guidelines, are appropriate for their circumstances when developing HGMP's. The Council requests from NOAA Fisheries annual reports on the status of HGMP's. 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.

The hatchery operators have considered the HSRG review as guidance in developing hatchery and genetic management plans (HGMPs) for each hatchery program. There are several propagation strategies that are implemented in the basin including; segregated programs to maintain fish abundance for harvest, integrated programs to compliment wild fish restoration and provide harvest benefits, supplementation and captive rearing programs to bolster weak wild populations, and reintroduction programs to replace fish population that have been lost completely. The Council defers to the tribal, state, and federal fish and wildlife managers 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:

- 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 processes 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. Managers 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. Bonneville will continue to provide adequate support for terminal fisheries in the estuary and other basin locations beyond 2017.
- 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. Managers 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 federal and state fish and wildlife agencies and appropriate Indian tribes, including complements to habitat improvements by supplementing native fish populations.
- The Council's research plan ~~will~~ shall 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 naturally spawning fish.
- The Council shall support~~s~~ the fish and wildlife managers utilizing and Bonneville continuing to support standardized performance measures to inform effectiveness of various propagation strategies in meeting intended hatchery goals.
- NOAA Fisheries should 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 shall request~~s~~ that NOAA update the list of reference streams first identified by the Ad Hoc Supplementation Workgroup that are linked to important population segments, major population groups and populations, and report on the average proportion of naturally spawning fish for the time series of data available on an as needed basis. The Council ~~may~~ should also ask that the ISAB review the list.
- 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, managers and operators ~~will~~ shall aspire to improve hatchery program performance and, in coordination with co-managers, ~~will~~ shall seek-out opportunities to test and monitor alternative hatchery strategies and approaches and alternative hatchery practices.
- To facilitate compliance monitoring, managers ~~will~~ shall monitor their

hatchery programs for compliance with Federal, and state, and other relevant requirements and they ~~will~~ shall make this information readily available.

- The Council shall continue~~s~~ to support PIT tagging and detection, coded wire tagging and recovery, acoustic and radio tagging and tracking, genetic tagging and recovery 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~~ shall rely on information provided by the independent science panels and the fish managers regarding hatchery science. The fish managers ~~will~~ shall 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.

1. Reintroduction

Sub-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, over time, result 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 fish and wildlife managers.

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 ~~L~~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 shall be developed by the fish and wildlife managers and submitted to the Council

C. Other strategies

1. Wild fish

Strategy

Native, wild or naturally spawning 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 hydro system's impact on wild fish and to assist in the rebuilding of certain wild fish populations.

Rationale

Since 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, but where other limiting factors prevent naturally spawning populations of salmon and steelhead from persisting on their own, the use of hatchery fish used for supplementation or conservation may be appropriate.
- 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 Hydro-system 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 naturally spawning populations in fisheries should be managed consistently with Harvest Biological Opinions and with other conservation-based management agreements.

General measures

- The Council shall consider the needs of wild fish in all facets of its fish and wildlife program including: hydro system passage, fish propagation facilities, climate change, predation, strongholds, research, carrying capacity, and habitat actions.
- Consistent with the Council's quantitative objectives for adult naturally spawning salmon and steelhead, the Council ~~will~~ shall 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, strategies: strongholds, hatcheries, habitat, and adaptive management

2. 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 C].

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)~~managers~~
  - 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 and/or anadromous fish
- Populations that support important fisheries. This priority applies to introduced and native species, including 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 Aaction Aagencies and FERC, in collaboration with state agencies and tribes, shall fund mitigation of anadromous fish losses, including approaches 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

- **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 by 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 plantings of salmon and steelhead. If the area that would be used by anadromous fish is in British Columbia, this element in particular would require cooperation and collaboration with provincial, federal, First Nation and other partners in Canada.
- 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.

o 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

o 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, through 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, should investigate and, if warranted, implement passage and reintroduction of anadromous fish into suitable habitats within the United States. This should include:
  - Funding research associated with critical uncertainties at Chief Joseph and Grand Coulee dDams 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.

3. 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~~ 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 ~~completed~~ quantitative native resident fish loss assessments ~~and where mitigation based on native resident fish is not feasible,~~ 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 ~~acquisitions~~ in perpetuity for purposes of fish habitat, 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~~. 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. Mitigate according to the following ordered priorities:
    - weak, but recoverable, native populations injured by the hydropower system, as such populations are identified for the Council by the fishery agencies and tribes;
    - areas of the basin where anadromous fish are not present;
    - resident fish projects that also provide benefits for wildlife
    - populations that support important fisheries. This priority applies to introduced and native species, including trout, sturgeon, kokanee, burbot, bass, perch and others

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, ~~If it is not feasible to restore native fish,~~ Bonneville shall ~~create~~ acquire fish habitat equal to the ~~quantity and~~ 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 shall 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 efforts[6] 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 shall encourage~~s~~ Bonneville to negotiate settlement agreements, as described in the Appendix K.

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

- 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 ~~E~~evaluating~~e~~ 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, if warranted.
- Bonneville, the Corps, and the Bureau shall restore passage for native resident fish where feasible, including at Albeni Falls

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.

4. 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 ~~throughout the Columbia and Snake River basins~~ are 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 and/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 ~~the Kootenai Tribe Integrated Fish and Wildlife Program as~~ interim measures to avoid ~~extinction~~ extirpation of ~~a~~ 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:
  - 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
- ~~Bonneville and the Corps shall:~~
  - 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 dewater 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 and 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, that affect natural spawning, reproduction, growth, and survival of larval and juvenile fishes, and overall recruitment success of sturgeon
- ~~Conduct dredging operations in a manner~~ Mm~~i~~inimiz~~inge~~ dredging-related ~~operation-related~~ mortality on sturgeon including their primary prey/food. This is especially important for Snake River sturgeon that grow and mature more slowly than other Columbia Basin sturgeon populations.

Predation – See predator control strategy

Research – See research section of the adaptive management strategy

Monitoring

- The Action Agencies shall support the agencies and tribes to:
  - 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
  - ~~Harvest stock assessment:~~ 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 and agencies and tribes shall:
  - Consider hatcheries for sturgeon as a mitigation strategy to supplement populations where natural recruitment is currently severely limited. ~~If and w~~When the strategy is implemented~~, and~~ 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
- ~~Fund research into~~Develop larval collection techniques ~~and implementation of~~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; and
- 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 shall support the agencies and tribes to:
  - Conduct baseline population assessments to monitor hatchery and naturally spawning 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 ~~recovery~~ 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.

5. Lamprey

Strategy

Implement actions that result in increased abundance and survival for lamprey ~~eels~~, 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 ~~western~~ brook lamprey. Most of the information and efforts~~s~~ 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. ~~Lamprey are extirpated above impassable dams in West Coast streams.~~ 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 Pacific Lamprey Conservation Agreement

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 p~~Improve understanding of p~~opulation size, distribution, and other limiting factors for lamprey related to the hydropower system needs improved understanding

- Lamprey throughout their historic range should be self-sustaining and harvestable

General measures

Hydropower system

- The Action Agencies shall:
  - ~~I~~Identify and address effects of hydrosystem operations, including reservoir elevation fluctuations and an altered hydrograph on adult and juvenile lamprey ~~residing in reservoirs~~
  - 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/or other metrics relating to migratory success of lamprey above dams with poor passage
  - Install lamprey-friendly passage structures for adult and juvenile lamprey ~~at known passage obstacles~~
  - Monitor and report predation on adult and juvenile lamprey during passage at mainstem dams.
  - Assess the i~~I~~mpacts of dredging on lamprey around hydropower dams and navigation facilities.

Mainstem and tributary habitat

- The Action Agencies and 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 control strategy

Research – See research section of the adaptive management strategy

Monitoring

- The Action Agencies shall support the agencies and tribes to:
  - 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 ~~Hatchery~~

~~E~~ The Action Agencies and agencies and tribes shall evaluate the potential role of lamprey ~~hatcheries~~ 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 and agencies and tribes shall:
  - Complete a loss assessment for lamprey
  - ~~d~~Determine the potential effects of climate change on lampreys, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetics and performance
  - 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, needs to be taken into consideration
  - 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 control, water quality, habitat, adaptive management (research)

6. Eulachon

Strategy

Increase understanding, protection and required restoration of eulachon for the Basin, estuary and ocean ecosystems. Better understand how the development and operation of the Federal Columbia River Power System affects eulachon spawning, egg, larvae survival 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, the 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 shall support~~s~~ 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 shall 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 shall ~~C~~consider developing the following specific to eulachon:
  - If developed for the eulachon recovery plan the biological objectives for eulachon population characteristics and habitat needs will be supported by the Council
  - Develop a high-level indicator for eulachon abundance
  - Monitor the status of and evaluate the characteristics affecting survival of eulachon
- If NOAA Fisheries identifies actions for eulachon restoration, the Council ~~will~~ shall 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 and NOAA Fisheries, ~~states~~ agencies and tribes, ~~will~~ shall 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 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.

7. 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 shall 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, shall publicly recognize and acknowledge entities that provide good examples of productive partnerships across social and ecological boundaries
- The Council shall 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 towards program goals and objectives.

Rationale

The Council has recognized the need to apply an adaptive management approach since its 1982 program. Appling 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 Basins' fish, wildlife and their habitat.

Monitoring, research, data management, evaluation and reporting- are essential tools of adaptive management for assessing successes and failures of ~~actions~~ 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 ~~has been~~continues to be improved. ~~incomplete due to the lack of specific quantitative objectives to guide monitoring and evaluation activities and the lack of long-term evaluation and reporting about progresstowards program objectives have resulted in incomplete adaptive management process for the program, . has also contribute to this incomplete application. Further to facilitate tracking and reporting on program progress.~~Ongoing efforts ~~to address these~~ needs 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. ~~This work is being accomplished in collaboration with the fish and wildlife agencies, tribes, and others and is complemented by the Pacific Northwest Aquatic Monitoring Partnership's~~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:

- Monitor program-funded projects and measures to ensure they are implemented properly, comply with established standards, perform for the intended duration, and are completed as planned.
- Monitor the status and trends of fish, wildlife, and habitat over time with particular attention to tracking quantitative biological objectives, reporting on indicators, and informing statistical models such as life-cycle models.
- Status and trend monitoring also informs baseline information needed to track progress to Council's 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.
- Project~~s~~ 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 ~~interpreted~~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.org to share information about how data are collected.
- Bonneville and the hatchery managers 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. The first report should be submitted in December 2014. BPA 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 databases 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

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.

Research

Principles

- Research ~~explores the cause and effect relationship between program-funded measures and improved conditions for fish and wildlife. It also~~ 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 — addresses hypotheses relevant to management decisions, an underlying assumption of the program, and include expected effectiveness outcomes;
  - Legal Relevance — addresses 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 (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 and 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.
- ~~Bonneville and its partners should continue to transition its evaluation of habitat projects into a comprehensive, independent, standardized, and cost-effective effort~~
- 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 system that provides access to data from federal and state agencies and tribes, and other data gathering entities in the Basin.
- Refinement of coordinated data management systems should be guided by program evaluation and reporting needs.
- Collaboration among ~~federal and state~~ 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 habitat.

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 a single website.

- Bonneville should ensure that ~~All~~ all information about anadromous fish is summarized by specific life-cycle stage and made accessible from a single gateway location,.~~should be accessible from a single location and tracked by specific life-cycle stage.~~

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, and are a good sub-metric for much broader HLIs.

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 fish and wildlife ~~managers~~ agencies and 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 will continue to maintain the program's dashboard and HLI web-report and produce its own reports, and 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 list of Council requested reports].
- The Council with the assistance of fish and wildlife ~~managers~~agencies and tribes and others will maintain the program's dashboard, HLI web-report, and, as appropriate other reports, such as a report that tracks anadromous fish forecasts and ~~results~~ actual run size on an annual basis. This will provide

easy access for the public and allow the Council to review the accuracy of the pre-season 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 ISRP will use the risk uncertainty matrix to assess whether the level of monitoring is appropriate for the proposed project and measures. This assessment should be done by both the project sponsor when submitting a proposal for review and 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, 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, and/or population

characteristic align with the perceived risk[7] of the activity to fish, wildlife and habitat and the level of certainty[8] 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.

