Oregon
John A. Kitzhaber, MD, Governor

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September 16, 2013

Bill Bradbury, Council Chair
Northwest Power and Conservation Council
851 SW Sixth Avenue, Suite 1100
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Dear Chair Bradbury:

On behalf of the State of Oregon, the Oregon Department of Fish and Wildlife (the Department) is submitting recommendations for amendments to the Columbia River Basin Fish and Wildlife Program. Specifically, our recommendations are for revisions to Northwest Power and Conservation Council (Council) documents:

- 2009-09, entitled "Columbia River Basin Fish and Wildlife Program."
- 2003-11, entitled "Mainstem Amendments to the Columbia River Basin Fish and Wildlife Program."
- Subbasin plans, as adopted into the Columbia River Basin Fish and Wildlife Program from December 2004 through June 2005.

Under the Northwest Power Act, state fish and wildlife agencies have a significant role in recommending changes to the Program. Oregon's recommendations are presented in *Attachment 1 - The State of Oregon's Recommendations for Amendment of the Northwest Power and Conservation Council's Fish and Wildlife Program.* These were informed and developed in collaboration with our fish and wildlife co-managers, including sixteen of the Basin's tribal, state and federal agencies. *Attachment 2 - Columbia River Basin Fish and Wildlife Managers' Draft Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations*" is provided as a cross reference to material we have drawn upon for 2009 Program amendments. Attachment 1 is Oregon's recommendations and therein we reference Attachment 2 to assure that you can appreciate our shared views with our fellow fish and wildlife co-managers.

The measures that Oregon recommends include specific projects to be funded by the Bonneville Power Administration (see *Attachment 3 - Priority fish and wildlife management actions to be funded by the Bonneville Power Administration in Oregon Columbia and Snake River subbasins*).

We look forward to working with the Council to ensure the Columbia River Basin Fish and Wildlife Program protects, mitigates and enhances fish and wildlife resources affected by the construction and operation of the hydropower system. We intend to work closely with the Council, Bonneville Power Administration, and the Basin's other fish and wildlife agencies and

tribes, to set appropriate priorities for Program implementation, as well as for coordination and review. We expect that this partnership will be based on full recognition of deference due under the Northwest Power Act, including the principles articulated in sections 4(h)(2), 4(h)(6), and 4(h)(8).

Thank you for this opportunity to provide our recommendations. As you proceed to amend and implement the Program, please work with Tom Rien at 971-673-6061 to coordinate Oregon's participation in these efforts.

Sincerely,

Roy Elicker,
Director

Attachments

cc: Henry Lorenzen, Oregon Council Member
Richard Whitman, Natural Resources Policy Director, Governor's Office

Attachment 1

The State of Oregon's Recommendations for Amendment of the Northwest Power and Conservation Council's Fish and Wildlife Program

September 17, 2013

Table of Contents

1.0 Overview

On behalf of the State of Oregon, the Oregon Department of Fish and Wildlife (ODFW) is submitting recommendations for amendments to the Columbia River Basin Fish and Wildlife Program (Program). Specifically, our recommendations are for revisions to the following Northwest Power and Conservation Council (Council) documents:

- 2009-09, entitled "Columbia River Basin Fish and Wildlife Program."
- 2003-11, entitled "Mainstem Amendments to the Columbia River Basin Fish and Wildlife Program."
- Subbasin plans, as adopted into the Columbia River Basin Fish and Wildlife Program from December 2004 through June 2005.

Under the Northwest Power Act, state fish and wildlife agencies have a significant role in recommending changes to the Program. Oregon's recommendations presented here (in Attachment 1), were informed by and developed in collaboration with our fish and wildlife co-managers, including sixteen of the Basin's tribal, state and federal agencies. *Attachment 2 - Columbia River Basin Fish and Wildlife Manager's Draft Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations*, is provided as a cross reference to material we have drawn upon for recommended 2009 Program amendments. Attachment 1 provides Oregon's specific recommendations, with cross references to Attachment 2 provided in parenthesis below the respective section and subsection headers (those listed in the table of contents) in order to assist in highlighting shared views with our fellow fish and wildlife co-managers.