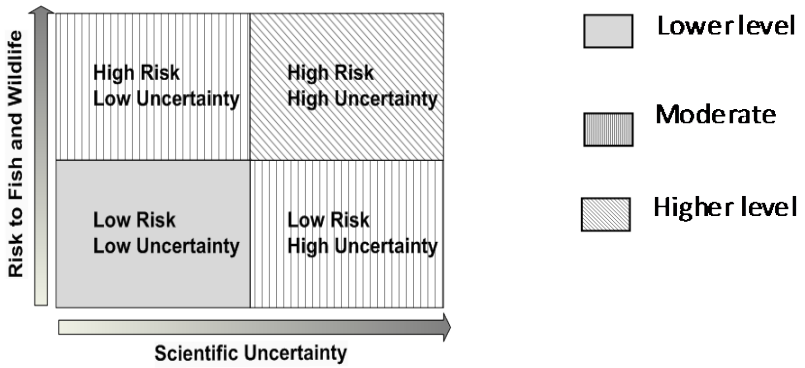

Figure 5. Risk-uncertainty matrix guiding level of monitoring efforts for a given action (hatchery, hydrosystem, habitat), and biological status. This guidance also applies to effectiveness assessments and research.

[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 and/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 the 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 ~~managers~~ 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 management 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 the Bonneville Power Administration (Bonneville) funding which 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 indentified in the subbasin plans or other relevant planning documents.

The ISRP uses the 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 the areas with dam removal or where substantial restoration work has occurred. Subbasin plans provided the foundation for many ESA recovery plans and state management plans. For the Council, the subbasin plans remain the primary planning document 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 ~~provide~~ links to the latest tribal, state and federal planning efforts. ~~as well as key elements of the subbasin plans such as objectives, limiting factors, and focal species information.~~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 are 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 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 science 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 science review of proposed work and, if ongoing, of past performance. Projects and the science review report are subject to public review. The Council then develops funding recommendations for Bonneville based on the proposed projects, the program, the science 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

Bonneville, the Corps, and the Bureau, in collaboration with federal and state agencies and tribes, will 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 that 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 ~~manager~~ agencies and tribes (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 ~~strategies~~ 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 ~~and not a mitigation obligation under the Fish and Wildlife Program~~. Funding for these efforts should be derived primarily from the Corps and the Bureau O&M 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). T~~If necessary, t~~he Council ~~encourages~~ urges the ~~Corps~~ Action Agencies to ~~seek, secure and award sufficient funding authorization to~~ meet ~~the priorities of both~~ their Willamette and FCRPS Biological Opinion~~s~~ 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.

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 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 over time 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 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 ~~control~~; (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 the 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 rate-payers. 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 is comprised of 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.

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, in most cases results in a stronger project to benefit fish and wildlife and the region.

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 ~~linked to~~ milestones and deliverables. ~~for those projects as appropriate~~
- 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 which may include:. ~~The elements below represent the key areas in which the Council seeks continued coordinated efforts from fish and wildlife managers and interested parties throughout the region.~~

- 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 affect fish and wildlife are planned and implemented
- C~~Subbasin level c~~oordination of subbasin or other level ~~of p~~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 ~~bi~~annual forum and a subset of the resulting priority activities identified by the group, as appropriate for the particular entity. All related work should be focus ~~ed~~ on ~~the following~~ activities that inform the Council on policy, program performance evaluation, and implementation decisions and that are of benefit at a basinwide or regional scale.

~~support program implementation:~~

- ~~Facilitating and participating in Council-sponsored or -requested workgroups and forums~~
- ~~Program reporting (data management, storage, and synthesis)~~
- ~~Monitoring and evaluation (framework and assessment)~~
- ~~Developing and tracking biological objectives and indicators~~

- ~~Review of technical documents and processes~~
- ~~Coordination of projects, programs, and funding sources within subbasins~~
- ~~Information dissemination (technical, policy, and outreach)~~

All ~~Any~~ entities~~y~~ ~~or organization~~ 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. Each group 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, also in 1996, 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 toward 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 Council established the Independent Economic Analysis Board ~~(IEAB)~~ to provide the Council with advice and an increased analytical capability to help bring economics to bear on issues within the Council's statutory responsibilities. This advisory committee 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 itself and approved by majority vote of the Council's, NOAA Fisheries', and the tribes' representatives overseeing the ISAB's administration.

The Independent Economic Analysis Board responsibilities ~~will~~ include:

- Aadvise~~e~~ing 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

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.
Findings on the recommendations

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 or 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
~~The enhancement of resident fish to address losses of salmon and steelhead in those areas permanently blocked to anadromous (ocean-migrating) fish as a result of hydroelectric dams.~~

Baseline condition - historical and/or current conditions against which progress (or lack of progress) can be measured. The lack of baseline condition should not be a reason to take no actions under this program. Enough baseline information should be gathered as quickly as possible to be reasonably certain the actions proposed are addressing priority limiting factors to benefit focal species in priority reaches.

Baseline passage measures: the base, or starting point, for fish passage measures in the program based on the FCRPS Biological Opinion.

Baseline water management measures: the base, or starting point, for water management operations in the program based on the FCRPS 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 states, which 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.

Confidence level - the percentage of all possible samples that can be expected to include the true population parameter. For example, if all possible samples were selected from the same population and a confidence interval is computed for each sample. A 95% confidence level implies that 95% of the confidence intervals would include the true population parameter.

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 Wildlife Losses - The wildlife losses that occurred as a direct result of construction of a dam and the flooding of the area up-river 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, that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).

DPS (Distinct population segment) –

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 - 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.

Effectiveness monitoring - Assessing that 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 of 1973 as amended - Federal legislation 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 the 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.

Exceptional Benefits -

Extirpated – the loss of a discrete subpopulation within a species

Extinction - the loss of an entire species

~~**Extinction** - The natural or human-induced process by which a species, subspecies or population ceases to exist.~~

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 ~~managers~~ agencies and tribes – the Federal and region's State fish and wildlife agencies and Indian tribes.

Floodplain - Land adjacent to 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 and/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.

Gas supersaturation - The overabundance of gases in turbulent water, such as at the base of a dam spillway. Gas supersaturation can cause a fatal condition in fish similar to the bends in humans.

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 ~~managers~~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 naturally spawning 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.

HOB/NOB - number of hatchery-origin fish and natural-origin fish used as hatchery broodstock) and pNOB values (proportion of hatchery broodstock composed of natural-origin fish

HOS/NOS - number of hatchery-origin fish and natural-origin fish spawning naturally) and pHOS values (proportion of natural spawners composed of hatchery-origin fish

HORS/NORS - the number of hatchery-origin recruits and natural-origin recruits

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.

Irrigation - Water diverted from surface-water bodies or pumped from groundwater and applied to agricultural lands though 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.

Jack salmon - A salmon that matures at age 2 and returns from the ocean to spawn a year earlier than normal. Jacks are all male fish.

Juvenile - 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 its 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 life history stages (temporally and spatially connected sequences in life history segments) available for a species to complete 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.

Mainstem 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.

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

Mixed-stock fishery - A fish-harvest management technique by which different species, strains, races, or stocks are harvested together.

MPG (Major population group) –

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

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

Naturally spawning populations - Populations of fish that have completed their entire life cycle in the natural environment and may be the progeny of wild, hatchery, or mixed parentage.

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.

Non-native invasive species – an exotic 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.

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.. ~~Studies show a Northern Pikeminnow can eat up to 15 young salmon a day.~~

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 - An element (oxygen, nitrogen, and phosphorus) or compound required for the growth and development of an organism.

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

Objectives – clearly describe biological and non-biological changes needed to achieve the vision in a quantifiable fashion. This is a broader term that includes biological objectives, defined above. These serve as a benchmark to evaluate progress toward the vision and should, as feasible, be 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/or 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.

Operational losses - The direct wildlife losses caused by the day-to-day fluctuations in flows and reservoir levels resulting from the operation of the hydropower system.

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.

Performance measures, standards and targets - 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.

pHOS – percent HOS, see glossary for HOS

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.

PNI Value – Proportionate natural influence on a composite hatchery-/natural-origin population.

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 - Precision is 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 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, 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 (RSW) - 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, resident life histories of the native anadromous species, e.g. kokanee (see appendix with all focal species).

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.

Run-of-river - (ROR) is a type of hydroelectric generation whereby little or no water storage is provided. Run-of-the-river power plants may either have no storage at all, or a limited amount of storage, therefore, subject to seasonal river flows and may operate as an intermittent energy source while a plant with storage can regulate water flow and serve either as a peaking power plant or base load power plant.

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

Secondary Wildlife Losses - The cumulative ongoing loss of wildlife from multiple effects, including: food web changes resulting from changed ecosystems, the lack of ocean nutrients formerly derived from salmon and steelhead that were blocked or diminished following dam construction.

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 therefore 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.

Species Range - Species have areas of occurrence (ranges) that are limited by suitable climatic conditions, especially temperature and moisture availability.

Thus, as temperature and precipitation patterns change, species will disappear from parts of their former ranges that have become unsuitable for their existence, and they may appear in new areas where they were formerly absent. Whether or not the ranges move or expand depends on the ability of organisms to disperse or migrate to the areas that become suitable.

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.

Statistical Significance - Statistical significance is the probability that an effect is not likely due to just chance alone.

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 assessment - The assessment is the technical evaluation of the biological and physical characteristics of the subbasin. Its primary purpose is to bring together technical information for the analysis needed to develop biological objectives.

Subbasin management plans - Management plans sets 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 the dam.

Tailwater - The water surface immediately downstream from a dam.

Take - From Section 3(18) of the Federal Endangered Species Act: “The term ‘take’ means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

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.

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 and/or migratory routes cross the United States-Canada border.

Transportation - Collecting migrating juvenile fish and transporting them around the 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; and the Spokane Tribe of Indians.

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

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

***U.S. 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.

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.

Yearling - A juvenile fish between one and two years old.

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.
http://www.nwcouncil.org/media/115927/AppendixDLosses.pdf

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

1. Mitigation priorities

a. Bonneville and wildlife ~~managers~~agencies and tribes

Ensure that wildlife mitigation projects implemented in fulfillment of this program are consistent with the basinwide implementation priorities described in Tables C-1, C-2 and C-3, below.

Table C-1 Lower Columbia Subbasin Wildlife Mitigation Priorities

Habitat Types--Target Species	Priority
Riparian/Riverine • Great Blue Heron	High
Old Growth Forest • Northern Spotted Owl	High
Wetlands • Great Blue Heron • Band-tailed Pigeon • Western Pond Turtle	High
Coniferous Forest • Ruffed Grouse • Elk • American Black Bear/Cougar	Medium

Table C-2 Upper Columbia Subbasin Wildlife Mitigation Priorities	
Habitat Types--Target Species	**Priority**
Riparian/River • Bald Eagle (breeding) • Black-capped Chickadee • Peregrine Falcon	High
Shrub-Steppe • Sharp-tailed Grouse • Pygmy Rabbit • Sage Grouse • Mule Deer	High
Wetlands • Mallard • Redhead	High
Islands • White Pelicans	Medium
Agricultural Lands • Swainson's Hawk • Ring-necked Pheasant	Low

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Table C-3 Snake River Subbasin Wildlife Mitigation Priorities	
Habitat Type--Target Species	**Priority**
Riparian/Riverine • Bald Eagle (breeding) • Bald Eagle (wintering) • River Otter • Black-capped Chickadee • Peregrine Falcon • Ruffed Grouse	High
Wetlands • Mallard	High
Native Grasslands and Shrubs • Mule Deer/Elk • White-tailed Deer • Sharp-tailed Grouse	Medium
Coniferous Forest • Elk	Medium

Old Growth Forest • Pileated Woodpecker	Medium
Lowland Forest • White-tailed deer	Low

Table C-4 Estimated Losses and Gains Due to Hydropower Construction and Inundation[9] (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
• Black Capped Chickadee	-890
• Ruffed Grouse	-919
• Blue Grouse	-1,980
• Mule Deer	-2,689
• Peregrine Falcon	-1,222 acres*
* Acres of riparian habitat lost. Does not require purchase of any lands	
Black Canyon	
• Mallard	-270
• Mink	-652
• Canada Goose	-214
• Ring-necked Pheasant	-260
• Sharp-tailed Grouse	-532

[9] The above tables represent the wildlife losses associated with the construction and inundation of the Columbia River hydrosystem. From its inception, the Fish and Wildlife Program 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 and are intended to provide mitigation for the wildlife losses associated with hydroelectric projects in the state of Montana, the Willamette Basin in Oregon and for Dworshak Dam in Idaho.

• Mule Deer	-242
• Yellow Warbler	+8
• Black-capped Chickadee	+68
Deadwood	
• Mule Deer	-2080
• Mink	-987
• Spruce Grouse	-1411
• Yellow Warbler	-309

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Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
Palisades	
• Bald Eagle	-5,941 breeding -18,565 wintering
• Yellow Warbler/	-718 scrub-shrub
• Black Capped Chickadee	-1,358 forested
• Elk/Mule Deer	-2,454
• Waterfowl and Aquatic Furbearers	-5,703
• Ruffed Grouse	-2,331
• Peregrine Falcon*	-1,677 acres of forested wetland -832 acres of scrub-shrub +68 acres of emergent wetland
* Acres of riparian habitat lost. Does not require purchase of any lands	
Willamette Basin Projects	
• Black-tailed Deer	-17,254
• Roosevelt Elk	-15,295
• Black Bear	-4,814
• Cougar	-3,853
• Beaver	-4,477
• River Otter	-2,408
• Mink	-2,418
• Red Fox	-2,590
• Ruffed Grouse	-11,145
• California Quail	-2,986
• Ring-necked Pheasant	-1,986
• Band-tailed Pigeon	-3,487
• Western Gray Squirrel	-1,354
• Harlequin Duck	-551
• Wood Duck	-1,947
• Spotted Owl	-5,711
• Pileated Woodpecker	-8,690
• American Dipper	-954
• Yellow Warbler	-2,355
• Common Merganser	+1,042
• Greater Scaup	+820
• Waterfowl	+423
• Bald Eagle	+5,693
• Osprey	+6,159
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

Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+")

Species	Total Habitat Units
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
• Spotted Sandpiper	-534
• Yellow Warbler	-170
• Black-capped Chickadee	-183
• Western Meadowlark	-247
• Mink	-330
Bonneville	
• Lesser Scaup	+2,671
• Great Blue Heron	-4,300
• Canada Goose	-2,443
• Spotted Sandpiper	-2,767
• Yellow Warbler	-163
• Black-capped Chickadee	-1,022
• Mink	-1,622
Dworshak	
• Canada Goose-(breeding)	-16
• Black-capped Chickadee	-91
• River Otter	-4,312
• Pileated Woodpecker	-3,524
• Elk	-11,603
• White-tailed Deer	-8,906

• Canada Goose (wintering)	+323
• Bald Eagle	+2,678
• Osprey	+1,674
• Yellow Warbler	+119

Table C-4 (cont.) Estimated Losses and Gains Due to Hydropower Construction (losses are preceded by a "-", gains by a "+"	
Species	**Total Habitat Units**
Minidoka	
• Mallard	+174
• Redhead	+4,475
• Western Grebe	+273
• Marsh Wren	+207
• Yellow Warbler	-342
• River Otter	-2,993
• Mule Deer	-3,413
• Sage Grouse	-3,755
Chief Joseph	
• Lesser Scaup	+1,440
• Sharp-tailed Grouse	-2,290
• Mule Deer	-1,992
• Spotted Sandpiper	-1,255
• Sage Grouse	-1,179
• Mink	-920
• Bobcat	-401
• Lewis' Woodpecker	-286
• Ring-necked Pheasant	-239
• Canada Goose	-213
• Yellow Warbler	-58

b. Monitor and evaluate wildlife efforts at non-federal projects

Non-federal hydroelectric projects are licensed by the Federal Energy Regulatory Commission. The Electric Consumers Protection Act of 1986 (ECPA) mandates that the Federal Energy Regulatory Commission give equal consideration to the protection, mitigation of damage to, and enhancement of wildlife in licensing and relicensing decisions.

2. Mitigation considerations in dam licensing decisions

a. Federal Energy Regulatory Commission

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 & protected areas, water quality, climate change, mainstem hydrosystem flow and passage operations, estuary, plume and near-shore ocean, adaptive management
        - o 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
        - o 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
        - o 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 events[10]:

[10] 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*

Dam Project	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, met 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

b) Objective: As interim habitat objectives, continue to 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: 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

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Plan for Total Dissolved Gas and Water Temperature in the Mainstem Columbia and Snake Rivers (WQP) for periodical updates to the TDG.

7. **Goal:** Expand the complexity and range of aquatic habitats to enhance life history and species diversity
   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 & 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:** Improve in-channel tributary and mainstem habitat function, structure, and complexity
   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 & 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

9. **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 & 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

10. **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 & protected areas, strongholds, Adaptive Management
         - Indicators: to be developed under the Ecosystem Health and Council Actions categories

11. **Goal:** Mitigate riparian, wetland, floodplain, mainstem, alluvial reaches, estuary and near-shore ocean ecosystem functions and habitats that are used by all life stages, including salmon and steelhead life-stages and especially for Hanford Reach Fall Chinook
    a) Objective: 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, predation, future development, water quality, climate, mainstem hydrosystem flow and passage operations, estuary, plume, adaptive management
            - Indicators: Council Actions; Ecosystem Health category

12. **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 & 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

13. **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

14. **Goal:** Mitigate for wildlife losses
    a) Objectives: Acquire Habitat Units (HU) to offset losses or fulfill settlement agreements
        - Strategies: wildlife mitigation
            - Indicators: HUs acquired and maintained or settlements established

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

~~14.~~15. **Goal:** Restore healthy[11], self-sustaining, and harvestable, naturally spawning anadromous fish, especially salmon, steelhead, eulachon, and lamprey species and resident fish, including sturgeon and bull trout

a) Objective: Halt declining trends in Columbia River Basin salmon and steelhead populations ~~by 2024~~
   - 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 above Bonneville Dam by 2025 to an average of 5 million annually
   - Strategies: wild fish, ~~lamprey, eulachon~~, adaptive management
     - Indicator: Abundance of Fish and Wildlife

c) Objective: As an interim population objective , i~~I~~ncrease total adult runs for listed lower Columbia salmon and steelhead ~~to 75 percent of recovery goals by 2025~~ to meet NOAA Fisheries' FCRPS Biological Opinion.
   - Strategies: wild fish~~, lamprey, eulachon~~, 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~~, eulachon~~, 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

~~15.~~16. **Goal:** Achieve full mitigation for anadromous fish and~~,~~ native resident fish~~, and wildlife losses~~

~~-~~ 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

[11] Healthy is defined as having abundance, productive, diverse and spatially distributed populations

populations that originate above Bonneville Dam and supports tribal and non-tribal harvest. ~~Consistent with ESA efforts, increase total adult salmon and steelhead runs above Bonneville Dam by 2025 to an average of 5 million annually.~~

- Strategies: hatchery, wild fish, ~~wildlife mitigation~~, ~~resident fish mitigation ,~~ anadromous fish mitigation strategy in blocked areas of the basin, ~~lamprey, sturgeon,~~ adaptive management
  - Indicators: Abundance of Fish and Wildlife; Hydrosystem Passage and Survival

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.

b) ~~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, ~~wildlife mitigation~~, ~~resident fish mitigation~~ , anadromous fish mitigation strategy in blocked areas of the basin, ~~lamprey, sturgeon,~~ adaptive management
  - Indicators: Abundance of Fish and Wildlife; Hydrosystem Passage and Survival

~~16.~~17. **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 ~~anadromous~~ fish.

- Strategies: wild fish, ~~hatchery~~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

~~17.~~18. **Goal:** As an interim objective, achieve the goals 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 ecological province ~~by 2024~~.

- 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

~~18.~~19. **Goal:** Achieve anadromous fish inriver migration and passage survival that approximate natural survival during inriver migration

a) Objective: Achieve the four juvenile and adult fish passage performance standard consistent with the most recent NOAA Fisheries FCRPS Biological Opinion[12]. As of 2009 these consist of:
   - Annually achieve juvenile fish dam passage performance standards, at each Snake River 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

[12] 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.

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 is met	None
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

~~19.~~20. **Goal:** Enhance harvest of anadromous fish including salmon, steelhead, and lamprey, and resident fish

a) Objective remain 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

~~20.~~21. **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

~~21.~~22. **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

~~22.~~23. **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

24. Goal: Achieve open public access for all program related data.

b) 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 the program 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 as described by the Northwest Power Act.

The Council approved during its October 2009 meeting three high-level indicators (HLIs) 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 HLIs 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 HLIs and their supporting fish and wildlife program indicators (FWIs), the Council also approved these fish and wildlife program management questions (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 Council 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 HLIs graphics are reported on the Council's High Level Indicator report and the supporting FWIs 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 ~~managers~~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 ~~managers~~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, HLIs, and supporting FWIs.

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

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

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 ~~managers~~ agencies and tribes and the Council throughout study, design, construction, and operation of the project
- Develop specific plans for flows and fish facilities prior to construction
- The best available means for aiding downstream and upstream passage of anadromous and resident fish
- Provide 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
- 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 ~~managers~~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:

- Consultation with fish and wildlife ~~managers~~ 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 ~~managers~~agencies and tribes) when clearing, rip-rapping, 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 ~~managers~~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
- Assurance that the project will not inundate the usual and accustomed, traditional or contemporary hunting places of any tribe without tribal approval
- Assurance 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[13] 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.

[13] NOTE To Reviewers (Jan 2014): I've reorganized the provisions of the Protected Areas section, to make more sense and to match better the original. Did not red-line the reorganization to avoid confusion. Have not changed the text except as seen in the red-lining. JS

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

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.

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. 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.

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 have 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 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 therefore exempts from the effect of an amendment that designates a previously unprotected area as protected, any project for which the developer had obtained a preliminary permit or filed an application for license or exemption prior to the date on which the Council entered rulemaking on the amendment. However, it is the Council's intention that the Federal Energy Regulatory Commission give full consideration to the protection of fish and wildlife resources located at these project sites and provide suitable protection and mitigation for such resources in the event that a license or exemption is approved.

Effect on water rights. 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 benefits to 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.

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 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 higher water temperatures, increasing susceptibility to diseases, thermal stress and mortality rates.

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. Regionwide 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/or 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.

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 database conforms to appropriate standards for data management, including review of the database 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. Grand Coulee operations

Spokane Tribe recommendations -- 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 ~~managers~~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

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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.

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 is required, 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.

Bonneville 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

<u>Management Plan and Operation and Maintenance Funding</u>
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 Appendix

Council's Annual Report to Governors and Congress: 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 for informing Governors and Congress on an annual basis.

Science-Policy 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~~managers~~, researchers, and policy makers.

Council Topic Specific Tracking: serve to inform about topics of interest. Topics that are tracked will include, 1) starting in 2015~~,~~ annual anadromous fish forecasts and results. 2)Bonneville and the hatchery managers 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. The first report should be submitted in December 2014. Council staff, Bonneville, fish and wildlife ~~managers~~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 fish and wildlife ~~managers~~agencies and tribes to inform policy-makers and rate-payers.

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 need by the Council.

Bonneville Effectiveness ~~and Effect~~ Report: 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 fish and wildlife ~~managers~~ agencies and tribes and project sponsors who contribute data informing this assessment. Each report will focus on a subset of action-categories[14] implemented under the program that was assessed since the last program 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 ~~managers~~agencies and tribes and researchers, and rate-payers.