The measures that Oregon recommends include specific projects to be funded by the Bonneville Power Administration (see *Attachment 3 - Priority fish and wildlife management actions to be funded by the Bonneville Power Administration in Oregon Columbia and Snake river subbasins*). Consistent with the recommendations for Program amendment presented here, we continue to endorse Oregon's recommendations that were adopted into a Program appendix in 2008.

The State of Oregon looks forward to working with the Council to ensure the Columbia River Basin Fish and Wildlife Program protects, mitigates and enhances fish and wildlife resources affected by the construction and operation of the hydropower system. We intend to work with the Council and Bonneville Power Administration, along with the Basins other fish and wildlife agencies and tribes, to set appropriate priorities for Program implementation, as well as coordination and review. We expect that this partnership will be based on full recognition of deference due under the Northwest Power Act, including the principles articulated in sections 4(h)(2), 4(h)(6), and 4(h)(8).

2.0 Program Performance Objectives

2.1 Restructure the Program to Better Support Implementation of Adaptive Management

(Attachment 2, Section 2.1)

Current Program: Page 3, Program Framework, and throughout

Recommendation: Restructure the Fish and Wildlife Program to contain or have provisions to explicitly develop or track the following essential adaptive management steps:

1. Update the current status and trends of the fish and wildlife resources the Program is intended to protect, mitigate, and enhance;
2. Adopt biological objectives and document the current gaps between Program objectives and status for the fish and wildlife resources identified in step 1;
3. Quantify the limiting factors and threats, in terms of their relationship to the biological objectives with associated assumptions, hypotheses and critical unknowns;
4. Adopt strategies and measures linked to limiting factors and threats with a quantification of expected outcomes toward the filling of the gaps identified in step 2;
5. Develop and maintain Research, Monitoring, and Evaluation Plans that will track the status and trends of focal species and their threats and limiting factors, collect the information necessary to test assumptions and hypotheses, address critical uncertainties, and evaluate the implementation of measures;
6. Share through reports, web tools, and other sources the accumulated monitoring and research data and information which will be used to carry out steps 7 and 8;
7. Develop an evaluation process that deliberately contemplates the information from steps 1–6 to verify or adjust assumptions and hypotheses, adjusts biological objectives, and adjusts strategies and measures; and,
8. Establish a process for adjusting the implementation of the Program to align with the changes identified in step 7.

Each of these eight adaptive management steps is necessary to achieving transparent, accountable, and effective planning, implementation and evaluation process. In this process, *measures* are the actions, or prescriptions for actions. They implement strategies to address the limiting factors that create the gaps in biological productivity of the focal populations.

Rationale: Adaptive management is built on the principle of learning by doing. Natural resource management is not an exact science. Therefore, the premise of this Program should be to state hypotheses then implement measures contained therein and monitor, report, and evaluate outcomes to provide a clear sequential structure to decisions required in the continuing evolution and implementation of the Program. Together, these steps will provide accountability for the Fish and Wildlife Program and are likely to increase the realized benefits for the region's overall investment in fish and wildlife restoration.

2.2 Biological Objectives in the Program

(Attachment 2, Section 2.2)

Current Program: Pages 11-14, Biological Objectives, and Page 63, Program Reporting

Recommendations:

The Council should follow through on the existing language in the 2009 Program, page 11, to initiate a science based process to inform policy choices on biological objectives as supported by the ISAB. Until that time:

- Maintain the existing language from the 2009 Program listed below with modifications shown in bold. These are important general targets for highest level Program evaluation and should be maintained.
    - *"Increase total adult salmon and steelhead runs, in a manner consistent with achieving recovery of ESA listed populations and prevents additional listings of listed species, above Bonneville Dam by 2025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest, 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.* ***Increase total adult runs for listed Lower Columbia salmon and steelhead to achieve 75 percent of recovery goals (NOAA 2013) by 2025."***
    - *"Within 100 years achieve population characteristics that, while fluctuating due to natural variability, represent on average full mitigation for losses of anadromous fish caused by development and operation of hydroelectric facilities in the Columbia Basin."*
- Maintain the current basinwide biological objectives expressed in the 2009 Program with modifications shown here in bold (to represent a 10-year implementation plan for these recommendations):
    - "*Halt declining trends in Columbia River Basin salmon and steelhead populations* ***by 2024,*** ~~***especially those that originate above Bonneville Dam***~~*. Significantly improve the smolt-to-adult return rates (SARs) for Columbia River Basin salmon and steelhead, resulting in productivity well into the range of positive population replacement.* ***Restore healthy characteristics*** ~~***Continue restoration***~~ *of lamprey,* ***sturgeon, and eulachon*** *populations.*
    - *"Restore the widest possible set of healthy, naturally reproducing and sustaining populations of salmon and steelhead in each relevant ecological province* ***by 2024."***
- Continue to recognize productivity objectives for salmon and steelhead:
    - *"****As an interim goal****, **contribute to** achieving smolt-to-adult survival rates (SARs) in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead."*
- The Program should also continue to recognize the mitigation responsibility for areas where anadromous fish have been extirpated (see Substitution for Anadromous Fish Losses):

- Replace existing introductory paragraphs at the top of page 12 with the following: "***Part of the anadromous fish losses has occurred in the blocked areas. A corresponding part of the mitigation for these losses should occur in those areas. The Program has a "Resident Fish Substitution Policy" for areas where anadromous fish have been extirpated. Given the large anadromous fish losses in the blocked areas, these actions have not adequately mitigated these losses. The following objectives address anadromous fish losses and mitigation requirements in all blocked areas:***
  - ***~~Investigate reintroduction of~~ Take action to reintroduce*** *anadromous fish into blocked areas,* ***where feasible****.*
  - *Restore and increase the abundance of native resident fish species* ***(subspecies, stocks and populations)*** *throughout their historic ranges when* ***~~original~~ appropriate*** *habitat conditions exist or can be feasibly restored or improved.*
  - ***~~Develop~~ Administer*** *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* ***(includes intensive fisheries within closed or isolated systems)****."*

- Add biological objectives that address the reintroduction of extirpated populations in non-blocked areas above Bonneville Dam.
- Expand anadromous goals to the Subbasin and Province levels and add specific and measurable objectives for resident fish and wildlife to support high level indicators.
- The Council should report annually on progress towards achieving the Basin-Level Biological Objectives as presented in the Program. The reporting section of the Program (Section VII.E) should be expanded to include reporting high level indicators that represent the Program's basin-level biological objectives as reported in Section II.C of the current Program.
- Add explicit measurable biological objectives to support the more general Program goals consistent with ISAB recommendations (ISAB 2013-1). Also refer to Section 5 of this document, Species Focused Recommendations. These should integrate with the current Council high level indicators and would clarify how to report against current biological objectives:
  - Halt declining trends in salmon and steelhead populations
    - Graph trends in representative populations' abundance over time and determine whether populations are increasing, decreasing, or stable
  - Increase total populations of native anadromous and resident fish that support tribal and non-tribal harvest
    - Report abundance of fish runs annually
    - Report tribal and non-tribal harvest in all fisheries annually
  - Achieve 5 million fish above Bonneville dam and 75 percent of recovery goals for LCR ESUs by 2025

        - Report annually total abundance by ESU for salmon and steelhead populations including harvest and other mortality
    - Achieve SARs of 2-6% with an average of 4% for Snake River and Upper Columbia River populations
        - Report annually appropriate dam to dam SARs for representative populations to determine if cumulative hydrosystem actions are achieving the targeted level of survival
    - Restore the widest set of salmon and steelhead populations in each province
        - Report population status by province including reintroduction goals
    - Restore lamprey, sturgeon and eulachon
        - Create a monitoring framework and report status of lamprey, sturgeon, and eulachon across the Columbia River Basin on a regular basis
    - Restore lamprey, sturgeon and eulachon production, passage and habitat
        - Report passage counts at dams annually and map distributions every 5 years

Rationale: The current Program, on page 11, calls for a process to assess the value of these goals. This should be implemented as called for. The Program should restate the call to assess the value of quantitative biological objectives and to develop an updated and scientifically rigorous set of such quantitative objectives. Reviewing and refining the adult fish return and SAR goals is appropriate to assure that these are correctly scaled to evaluate the Program. Measureable objectives provide:

- Quantitative targets to support the Program vision, moving the program from the abstract to the concrete;
- A method to track program progress (a report card); and
- A measure of improvement needed in the program.