Annual Project Progress reports: are electronically submitted to Bonneville, and encompasses the content[15] and are in the format requested by Bonneville. 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. 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. This report will evolve to improve its organization and content to enhance its comprehensiveness and accessibility to address Bonneville, Council, and ISRP information needs, such as the ISRP's project reviews and the ISRP's program retrospective reports. Projects sponsors will produce these reports for use by Bonneville, ISRP, and the Council.

ISAB Review of the Fish and Wildlife Program: evaluates the program on its scientific merits in time to inform amendments to the program and before the Council requests recommendations from the region. This report is produced by the ISAB prior to the commencement of the program amendment process and

[14] Action-category refers to groups of identical actions implemented under the Program, such as hatchery releases, riparian plantings, invasive species removal, and in-stream large wood-debris additions.

[15] Content of annual project progress reports to Bonneville will be determined by Bonneville. 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. An annual project progress report will be a stand-alone, complete document, which does not rely on other documents, such as past annual project progress reports, to provide information needed to assess what has been done.

informs the Council, fish and wildlife ~~managers~~agencies and tribes and researchers.

ISAB Topic Specific Reports: provide independent scientific advice and recommendations regarding scientific issues as requested by the ISAB's Administrative Oversight Panel and serves to inform the Council, NOAA, the tribes, fish and wildlife agencies 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, fish and wildlife agencies and tribes and researchers, and Bonneville.

ISRP Retrospective review of program accomplishments: The ISRP with assistance from the Scientific Peer Review Groups review annually the results of prior-year expenditures based on the project review criteria, focusing on measurable benefits to fish and wildlife, and submit its findings to the Council. Also as part of the ISRP's annual retrospective report, the ISRP should summarize major basinwide programmatic issues identified during project reviews, and findings from Bonneville's summary of monitoring research and findings. This report informs the Council, Bonneville, fish and wildlife agencies and tribes, and rate-payers.

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, the Council adopts by reference the reporting and project management standards of relevant NOAA Fisheries' Biological Opinions for projects intended to meet the goals and objectives of those Biological Opinion.

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

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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**
Pacific lamprey	*Entosphenus tridentatus*
Chinook salmon	Onchorynchus tshawytcha
Chum salmon	Oncorhynchus keta
Coho salmon	Oncorhynchus kisutch
Steelhead	Oncorhynchus mykiss
Sockeye salmon	Oncorhynchus nerka

Resident Fish Focal Species (22 species)

Common Name	**Scientific Name**
Green sturgeon	Acipenser medirostris
White sturgeon	Acipenser transmontanus
Wood River sculpin	Cottus leiopomus
Freshwater sponge	Ephydatia cooperensi
Bluegill	Lepomis macrochirus
Burbot	Lota lota
Smallmouth bass[16]	Micropterus dolomieu
Largemouth bass[17]	Micropterus salmoides
Molluscs	Mollusca
Coastal cutthroat trout	Onchorynchus clarki clarki
Cutthroat trout	Oncorhynchus clarki
Westslope cutthroat trout	Oncorhynchus clarki lewisi
Yellowstone cutthroat trout	Oncorhynchus clarkii bouvieri
Redband trout	Oncorhynchus mykiss gairdneri
Kokanee	Oncorhynchus nerka
Oregon chub	Oregonichthys Crameri
Yellow perch	Perca flavescens
Black crappie	Pomoxis nigromaculatus
Mountain whitefish	Prosopium williamsoni
Brook trout	Salvelinus fontinalis

[16] These species are for substitution for lost anadromous fish in blocked areas
[17] These species are for substitution for lost anadromous fish in blocked areas

Walleye	Stitzostedion vitreum vitreum
Bull trout	Salvelinus confluentus

Wildlife Focal Species (209 species)

Common Name	**Scientific Name**
Northern goshawk	Accipiter gentilis
Western Grebe	Aechmoporus occidentalis
Boreal owl	Aegolius funereus
Agapetus caddisly	Agapetus montanu
Red-winged blackbird	Agelaius phoeniceus
Wood duck	Aix sponsa
Moose	Alces alces
Long-toed salamander	Ambystoma macrodactylum
LeConte's sparrow	Ammodramus leconteii
Grasshopper sparrow	Ammodramus savannarum
Sage sparrow	Amphispiza belli
Mallard	Anas platyrhynchos
Boreal toad	Anaxyrus boreas
Pronghorn antelope	Antilocapra americana
Golden eagle	Aquila Chrysaetos
Red tree vole	Arborimus longicaudus
Black-chinned hummingbird	Archilochus alexandr
Great blue heron	Ardea herodias
Coastal tailed frog	Ascaphus truei Stejneger
Burrowing owl	Athene cunicularia
Millipede	Austrotyla montani
Redhead	Aythya americana
Oregon slender salamander	Batrachoseps wrightorum
Ruffed grouse	Bonasa umbellus
American bittern	Botaurus lentiginosus
Pygmy rabbit	Brachylagus idahoensis
Marbled murrelet	Brachyramphus marmoratus
Canada goose	Branta canadensis
Great horned owl	Bubo virginianus
Barrow's goldeneye	Bucephala islandica
Western toad	Bufo boreas
Ferruginous hawk	Buteo regalis
Swainson's hawk	Buteo swainsoni
Green heron	Butorides virescens
Dunlin	Calidris alpina
California quail	Callipepla californica

Gray wolf	Canis lupus irremotus
Cassin's finch	Carpodacus cassinii
House finch	Carpodacus mexicanus
American beaver	Castor canadensis
Turkey vulture	Cathartes aura
Veery	Catharus fuscescens
Sage grouse	Centrocercus urophasianus
Brown creeper	Certhia americana
Elk	Cervus canadensis
Rocky Mountain elk	Cervus elaphus nelsoni
Vaux's swift	Chaetura vauxi
Snowy porter	Charadrius alexandrinus
Black tern	Chlidonias niger
Lark sparrow	Chondestes grammacus
Common nighthawk	Chordeiles minor
American dipper	Cinclus mexicanus
Northern harrier	Circus cyaneus
Western pond turtle	Clemmys marmorata
Western yellow-billed cuckoo	Coccyzus americanus
Band-tailed pigeon	Columba fasciata
Sharptailed snake	Contia tenuis
Olive-sided flycatcher	Contopus cooperi
Western wood-pewee	Contopus sordidulus
American crow	Corvus brachyrhynchos
Townsend’s big-eared bat	Corynorhinus townsendii
Townsend's western big-eared bat	Corynorhinus townsendii townsendii
Millipede	Corypus cochlearis
Western rattlesnake	Crotalus viridis
Trumpeter swan	Cygnus buccinator
Tundra swan	Cygnus columbianus
Black swift	Cypseloides niger
Blue grouse	Dendragopus obscurus
Yellow warbler	Dendroica petechia
Bobolink	Dolichonyx oryzivorus
Pileated woodpecker	Dryocopus pileatus
Northern alligator lizard	Elgaria coerulea
Southern alligator lizard	Elgaria multicarinatus
Hammond's flycatcher	Empidonax hammondii
Cordilleran flycatcher	Empidonax occidentalis
Willow flycatcher	Empidonax traillii
Southwestern Willow flycatcher	Empidonax traillii adastus

Gray flycatcher	Empidonax wrightii
Big brown bat	Eptesicus fuscus
Horned lark	Eremophila alpestris
Spotted bat	Euderma maculatum
Western skink	Eumeces skiltonianu
Taylor's checkerspot butterfly	Euphydryas editha taylori
Gillette's checkerspot	Euphydryas gillettii
Merlin	Falco columbarius
Peregrine falcon	Falco peregrinus
Gyrfalcon	Falco rusticolus
Common snipe	Gallinago gallinago
Common loon	Gavia immer
Common yellowthroat	Geothlypis trichas
Northern pygmy-owl	Glaucidium gnoma
Sandhill crane	Grus canadensis
Greater sandhill crane	Grus canadensis tabida
Wolverine	Gulo gulo
Bald eagle	Haliaeetus leucocephalus
Marbled Jumping-slug	Hemphillia danielsi
Harlequin duck	Histrionicus histrionicus
Caspian tern	Hydroprogne caspia
Fender's blue butterfly	Icaricia icarioides fenderi
Yellow-breasted chat	Icteria virens
White-tailed ptarmigan	Lagopus leucura
Loggerhead shrike	Lanius ludovicianus
Banbury Springs lanx	Lanx sp.
Silver-haired bat	Lasionycteris noctivagans
Hoary bat	Lasiurus cinereus
Snowshoe hare	Lepus americanus
Black-tailed jackrabbit	Lepus californicus
Franklin's gull	Leucophaeus pipixcan
Gray-crowned rosy-finch	Leucosticte tephrocotis
Hooded merganser	Lophodytes cucullatus
River otter	Lutra canadensis
Canada lynx	Lynx canadensis
Magnum mantleslug	Magnipelta mycophag
Hoary marmot	Marmota caligata
American marten	Martes americana
Fisher	Martes pennant
Acorn woodpecker	Melanerpes formicivorus
Lewis’ woodpecker	Melanerpes lewis
Montane vole	Microtus montanus
Brown-headed cowbird	Molothrus ater

Grey flycatcher	Muscicapa griseisticta
Mink	Mustela vison
Southern red-backed vole	Myodes gapperi
Fringed myotis bat	Myotis thysanode
Yellow pine chipmunk	Neotamias amoenus
Bushy-tailed woodrat	Neotoma cinerea
Clark's nutcracker	Nucifraga columbiana
Long-billed curlew	Numenius americanus
Snowy owl	Nyctea scandiaca
Black-crowned night heron	Nycticorax nycticoras
American pika	Ochotona princeps
Mule deer	Odocoileus hemionus
Columbian black-tailed deer	Odocoileus hemionus columbianus
Rocky Mountain mule deer	Odocoileus hemionus hemionus
Columbian white-tailed deer	Odocoileus virginianus leucurus
Mountain goat	Oreamnos americanus
Bitterroot mountainsnail	Oreohelix amariradix
Carinate mountainsnail	Oreohelix elrod
Mountain quail	Oreortyx pictus
Sage thrasher	Oreoscoptes montanus
Flammulated owl	Otus flammeolus
Bighorn sheep	Ovis canadensis
California bighorn sheep	Ovis canadensis californiana
Lazuli bunting	Passerina amoena
American white pelican	Pelecanus erythrorhynchos
Gray (Hungarian) partridge	Perdix perdix
Deer mouse	Peromyscus maniculatus
Ring-necked pheasant	Phasianus colchicus
Snake River physa	Physa natricina
White-headed woodpecker	Picoides albolarvatus
Black-backed woodpecker	Picoides arcticus
Three-toed woodpecker	Picoides tridactylus
Green-tailed towhee	Pipilo chlorurus
White-faced ibis	Plegadis chihi
Coeur d'Alene salamander	Plethodon idahoensis
Larch Mountain salamander	Plethodon larselli
Horned grebe	Podiceps auritus
Vesper sparrow	Pooecetes gramineus
Sora	Porzana carolina
Raccoon	Procyon lotor
Purple martin	Progne subis

Smoky taildropper	Prophysaon humil
Bruneau hot springsnail	Pyrgulopsis bruneauensis
Idaho springsnail	Pyrgulopsis idahoensis
Cascades frog	Rana cascadae
Red-legged frog	Rana draytonii
Spotted frog	Rana luteiventris
Leopard frog	Rana pipiens
Oregon spotted frog	Rana pretiosa
American avocet	Recurvirostra americana
Northern sagebrush lizard	Sceloporus graciosus graciosus
Western grey squirrel	Sciurus griseus
Rufous hummingbird	Selasphorus rufus
Western bluebird	Sialia mexicana
Spalding's catchfly	Silene spaldingii
White-breasted nuthatch	Sitta carolinensis
Pygmy nuthatch	Sitta pygmaea
Preble’s shrew	Sorex preblei
Great Basin Spadefoot	Spea intermontana
Northern Idaho ground squirrel	Spermophilus brunneus brunneus
Golden-mantled ground squirrel	Spermophilus lateralis
Washington ground squirrel	Spermophilus washingtoni
Red-naped sapsucker	Sphyrapicus nuchalis
Williamson's sapsucker	Sphyrapicus thyroideus
Spotted skunk	Spilogale gracilis
Brewer's sparrow	Spizella breweri
Chipping sparrow	Spizella passerina
Calliope hummingbird	Stellula calliope
Foster's tern	Sterna forsteri
Common tern	Sterna hirundo
Great gray owl	Strix nebulosa
Spotted owl	Strix occidentalis
Northern spotted owl	Strix occidentalis caurina
Western meadowlark	Sturnella neglecta
Nuttall's cottontail	Sylvilagus nuttallii
Northern bog lemming	Synaptomys boreali
Red squirrel	Tamiasciurus hudsonicus
Bliss Rapids snail	Taylorconcha serpenticola
Northern pocket gopher	Thomomys talpoides
Winter wren	Troglodytes troglodytes
Sharp-tailed grouse	Tympanuchus phasianellus
Columbian sharp-tailed grouse	Tympanuchus phasianellus columbianus

Barn owl	Tyto alba
Lyre mantleslug	Udosarx lyrat
Black bear	Ursus americanus
Grizzly bear	Ursus arcto
Utah valvata snail	Valvata utahensis
Red-eyed vireo	Vireo Olivaceus
Sheathead slug	Zacoleus idahoensis

* For wildlife species we mainly use habitat units to represent them and do not monitor the species directly.

O. Subbasin and basinwide measures

[Updated Aug 27]

2014 Fish and Wildlife Program Amendment Process

Recommended Subbasin Measures – *August 25, 2014 DRAFT*

Entity	Subbasin	Measure
Montana Fish Wildlife & Parks	Kootenai	We recommend that a program similar to the "Secure and Protect" project in the Flathead Subbasin (CSKT and MFWP) be established in the Kootenai Subbasin.
Montana Fish Wildlife & Parks	Flathead	The Council should be aware that funding for the Sekokini Springs Isolation Facility for genetic conservation of native westslope cutthroat trout, has not been fully allocated to date.
Oregon Department of Fish and Wildlife	Grande Ronde	Ladd Marsh Wildlife Mitigation
Oregon Department of Fish and Wildlife	Grande Ronde	Ladd Marsh Wildlife Mitigation
Oregon Department of Fish and Wildlife	Grande Ronde	Ladd Marsh Wildlife Mitigation
Oregon Department of Fish and Wildlife	Columbia Lower Mid	Develop a Master Plan for a Rearing Facility to Enhance Selected Populations of White Sturgeon in the Columbia River Basin
Oregon Department of Fish and Wildlife	John Day	John Day Habitat Enhancement
Oregon Department of Fish and Wildlife	Grande Ronde	Blue Mountain Fish Habitat Improvement
Oregon Department of Fish and Wildlife	Umatilla	Umatilla Anadromous Fish Habitat-Oregon Department of Fish and Wildlife (ODFW)
Oregon Department of Fish and Wildlife	Grande Ronde	Grande Ronde Model Watershed
Oregon Department of Fish and Wildlife	Fifteenmile Creek	Fifteenmile Creek Habitat Improvement

Entity	Subbasin	Measure
Oregon Department of Fish and Wildlife	John Day, Grande Ronde, Umatilla	Oregon Fish Screens Project
Oregon Department of Fish and Wildlife	Deschutes	Trout Creek Operations and Maintenance (O&M)
Oregon Department of Fish and Wildlife	Basinwide	Northern Pikeminnow Management
Oregon Department of Fish and Wildlife	Salmon	Snake River Sockeye Captive Propagation
Oregon Department of Fish and Wildlife	Hood River	Hood River Production Operations and Maintenance (O&M) and Powerdale
Oregon Department of Fish and Wildlife	Umatilla	Umatilla Hatchery Operations and Maintenance (O&M)
Oregon Department of Fish and Wildlife	Columbia Estuary	Select Area Fisheries Enhancement
Oregon Department of Fish and Wildlife	Grande Ronde	Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers
Oregon Department of Fish and Wildlife	Salmon	Snake River Sockeye Captive Propagation
Oregon Department of Fish and Wildlife	Grande Ronde	Spring Chinook Captive Propagation-Oregon
Oregon Department of Fish and Wildlife	Willamette	Middle Fork Willamette River Bull Trout Passage and Habitat Restoration
Oregon Department of Fish and Wildlife	Willamette	Development of protocols/priorities to re-establish naturally reproducing populations of U. Willamette R. Chinook Salmon above USACE dams/Willamette
Oregon Department of	Willamette	Conservation and Recovery of Endangered Species Act Listed Floodplain Fishes in the Willamette Basin, with Emphasis on Oregon Chub

Entity	Subbasin	Measure
Fish and Wildlife		
Oregon Department of Fish and Wildlife	Willamette	Willamette Bi-Op Habitat Restoration
Oregon Department of Fish and Wildlife	Willamette	Willamette Wildlife Fund (WWF)
Oregon Department of Fish and Wildlife	Willamette	ODFW Operations & Maintenance (O&M)
Oregon Department of Fish and Wildlife	Willamette	Willamette River Operations Administration
Washington Department of Fish and Wildlife	Columbia Estuary	Strengthen funding for Select Area Fishery Enhancement (SAFE)
Lower Columbia Fish Recovery Board	Columbia Estuary, Grays, Elochoman, Wind, Big Whie Salmon, Lewis, Cowlitz, Little White Salmon	Place greater emphasis on protection, mitigation, and enhancement of Lower Columbia salmon and steelhead populations, including the restoration of Lower Columbia tributary habitat
Lower Columbia Fish Recovery Board	Grays, Lewis	Give greater recognition to the need to protect, mitigate and enhance eulachon populations
Lower Columbia Fish Recovery Board	Columbia Estuary RM&E	Provide for a better understanding of fish utilization of, and hydrosystem impacts on the estuary, plume and nearshore ocean environments
Lower Columbia Fish Recovery Board	Columbia Estuary, Grays, Elochoman, Wind, Big Whie Salmon, Lewis, Cowlitz, Little White Salmon	Amend the F&W program and associated implementation measures to provide for restoration of Lower Columbia tributary habitat as an appropriate off site mitigation strategy for the estuary impacts on Lower Columbia Chinook, Coho, Chum and Steelhead.
Lower Columbia Fish Recovery Board	Columbia Estuary, Grays, Elochoman, Wind, Big Whie Salmon, Lewis, Cowlitz	Amend the F&W program and associated implementation measures to provide for restoration of Lower Columbia tributary habitat as an appropriate mitigation strategy for the impact of the Columbia hydropower system on Coho populations across the Basin.
Lower Columbia Fish Recovery Board	Columbia Estuary, Grays, Elochoman, Wind, Big Whie Salmon, Lewis, Cowlitz, Columbia Lower, Little White Salmon RM&E	Provide for the active participation in and support of Lower Columbia monitoring initiatives, particularly those dealing with action effectiveness and fish and habitat status and trends.

Entity	Subbasin	Measure
Lower Columbia Fish Recovery Board	Columbia Estuary, Columbia Lower	Support efforts to assess and reduce pinniped predation on Lower Columbia white sturgeon
Lower Columbia Fish Recovery Board	Columbia Estuary, Columbia Lower RM&E	Support efforts to assess and mitigate for the effects of altered flow patterns on Lower Columbia white sturgeon spawning success, migration patterns, and the quantity and quality of needed habitat
Lower Columbia Fish Recovery Board	Columbia Lower	Continue to fund the baseline piscivorous control program and expand efforts to assess, manage and reduce non-native fish species that compete with and/or prey on salmon and steelhead in the Lower Columbia.
Lower Columbia Fish Recovery Board	Columbia Lower, Colubia Estuary	Adopt and fund avian predator control plans developed through the USACE and other processes
Lower Columbia Fish Recovery Board	Columbia Lower, Colubia Estuary	Fund federal, tribal and state agencies to assess, manage, and reduce pinniped predation on salmon, steelhead, sturgeon, and lamprey
Yakima Basin Fish and Wildlife Recovery Board	Basinwide Coordination	The Program should commit the Council and federal Action Agencies to continuing to work with local and regional partners (including Washington State's recovery boards) to develop long-term implementation plans that, if implemented, would recover target species to levels that meet both ESA recovery criteria and the broader mandates of the Northwest Power Planning Act. These implementation plans should build on the existing work described above and be consistent with existing subbasin plans. In places (e.g. areas where all anadromous species are listed) it may be possible to simply adopt ESA recovery plans and associated implementation planning efforts. In other areas, where significant actions are needed for non-listed target species and ecosystems, or to recover listed species to levels well beyond meeting delisting criteria, additional work will be needed to identify appropriate goals and criteria and identify the actions that will be needed to meet those goals. We believe that it is critical that broadly accepted implementation plans be available prior to 2018, so that they are able to inform 1) development of the next FCRPS Biological Opinion, 2) future Fish Accords, 3) the next round of Council project reviews, 4) subsequent NOAA 5-year status reviews and any associated recovery plan updates, and 5) other local and regional efforts.
Collville Confederated Tribes	Okanogan, Columbia Upper, Sanpoil	The CCT recommends that the amended Program support the continued implementation of the actions in the 2008 Accord during the full period of the amended Program. The CCT's Accord will expire on September 30, 2018, which is within the anticipated 5-year timeframe of the upcoming amendments to the Program.
Collville Confederated Tribes	Okanogan, Columbia Upper, Sanpoil	The CCT recommends that the Council, as it did in the 2009 Program amendments, incorporate the actions in the CCT's Accord, along with the FCRPS biological opinion actions, into the Program.
Collville Confederated Tribes	Basinwide	Water and flow management actions, hydro spill and dam passage strategies, performance standards, and inriver survival targets reflected in the 2008/2010 FCRPS biological opinion and the 2008 CCT Accord.
Collville	Okanogan, Columbia	Preclude any prioritization among anadromous fish, resident fish and wildlife programs and projects within

Entity	Subbasin	Measure
Confederated Tribes	Upper, Sanpoil	the CCT Accords, once the biological opinion metrics for the Okanogan subbasin are met
Collville Confederated Tribes	Basinwide	Water and flow management actions, hydro spill and dam passage strategies, performance standards, and inriver survival targets reflected in the 2008/2010 FCRPS biological opinion and the 2008 CCT Accord.
Collville Confederated Tribes	Okanogan, Columbia Upper, Sanpoil	Preclude any prioritization among anadromous fish, resident fish and wildlife programs and projects within the CCT Accords, once the biological opinion metrics for the Okanogan subbasin are met
Collville Confederated Tribes		Continue to suppress flora and fauna populations that directly or indirectly adversely affect native fish and wildlife populations or habitats
Collville Confederated Tribes	Basinwide	The state and federal agencies and tribes should continue to work cooperatively with NOAA Fisheries, states, tribes, and the Council to review, evaluate, develop, and implement strategies to reduce non-native piscivorous predation on native fishes, including salmon and redband trout (both anadromous and resident), and white sturgeon, especially by smallmouth bass, channel catfish, walleye, and northern pike
Collville Confederated Tribes	Okanogan, Columbia Upper, Sanpoil	Continue to protect and increase the abundance of native resident fish species throughout their historic ranges when suitable habitat conditions exist or can be feasibly mitigated or improved
Collville Confederated Tribes	Sanpoil, Upper Columbia	Continue supporting existing artificial production (based on species identified by CCT) to substitute for lost salmon and steelhead in blocked areas
Collville Confederated Tribes	Okanogan	Continue to apply protections for wild salmon to other native fish as provided in the Accord.
Collville Confederated Tribes	Okanogan, Entiat, Methow, Wenatchee, Columbia Upper, Sanpoil	Continue to identify, protect and restore habitat areas and ecological functions that are associated with productive spawning, resting, rearing, and migrating salmon and steelhead, white sturgeon, and other native fish in the Columbia River mainstem, including the Okanogan, Methow, Entiat, Wenatchee and the blocked area, as supported by the existing Accord
Collville Confederated Tribes		Continue to protect, enhance, and connect freshwater habitat in the mainstem Columbia River for the life history stages of anadromous and resident fishes
Collville Confederated Tribes	Basinwide?	Continue to provide conditions that support the needs of resident fish species in the mainstem Columbia River and its tributaries
Collville Confederated Tribes	Basinwide?	Continue to enhance the abundance and productivity of white sturgeon in the mainstem in order to rebuild self sustaining populations able to support harvest. Continue to operate the hydropower system in a manner consistent with FCRPS biological opinion that balances needs of anadromous fish, white sturgeon, and other native fish species in the Columbia River.