The above actions and metrics along with importance, feasibility, and cost components, help inform future funding priorities to achieve specific goals. This contributes to policy discussions to prioritize funding to achieve specific goals. It is currently possible to report progress against the basin-level biological objectives that are stated in the Program. Establishing a consistent, transparent, reliable report using metrics to demonstrate progress of Program implementation is required to support true adaptive management at the basin-wide scale. The data currently exists to report against the objectives; however, the data management capacity and practices are not in place to support efficient, cost effective reporting.

Reference:

National Marine Fisheries Service (NMFS). 2013. ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead. Prepared by the National Marine Fisheries Service, Northwest Region, June 2013.

2.3 Coordinated Assessments Monitoring and Reporting

(Attachment 2, Section 2.3)

Current Program: Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure 1: The Council should adopt and BPA should fund full implementation of the Coordinated Assessments project to **report** on the indicators of natural origin spawners (NOR), smolt to adult return (SAR), adult to adult recruitment (AAR), and juveniles per spawner (JpS) for Columbia River salmon and steelhead populations.

Measure 2: BPA should fund expansion of the Coordinated Assessments project to include indicators for resident fish and wildlife.

Rationale: Approximately 78 million dollars are spent annually on anadromous monitoring in the Columbia Basin. This information is used to determine a population status and trend, effectiveness of habitat restoration, and for many other purposes. A variety of anadromous population data has been collected across various life stages and is reported by individual project sponsors in their annual reports. While this reporting is valuable at the project reporting scale, it is difficult to synthesize for reporting at the larger geographic scales such as the population, subbasin, province, major population, DPS/ESU, or Columbia Basin scales. In addition, there are many possible indicators that could be used for reporting. In 2010, fisheries agencies and tribes started the Coordinated Assessments (CA) project to standardize indicators for reporting across spatial scales and a data exchange standard to facilitate the associated data sharing. This was followed up with a pilot project that successfully demonstrated the proof of concept for this project. The CA project has now moved to the implementation phase, which includes modifying and developing new agency databases for storing raw and summarized data, analysis tools, and reporting databases. The agreed upon CA indicators track specific life stage survival and/or abundance of salmon and steelhead to provide the information needed for adaptive management process in the Columbia Basin and provide the necessary data for the FCRPS BiOP. These are the key indicators used for population status and trend analysis and for NOAA to determine population status under the ESA. The Program should continue to support this successful effort and expand the CA process to develop data sharing standards for resident fish and wildlife data.

2.4 Data Management

(Attachment 2, Section 2.4)

Current Program: Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure 1: BPA should fund adequate data management projects with the agencies and tribes to support regional reporting requirements for evaluation of Program activities that are additional to the agencies' and tribes' routine data management activities. There are data

specifically collected, managed, and analyzed due to the existence and operation of the FCRPS and its impact on fish and wildlife.

Measure 2: BPA should fund adequate reporting at the Council level to provide annual, and periodic, reporting of Program actions and effectiveness which supports Program scale adaptive management.

Rationale: The Council, tribal, state and federal natural resource managers agree that an information feedback process is required to inform management decisions about the use of fish and wildlife resources. Often this feedback process is characterized as "Adaptive Management," but this activity has not been funded or implemented.

A clear set of measurable biological objectives at various scales within the Program (high level indicators) could provide a top-down monitoring framework with which to guide data management infrastructure. A plan and process for reporting against those objectives could serve as an adaptive management tool for evaluating success of strategies and actions within the Program at each level.