Entity	Subbasin	Measure
Collville Confederated Tribes	Columbia Upper, Sanpoil	Within parameters established in the 2008/2010 biological opinion and 2008 Accord, continue to provide the conditions necessary to protect and mitigate populations of native fish in, and adjacent to, Lake Roosevelt to levels capable of supporting harvest consistent with the goals in the CCT's management and mitigation plans and recommendations
Collville Confederated Tribes	Columbia Upper, Kootenai	Implement actions to restore natural recruitment in Columbia River white sturgeon populations and to recover listed Kootenai River white sturgeon.
Yakima Nation	Wenatchee, Methow, Entiat	Describe and endorse for general use the protocol developed by the Yakama Nation for selecting habitat project priorities in the Upper Columbia River tributaries
Yakima Nation	Big White Salmon	Develop a White Salmon River sub-basin plan
Confederated Tribes of Grand Ronde	Willamette	Pacific Lamprey Reintroduction Pilot Project
Confederated Tribes of Grand Ronde	Willamette	Reintroduce Anadromous Fish into Blocked Habitat
Confederated Tribes of Grand Ronde	Willamette	Improve downstream passage through Foster reservoir and dam for juveniles and kelts.
Confederated Tribes of Grand Ronde	Willamette	Release flows from Foster/Green Peter dams to meet flow targets in the South Santiam River that protect spawning, incubation, rearing and migration of salmonids and lamprey.
Confederated Tribes of Grand Ronde	Willamette	Evaluate feasibility and effectiveness of interim operational temperature control at Foster and Green Peter dams.
Confederated Tribes of Grand Ronde	Willamette	Manage current CHS Harvest Mitigation Hatchery Program (HMP) facilities and broodstock to meet mitigation goals, but do so in a manner that the genetic and demographic impacts of program do not pose unacceptable risk to extant NOR fish populations or compromise long term productivity of a reintroduction stock that would preclude success of conservation reintroduction/supplementation program above Foster Dam.
Confederated Tribes of Grand Ronde	Willamette	Implement WP-RPA's 4.12.3 and 4.13 to provide safe and effective downstream passage through Detroit reservoir and Detroit and Big Cliff dams for juveniles and kelts.
Confederated Tribes of Grand Ronde	Willamette	Resolve uncertainty of any remaining pre-spawn mortality not associated with injury and stress associated with Minto Collection facility.
Confederated Tribes of Grand	Willamette	Release flows from Detroit/Big Cliff dams to meet flow targets in the North Santiam River that protect spawning, incubation, rearing and migration of salmonids and Pacific lamprey.

Entity	Subbasin	Measure
Ronde		
Confederated Tribes of Grand Ronde	Willamette	Construct, operate, and evaluate a temperature control structure at Detroit Dam to release water that more closely resembles normative water temperatures, reduces TDG exceedences, and meets TMDL temperature targets downstream of NS dams and operating dams to maximize benefits to Chinook, steelhead, and Pacific lamprey.
Confederated Tribes of Grand Ronde	Willamette	Manage current CHS Harvest Mitigation Hatchery Program (HMP) facilities and broodstock to meet mitigation goals, but do so in a manner that the genetic and demographic impacts of program do not pose unacceptable risk to extant NOR fish populations or compromise long term productivity of a reintroduction stock that would preclude success of conservation reintroduction/supplementation program above Detroit Dam.
Confederated Tribes of Grand Ronde	Basinwide	Restore adult access of natural origin fish to historic habitat blocked by large dams
Confederated Tribes of Grand Ronde	Willamette	Provide safe and effective downstream passage through Cougar reservoir and dam.
Confederated Tribes of Grand Ronde	Willamette	Increase retention and sourcing of gravels and other materials below USACE facilities with a combination of habitat improvements, targeted flows, and augmentation.
Confederated Tribes of Grand Ronde	Willamette	Operate McKenzie subbasin WP flood control/hydropower projects to mimic natural temperature regime, while at the same time complementing the downstream passage benefits of spilling, and minimizing exceedence of TDG (total dissolve gas) below projects, and managing ramping rates to minimize stranding of early Chinook life stages
Confederated Tribes of Grand Ronde	Willamette	Manage current CHS Harvest Mitigation Hatchery Program (HMP) facilities and broodstock to meet mitigation goals, but do so in a manner that the genetic and demographic impacts of program do not pose unacceptable risks to the remaining wild fish population
Confederated Tribes of Grand Ronde	Willamette	Provide safe and effective downstream passage through the Dexter/Lookout Point flood Control/hydropower complex to benefit all size classes of juvenile migrants produced above Lookout Pt. Dam.
Confederated Tribes of Grand Ronde	Willamette	Provide safe and effective downstream passage through Fall Creek reservoir and dam.
Confederated Tribes of Grand Ronde	Willamette	Provide safe and effective downstream passage through Hills Creek reservoir and dam.
Confederated Tribes of Grand Ronde	Willamette	Reduce pre-spawn mortality by reducing injury and stress related to fish handling at and above USACE facilities.

Entity	Subbasin	Measure
Confederated Tribes of Grand Ronde	Willamette	Increase retention and sourcing of gravels and other materials below USACE facilities with a combination of habitat improvements, targeted flows, and augmentation.
Confederated Tribes of Grand Ronde	Willamette	Operate WP flows in MF subbasin to mimic the natural temperature regime in the fall
Confederated Tribes of Grand Ronde	Willamette	Release flows from Look Out Pt./Dexter, Fall Creek, and Hills Creek dams to meet flow targets in the Middle Fork Willamette River that protect spawning, incubation, rearing and migration of salmonids and Pacific lamprey.
Confederated Tribes of Grand Ronde	Willamette	Manage current CHS Harvest Mitigation Hatchery Program (HMP) facilities and broodstock to meet mitigation goals, but do so in a manner that the genetic and demographic impacts of program do not pose unacceptable risk to extant NOR fish populations or compromise long term productivity of a reintroduction stock that would preclude success of conservation reintroduction/supplementation program above MF Willamette dams.
Confederated Tribes of Grand Ronde	Willamette	Within the 2008 BiOp COP process and BRT activities, evaluate further whether eventual reintroduction and production above Hills Creek Dam is a viable alternative to other remedies for improving VSP criteria to meet desired status risk level (Chinook-Low)
Confederated Tribes of Grand Ronde	Willamette	Increase protection and implementation of appropriate instream flows for UWR salmonids by a) removing barriers to coordinating with relevant management agencies on water withdrawals, b) encouraging BMP's to conserve water and reduce pollution loads, and c) not issuing anymore water rights within subbasins.
Confederated Tribes of Grand Ronde	Willamette RM&E	Determine funding sources and strategies to implement monitoring needed to track progress towards achieving recovery goals.
Confederated Tribes of Grand Ronde	Willamette	Protect and restore aquatic habitat function at confluence areas of Willamette River tributaries.
Confederated Tribes of Grand Ronde	Willamette	Look for opportunities to remove unnecessary revetments or increasing setbacks in the Mainstem Willamette and in subbasins. Minimize new ones in the future.
Confederated Tribes of Grand Ronde	Willamette	Manage flow during dry years to maintain and improve habitat conditions for ESA-listed species.
Confederated Tribes of Grand Ronde	Willamette	Release flows from WP dams and other storage dams to meet flow targets in mainstem Willamette River for rearing and migration.
Confederated Tribes of Grand Ronde	Willamette	Increase overall channel complexity, floodplain connectivity, and flood storage to the mainstem Willamette River to increase and improve salmonid rearing and migration habitat.

Entity	Subbasin	Measure
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Orchard Spray Buffer Riparian Planting Project (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Powerdale Corridor Floodplain Restoration (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Water Quality and Fish Habitat Protection at W. Fork Hood River Power Line Stream Crossing (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	East Fork Hood River Habitat Complexity Restoration (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Red Hill Creek Large Wood Addition (High Priority) (
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	W. Fork Hood River Large Wood Addition- Dry Run Bridge Reach (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	West Fork Hood River Large Wood Addition – Red Hill to Ladd Creek (High Priority)
Confederated Tribes of Warm Springs (Hood	Hood River	Lake Branch Large Wood Addition – No-name Creek to Raker Pit Reach (High Priority)

Entity	Subbasin	Measure
River Watershed Action Plan)		
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Dee Irrigation District Distribution Piping (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Christopher Pipeline Project- Phase 1 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	East Fork Irrigation District Telemetry System (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Green Point Upper Reservoir Improvement / Green Point Lower Reservoir and Ditch Creek Restoration (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Evans Cr. -Hutson Drive Culvert Replacement (Medium Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Odell Creek Hydroelectric Project Decommissioning (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Indian Creek Riparian Enhancement (Medium Priority)
Confederated	Hood River	Clear Branch Dam Fish Passage, Stream Flow and Temperature Improvement (High Priority)

Entity	Subbasin	Measure
Tribes of Warm Springs (Hood River Watershed Action Plan)		
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River RM&E	Supplementation and Monitoring of Substrate below Clear Branch Dam (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Middle Fork Irrigation District Irrigation Efficiency Projects: Pressure Reducing Stations & Landowner Incentive Program (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Coe Branch Channel Roughening and Fish Passage Protection (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Meadows Creek Culvert Replacement Project (Medium Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Hood River Delta & Nichols Boat Basin Habitat Improvement (Medium Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Water Quality and Quantity Project Implementation on Agricultural Lands (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed	Hood River RM&E	Early Detection Rapid Response Weed Species Control/Eradication (Medium Priority)

Entity	Subbasin	Measure
Action Plan)		
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Stream Crossing Enlargement- FSR 1340 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Stream Crossing Enlargement- FSR 1600 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Stream Crossing Enlargements- FSR 1800 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	McGee Creek Riparian Thinning – Phase 2 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	McGee Creek Tributary Fish Passage Remediation (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	McGee Creek Fish Passage Remediation-FSR 1800 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Marco Creek Fish Passage Remediation-FSR 1600 (High Priority) (
Confederated Tribes of Warm	Hood River	Marco Creek Fish Passage Remediation-FSR 1800 (High Priority)

Entity	Subbasin	Measure
Springs (Hood River Watershed Action Plan)		
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Elk Creek Fish Passage Remediation-FSR 1800 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Tumbledown Cr. Fish Passage Remediation-FSR 1800 (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	BPA Powerline Road Storm-proofing (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Red Hill Restoration: Road Decommissioning/Closure (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Invasive Plant Control/Eradication on USFS Lands (High Priority) (
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Upper West Fork Hood River Private In-holding Purchase (High Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Oregon White Oak Community Regeneration (Medium Priority)

Entity	Subbasin	Measure
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Aspen Community Regeneration (Medium Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Interstate 84, Highway 281 and Highway 35 Wildlife Crossing Upgrades (Low Priority)
Confederated Tribes of Warm Springs (Hood River Watershed Action Plan)	Hood River	Gravel Pit and Rock Quarry Maintenance and Final Reclamation (Low Priority)
Confederated Tribes of Warm Springs	Hood River	Continue adoption of accords as program measrues.
Kalispel Tribe	Pend Oreille	Support bull trout passage at Albeni Falls
Kalispel Tribe	Pend Oreille	Albeni Falls Dam Wildlife Mitigation: Operations, Maintenance, and Enhancements (ongoing & expanded)
Kalispel Tribe	Pend Oreille	Wildlife Assessment of Operational Effects (Albeni Falls)
Kalispel Tribe	Pend Oreille	Kalispel Tribe Resident Fish (Habitat and Hatchery components)
Kalispel Tribe	Pend Oreille	Pend Oreille Non-native Fish Suppression Project
Kalispel Tribe	Pend Oreille	Restoration of bull trout passage at Albeni Falls Dam
Kalispel Tribe	Pend Oreille	Resident Fish: Assessment of Operational Effects (Albeni Falls)
Kalispel Tribe	Pend Oreille	Pend Oreille River Basin Initiative: Land Acquisitions, Watershed Restoration, Conservation
Kalispel Tribe	Pend Oreille	Cultural Resource Management Clearance of F&W projects
Kalispel Tribe	Pend Oreille	Interim Passage of Bull Trout
Kalispel Tribe	Pend Oreille	Albeni Falls Wildlife Mitigation (Land Acquisitions)
Kalispel Tribe	Columbia Upper, Pend Oreille	Support Kalipsel accord
Kootenai Tribe of Idaho	Kootenai	Kootenai River Native Fish Conservation Aquaculture Program
Kootenai Tribe of Idaho		Ecosystem Restoration Project
Kootenai Tribe of Idaho	Kootenai	Kootenai River Habitat Restoration Program
Kootenai Tribe of	Kootenai	The Council and BPA shall complete mitigation and restoration actions where operational and secondary

Entity	Subbasin	Measure
Idaho		loss assessments have been estimated and/or addressed (i.e., Kootenai Subbasin project 2002-011-00).
Kootenai Tribe of Idaho	Kootenai	loss assessments have been estimated and/or addressed (i.e., Kootenai Subbasin project 2002-011-00).
Kootenai Tribe of Idaho	Kootenai	Albeni Falls Wildlife Mitigation Project (1992-061-05)
Kootenai Tribe of Idaho	Kootenai	Kootenai Tribe Integrated Fish and Wildlife Program Measures
Kootenai Tribe of Idaho	Kootenai	Support operations and maintenance and funding to support full timplementation of KTOI integrated fish and wildlife program
Kootenai Tribe of Idaho	Basinwide/Kootenai	The Council and BPA shall support and fund adequate on-going and long-term operations and maintenance for all mitigation actions as part of a commitment to fully address construction and inundation and operational losses to the extent required under the Northwest Power Act.
Spokane Tribe	Spokane	Spokane Tribe Wildlife Mitigation Operations & Maintenance
Spokane Tribe	Spokane	Lake Roosevelt Fish Habitat Enhancement Project
Spokane Tribe	Spokane	Spokane Tribe Fish Habitat Enhancement Project
Spokane Tribe	Columbia Upper	Lake Roosevelt White Sturgeon Conservation Hatchery Project
Spokane Tribe	Columbia Upper	Lake Roosevelt White Sturgeon Recovery Project
Spokane Tribe	Columbia Upper	Spokane Tribe Wildlife Mitigation Project (formerly Blue Creek Winter Range.)
Spokane Tribe	Columbia Upper	Spokane Tribal (Galbr Sprgs) Hatchery
Spokane Tribe	Columbia Upper	Remove Non-native Predators Using Established Methods
Spokane Tribe	Columbia Upper	Spokane Tribe Wildlife Mitigation Operations & Maintenance
Spokane Tribe	Columbia Upper	O&M of Lake Roosevelt Sturgeon Conservation Hatchery
Spokane Tribe	Columbia Upper	Construction of Lake Roosevelt Sturgeon Conservation Hatchery
Spokane Tribe	Columbia Upper	Seeding and Fertilization in Lake Roosevelt to improve habitat and food resources PILOT
Spokane Tribe	Columbia Upper	Feasibility study - Reintroduction of Anadromous Fish Above Grand Coulee
Spokane Tribe	Columbia Upper RM&E	Large scale seeding and fertilization of Lake Roosevelt to improve haitat and food resources.
Deschutes River Conservancy	Deschutes	further invest in water transactions above the Pelton Round Butte dam complex on the Deschutes River as a strategy to recover Middle Columbia River steelhead; and
Deschutes River Conservancy	Deschutes	To date, the Fish and Wildlife Program has largely considered steelhead recovery upstream from the Pelton Round Butte dam complex to be primarily the responsibility of dam operators and secondarily the responsibility of the Program. However, the importance of upper Deschutes Basin steelhead to delisting and the success of restoration efforts in the region suggests that Fish and Wildlife Program investments above the Pelton Round Butte dam complex will be critical to steelhead recovery, support a well-matched program, and contribute to an example of collaborative restoration that embodies the directions provided by the Fish and Wildlife Program in 2009. The DRC recommends that the Fish and Wildlife Program emphasize these directions (NPCC 2009: 62) to improve streamflow restoration effectiveness. The DRC also recommends that the Fish and Wildlife Program further invest in water transactions above the Pelton Round Butte dam complex as a strategy to recover Middle Columbia River steelhead.

Entity	Subbasin	Measure
Foster Creek Conservation District		The purpose of this proposal is to initiate a comprehensive, coordinated, watershed habitat restoration program, with the emphasis on those projects that will benefit Columbian sharp-tailed grouse and greater sage-grouse.
Methow Conservancy	Methow	Protect habitat in the methow subbasin
Pacific States Marine Fisheries Commission	Columbia Estuary	continued endorsement of restoration activities in the Lower Columbia River estuary to accelerate recovery of both up-river runs and lower-river priority salmon runs. In addition, the estuary and lower river habitat is thought to be important to eulachon smelt, a species listed as threatened under the Endangered Species Act and not an apparent consideration in the 2009 Fish and Wildlife Program.

2009 Fish and Wildlife Program measures

1. Subbasin measures

Columbia Estuary Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Lower Columbia Fish Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/67/NPCC%20comments.pdf (Recommendation)
http://www.lcfrb.gen.wa.us/December%20Final%20%20Plans/lower_columbia_salmon_recovery_a.htm (Recovery plan)

Lower Columbia River Estuary Partnership recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/63/Lower%20Columbmia%20River%20Estuary%20Partnership%20Proposed%20Amendment.doc

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

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

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Lower Columbia Fish Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/67/NPCC%20comments.pdf (Recommendation)
http://www.lcfrb.gen.wa.us/December%20Final%20%20Plans/lower_columbia_salmon_recovery_a.htm (Recovery plan)
Natural Solutions recommendation, to the extent it complements existing and future work by the agencies and tribes
http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=42
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522
Willamette Subbasin
City of Portland recommendation, to the extent it complements existing and future work by the agencies and tribes
http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=88
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
Columbia Basin Fish Accords (Warm Springs)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/100/2_FINAL_moa.pdf
Grande Ronde recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/103/NPCC%20Recommendations_CTGR_FINAL.doc
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Willamette Biological Opinion
http://www.nwcouncil.org/media/15611/willamette_biop_final_part3_july_2008.pdf (Chapter 9)

Sandy Subbasin

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

White Salmon Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Fifteenmile Subbasin

Columbia Basin Fish Accords (Warm Springs)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/100/2_FINAL_moa.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Hood Subbasin

Columbia Basin Fish Accords (Warm Springs)

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/100/2_FINAL_moa.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Hood Watershed Group recommendation, to the extent these actions complement the existing and future work by tribes and state fish and wildlife agencies
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/82/2008%20Hood%20River%20Watershed%20Action%20Plan.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Klickitat Subbasin

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Columbia Gorge mainstem subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Northwest Sportsfishing Industry Association recommendation, to the extent it complements the existing and future work of the agencies and tribes
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/85/NSIA%20Amendment%20Comments.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft Program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Crab Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Deschutes Subbasin

Columbia Basin Fish Accords (Warm Springs)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/100/2_FINAL_moa.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
Deschutes Basin Board of Control recommendation, to the extent it complements the existing and future work by the agencies and tribes
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/119/dbbc.pdf
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

John Day Subbasin

Columbia Basin Fish Accords (Umatilla)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/104/CTUIR%20Amendment%20Recommendations%20to%20NPCC.pdf

Columbia Basin Fish Accords (Warm Springs)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/100/2_FINAL_moa.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Palouse Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Tucannon Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Nez Perce Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Snake River Salmon Recovery Plan for Southeast Washington
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/120/srsrb.pdf (Recommendation)
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Umatilla Subbasin

Columbia Basin Fish Accords (Umatilla)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/104/CTUIR%20Amendment%20Recommendations%20to%20NPCC.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Walla Walla Subbasin

Columbia Basin Fish Accords (Umatilla)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/104/CTUIR%20Amendment%20Recommendations%20to%20NPCC.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Snake River Salmon Recovery Plan for Southeast Washington
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/120/srsrb.pdf (Recommendation)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Yakima Subbasin

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Yakima steelhead recovery plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/54/Council%20letter.pdf (Recommendation)

Lower Middle Columbia/Lower Snake Subbasins

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Nez Perce Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Snake River Salmon Recovery Plan for Southeast Washington
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/120/srsrb.pdf (Recommendation)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Entiat Subbasin

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/53/2008_03_27_NPCC_Amendment_FINAL.pdf (recommendation)
http://www.ucsrb.com/UCSRP%20Final%209-13-2007.pdf (Recovery plan)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Lake Chelan Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Methow Subbasin

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/53/2008_03_27_NPCC_Amendment_FINAL.pdf (Recommendation)
http://www.ucsrb.com/UCSRP%20Final%209-13-2007.pdf (Recovery plan)

Okanogan Subbasin

Columbia Basin Fish Accords (Colville)
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/Colville-Tribes-Action-Agency-Agreement.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/53/2008_03_27_NPCC_Amendment_FINAL.pdf (Recommendation)
http://www.ucsrb.com/UCSRP%20Final%209-13-2007.pdf (Recovery Plan)
Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Wenatchee Subbasin

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/53/2008_03_27_NPCC_Amendment_FINAL.pdf (Recommendation)
http://www.ucsrb.com/UCSRP%20Final%209-13-2007.pdf (Recovery plan)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft Program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Upper Middle Columbia Subbasin

Columbia Basin Fish Accords (Colville)
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/Colville-Tribes-Action-Agency-Agreement.pdf

Columbia Basin Fish Accords (Yakama)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/107/2_recommendations.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/53/2008_03_27_NPCC_Amendment_FINAL.pdf (Recommendation)
http://www.ucsrb.com/UCSRP%20Final%209-13-2007.pdf (Recovery Plan)

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Coeur d'Alene Subbasin

Coeur d'Alene Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/62/Final_CDAT_Program_Amendments.doc

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC

Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc

Pend Oreille Subbasin

Coeur d'Alene Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/62/Final_CDAT_Program_Amendments.doc

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC

Kalispel Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/69/Kalisepl%20Tribe%20Amendment%20recs_3-08.pdf

Kootenai Tribe of Idaho recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/94/1_KTOI%202008%20NPCC%20Amendment%20Final.pdf

Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc

San Poil/Lake Rufus Woods/Upper Columbia Mainstem Subbasins

Columbia Basin Fish Accords (Colville)
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/Colville-Tribes-Action-Agency-Agreement.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Spokane Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/71/Bill%20Booth%20-%20SpokaneTribe%20Amendment%20Final.pdf

Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Spokane Subbasin

Coeur d'Alene Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/62/Final_CDAT_Program_Amendments.doc
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
Spokane Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/71/Bill%20Booth%20-%20SpokaneTribe%20Amendment%20Final.pdf
Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc
Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Flathead Subbasin

Columbia Basin Fish Accords (Montana)/Montana Fish Wildlife and Parks recommendation, as modified by comments on draft program
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/MT_MOA_Final.pdf (Accord)
http://www.nwcouncil.org/fw/program/2008amend/comment?id=518 (Recommendations/comments)
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
Confederated Salish and Kootenai Tribes recommendation, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=530

Kootenai Subbasin

Montana Fish Wildlife and Parks recommendation, as modified by comments on draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=518 (Recommendations/comments)
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
Confederated Salish and Kootenai Tribes recommendation, as modified by comments on the draft program

http://www.nwcouncil.org/fw/program/2008amend/comment?id=530

FCRPS and Libby Dam Biological Opinions, including the Libby Dam Biological Opinion settlement
http://www.fws.gov/easternwashington/documents/Final%20Libby%20Dam%20BiOp%202-18-06lr3.pdf (Biological Opinion)
http://www.nwcouncil.org/media/15009/Libby.pdf (Settlement agreement)

Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC

Kootenai Tribe of Idaho recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/94/1_KTOI%202008%20NPCC%20Amendment%20Final.pdf

Upper Columbia United Tribes recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc

Asotin Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf

Nez Perce Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Snake River Salmon Recovery Plan for Southeast Washington
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/120/srsrb.pdf

Washington Department of Fish and Wildlife recommendations, as modified by comments on the draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Grande Ronde Subbasin

Columbia Basin Fish Accords (Umatilla)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/104/CTUIR%20Amendment%20Recommendations%20to%20NPCC.pdf

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Nez Perce Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Imnaha Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Oregon Department of Fish and Wildlife recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc
Nez Perce Tribe recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Snake Hells Canyon Subbasin

Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC
Columbia Basin Fish Accords (Idaho)/Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ID_MOA_Final.pdf (Accord)

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC (IDFG recommendation)

Nez Perce Tribe recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Clearwater Subbasin

Columbia Basin Fish Accords (Idaho)/Idaho Department of Fish and Game/Office of Species Conservation recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ID_MOA_Final.pdf (Accord)

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC (IDFG recommendation)

Columbia Basin Fish and Wildlife Authority recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion

http://www.nwcouncil.org/media/15018/RPA.pdf

Nez Perce Tribe recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Columbia Basin Fish Accords (Shoshone-Bannock) and Shoshone-Bannock Tribes recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ShoBan-AA%20MOA%20FINAL%20PACKAGE.pdf (Accord)

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=102 (Recommendation)

Salmon Subbasin

Columbia Basin Fish Accords (Idaho)/Idaho Department of Fish and Game/Office of Species Conservation recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ID_MOA_Final.pdf (Accord)

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC (IDFG recommendation)

Columbia Basin Fish and Wildlife Authority recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

FCRPS Biological Opinion

http://www.nwcouncil.org/media/15018/RPA.pdf

Nez Perce Tribe recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Columbia Basin Fish Accords (Shoshone-Bannock) and Shoshone-Bannock Tribes recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ShoBan-AA%20MOA%20FINAL%20PACKAGE.pdf (Accord)

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=102 (Recommendation)

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

Burns Paiute Tribe (Malheur) recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/74/BPT%20Amendment%20Package%204-4-08.pdf

Columbia Basin Fish and Wildlife Authority recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)

Idaho Department of Fish and Game/Office of Species Conservation recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC

Oregon Department of Fish and Wildlife (Malheur) recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Columbia Basin Fish Accords (Shoshone-Bannock) and recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ShoBan-AA%20MOA%20FINAL%20PACKAGE.pdf (Accord)

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=102 (Recommendation)

Shoshone-Paiute Tribe recommendations

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/87/SPT%202008%20NPCC%20Amendment%20Recommendations.doc

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

Ad Hoc Supplementation Work Group recommendation
http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=95
Columbia Basin Fish Accords (Colville)
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/Colville-Tribes-Action-Agency-Agreement.pdf
Columbia Basin Fish Accords (Idaho)/Idaho Department of Fish and Game-Office of Species Conservation recommendation
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ID_MOA_Final.pdf (Accord)
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC (IDFG recommendation)
Columbia Basin Fish Accords (Three Treaty Tribes)
http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/3-tribe-AA-MOA-Final.pdf
Columbia Basin Fish and Wildlife Authority recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/111/2_Recommendation.pdf
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/comments/218/4_Attachment3_ResidentFishSection4.doc (Revised resident fish section)
Columbia Basin Water Transaction Program recommendation (see program section VIII.D.2)
http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=86
FCRPS Biological Opinion
http://www.nwcouncil.org/media/15018/RPA.pdf
Idaho Department of Fish and Game/Office of Species Conservation recommendation
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/99/Idaho%20Final%20Amendment%204-4-08.DOC (Recommendations)
Kintama
http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/81/NWPCC%20Amendments-Kintama%20Comments.pdf
Montana Fish Wildlife and Parks recommendation, as modified by comments on draft program
http://www.nwcouncil.org/fw/program/2008amend/comment?id=518
Oregon Department of Fish and Wildlife recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/89/Oregon%20Attachment%204%20Projects%20&%20Measures%20(04-04-08).doc

Nez Perce Tribe recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/123/1_NPT%20Project%20Measures.xls

Northwest Habitat Institute recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/50/NHI%20Amendment%20Recommendations%2003-20-08.zip

Pacific States Marine Fisheries Commission recommendations

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=114 (data management)

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/122/rec.doc (invasives)

Columbia Basin Fish Accords (Shoshone-Bannock) and Shoshone Bannock recommendation

http://www.salmonrecovery.gov/Biological_opinions/FCRPS/2008_biop/docs/ShoBan-AA%20MOA%20FINAL%20PACKAGE.pdf (Accord)

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=102 (Recommendation)

Stewardship Partners recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/58/Columbia%20recommendations.doc

Upper Columbia United Tribes recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/80/UCUT%20Program%20Amendments%203-08.doc

U.S. Environmental Protection Agency

http://www.nwcouncil.org/fw/program/2008amend/recs/rec?id=59

U.S. Fish and Wildlife Service recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/109/1_Recommendation.pdf

U.S. Geological Survey recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/90/NPCC%20CovLetter%20F&W%20Plan%20Recommendations.pdf

Washington Department of Fish Wildlife recommendation, as modified by comments on the draft program

http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Washington Governors Office/Department of Ecology/Washington Department of Fish and Wildlife recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/83/WA%20F&W%20Amends%20(4-04-08).pdf

http://www.nwcouncil.org/fw/program/2008amend/comment?id=522

Washington Monitoring Forum recommendation

http://www.nwcouncil.org/uploads/2008amend/uploadedfiles/55/MonForum%20ltr%20to%20NPCC%20-%203%2021%2008.pdf

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 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 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 shall 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 shall convene a work group comprising action agenciesy and fish and wildlife ~~manager~~ agencies and tribes ~~representatives~~ 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 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 shall 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, 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

A panel consisting 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 [draft] 2014 Columbia River Fish and Wildlife Program.

The AEERPS conclusion with regard to the fish and wildlife program measures is necessarily preliminary because of what happens next. Under the Northwest Power Act, subsequent to the Council follows the fish and wildlife program amendment process, the Council begins the separate statutory process to review

and revise its by reviewing the Council's regional electric power and conservation plan. The AEERPS conclusion in the ~~this (and every other)~~ fish and wildlife program decision recognizes and assumes that the Council will adhere to the Power Act requirements in developing the ~~continue to do what the agency is supposed to do in the~~ regional power plan.~~:~~ including approving~~e~~ 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, 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 ~~consistently~~ understood and applied the statutory AEERPS provision in a consistent way ~~e~~ both before and after the 1994 explanation, although ~~but~~ that has been the most extensive discussion~~guide~~. *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.~~, which is only summarized in this section.~~ 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 ~~that can be brought~~ on line quickly in the event of a system disruption ~~and through controls on the transmission system~~. 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 ~~thus~~ 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 ~~preliminary~~ determination whether it can adopt the fish and wildlife program and still ~~the region will still be able to~~ 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. ~~The Advisory Committee is in the middle of the next assessment, with a final assessment for the Committee due in May 2014.~~

2010, ~~and~~ 2012 and 2014 adequacy assessments

At the time of the most recent adequacy assessments -- for the Sixth Power Plan in 2010~~,~~ and then in ~~the late~~ 2012 and 2014 ~~resource adequacy assessment~~ -- 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, ~~I~~implementation of ~~these~~ operations to benefit fish have reduced hydroelectric generation on average by about 1200 average megawatts relative to an operation without any constraints for fish and wildlife. For perspective, this energy loss represent~~sed~~ 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 1200 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 1200 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~~s~~ did show the potential for a power supply adequacy problem in 201~~7~~9, with a loss-of-load probability of ~~nearly 7~~ 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 ~~in~~ January and February~~. and, to a lesser extent, August.~~ The analysis also suggested that there were a number of reasonable actions the region's utilities and Bonneville can take well before 201~~7~~9 -- new generation, new energy efficiency, or a combination -- to result in ~~350~~400 megawatts of additional capacity and ~~that would~~ bring the adequacy estimate to the minimum acceptable level by 201~~7~~9. And the recent assessment also adds ~~Just since the Council's last adequacy assessment in 2012, the region has planned for an additional~~ 670 megawatts of planned thermal resource capacity that should be operational before 2019. ~~Some of these gains are offset by reductions in existing resources. Even so, the resource gains combined with the region's continued success in achieving the energy efficiency targets in the Council's power plan are expected to produce in the next assessment a loss-of-load probability reduced to 6 percent for 2019, with even further resource gains expected in the near future to reduce the probability below the 5 percent standard.~~ 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 [draft] 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 O~~o~~pinion, 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 an extent that would affect system generation~~ to such a degree as to ~~and thus~~ 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 wild 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 20104 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-effective 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, makes 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 continue efforts in this direction. So does the 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 science review of both individual projects and of larger scientific questions, assumptions, decisions, and reports underling 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 decisionmaking; (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 decisionmakers 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 ~~absorbing~~ the financial effects of fish operations that reduce the output and revenue of the system as well as ~~and~~ expenditures on other ~~program~~ 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 ~~.~~ ~~A~~assur~~e~~~~ing~~ 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 ~~is the consideration, not just that the system bears added costs~~.

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 2012, in May 2013. ~~, and a~~As of September ~~April~~ 2014, the Council has not completed ~~is at~~ work on the Fiscal Year 2013 report. 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, the year covered in the most recent report by the Council to the governors on fish and wildlife program costs, 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 foregone 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 summarized in a draft report issued by the Council for public comment in July 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 foregone 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 ~~[draft]~~ 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 ~~and for~~ other reasons, and in this sense ~~on this basis~~ 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. Findings on the recommendations

[developed upon adoption of program]

I. Message from the Council - *from the April draft*

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. The authority for this work is in the Northwest Power Act of 1980, a federal law that authorized the states of Idaho, Montana, Oregon, and Washington to form the Council. The Power Act gives the Council three distinct responsibilities: 1) to prepare and periodically update a plan to assure the Pacific Northwest region an adequate, efficient, economical, and reliable power supply; 2) to develop a program as part of the power plan to protect, mitigate, and enhance fish and wildlife of the Columbia River Basin that have been affected by hydropower dams; and 3) to inform the public about regional energy issues and involve the public in decision-making.

The challenge for the Council in this 2014 Program is as relevant today as it was in 1980. The Council's response to the hydropower mitigation obligation in the Power Act has evolved each time the Council has revised all or part of the program since 1982. 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, an area of more than 200,000 square miles. Later programs reflect 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 quantitative goals and objectives, clear strategies for attaining them, and effective monitoring and evaluation to measure progress and promote adaptive management. [*see Progress Update and Program Framework*]

The Council adopts into the program measures by reference from the various biological opinions. 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. This includes other anadromous species, such as lamprey and eulachon, as well as a number of native resident fish, including sturgeon, bull trout, kokanee, and others. The habitat and hatchery strategies in the program apply to all species in some way, but because the primary focus has been on salmon and steelhead, recommending entities have asked the Council to include 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 (ISAB) 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 of non-native species of fish on native salmon and steelhead, particularly juvenile fish, in the Columbia River Basin. The ISAB has reported that most subbasins of the Columbia River Basin already are dominated by non-native fish species, and NOAA fisheries researchers have reported that, for example, non-native smallmouth bass consume 35 percent or more of juvenile salmon outmigrants in some regions of the basin every year. Consistent with a recommendation from the Council's Independent Economic Advisory Board in 2014, this program calls on state fish and wildlife agencies to apply existing and new scientific research to identify where removal of non-native species would be most effective in increasing native fish populations.

The Council continues to evolve in its role as a planning, policy-making, and reviewing body. Currently, the Council perceives 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 of 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.

[signatures of Council members]