A critical part of an adaptive management process is the collection, storage and analysis, and presentation of information about natural resources in a way that is useful to decision makers. Yet this critical activity has received little recognition and even less support in the Fish and Wildlife Program. The following actions are needed to rectify this oversight:

- Restructure and simplify the Program to provide Goals, Measurable Objectives, Strategies and Measures at the Basinwide, Province and Subbasin scale. All measures should be linked back to specific measurable objectives. The goals and objectives should then guide the development of a data management framework to support specific annual, bi-annual, and five year reporting requirements;
- Use a Regional Coordination forum including BPA, Council, tribal, state, and federal resource managers, and data management leaders to develop and review regional restoration progress reports, discuss options to improve reporting, and provide policy guidance for data management efforts;
- Use the StreamNet and Pacific Northwest Aquatic Monitoring Partnership (PNAMP) forums for development of the technical issues and tools necessary for coordinated data management. Extend this forum over time to include wildlife and terrestrial habitat data and other key sources of fish and wildlife related data sources (especially the Corps and LSRCP, but others such as the USFS, BLM, BOR, NRCPs, etc.);
- Use the updated F&W Program as the starting point for developing a coordinated data management system based on explicit reporting requirements adopted by the Council.
- Expand the Coordinated Assessment Project effort (under StreamNet and PNAMP) to develop data standards and sharing processes for derived data to support ESA and Fish and Wildlife Program reporting needs;
- Incorporate concepts consistent with the Council staff Draft Guidance for Information Management, Evaluation and Reporting; and

- Incorporate concepts consistent with the Council staff Draft Guidance for a Balanced and Coordinated Approach for Conducting Monitoring and Research Activities.

2.5 Hatchery Effectiveness Monitoring

(Attachment 2, Section 2.5)

Current Program: Pages 18-19, Artificial Production Strategies, and Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure: The Council should adopt and BPA should fund hatchery effectiveness monitoring and reporting for Columbia Basin hatcheries.

Recommendation: Insert a new bullet under *Artificial Production Strategies* (page 19), or under *Reporting and Data Management* (page 25) as follows:
"Hatchery Effectiveness Monitoring: The minimum reporting indicators for successful hatcheries to meet the Council's Artificial Production Review are: 1) the number of juveniles released by life stage, and 2) the components of total adult hatchery production, which include the number of hatchery adults returning to the hatchery, spawning in rivers, and caught in fisheries. These indictors can be used to assess the conservation and/or harvest benefits common of all hatchery programs. In addition to compiling this information for reporting, we also recommend a reporting database for these hatchery indicators be developed and funded to allow tracking of hatchery performance."

Rationale: Currently, approximately 26 million dollars are spent annually on hatcheries in the Columbia Basin to mitigate for losses cause by the FCRPS and it is important for the Council to track the effectiveness of hatchery programs. Hatcheries and individual hatchery programs in the Columbia River have been reviewed by NOAA through the Columbia Basin Hatchery Environmental Impact Statement and Hatchery Genetic Management Plans, the Hatchery Science Review Group, and Independent Science Review Panel. In addition, the Council has developed an Artificial Production Review (ARP) Process (NPCC 1999). The NPCC (2004) judged a hatchery program to be successful if it met the following conditions: 1) it must produce a healthy and viable hatchery population; 2) it must make a sustainable contribution of adult returns to conservation and/or harvest; 2) its potential effects on wild and native populations and the environment must be understood, and 4) it must collect, record, evaluate, and disseminate information pertaining to the first three conditions so that decision-makers may be informed about the benefits and risks of the program relative to other means of achieving similar conservation and harvest goals. While it is the responsibility of hatchery operators and funders to develop specific hatchery goals, the purpose of this amendment is to develop interim indicators that provide measures hatchery performance for the Council's role in hatchery oversight and to meet its reporting requirements. The minimum reporting indicators for successful hatcheries are 1) the number of juveniles released by life stage, and 2) the components of total adult hatchery production, which include the number of hatchery adults returning to the hatchery, spawning in rivers, and caught in fisheries as these can be used to

assess the conservation and harvest benefits of all hatchery programs. In addition, to compiling this information in a report (see Roler 2012 for an example of total adult production report), we recommend a reporting database for these hatchery indicators be funded possibly through StreamNet.

References cited:

Northwest Power Planning Council. 1999. Artificial Production Review. Council document 99-15, Northwest Power Planning Council, Portland, OR.

Northwest Power Planning Council. 2004. Artificial Production Review: Final Basin Level Report. Council document 2004-17, Northwest Power Planning Council, Portland, OR.

Roler, R., and E. Olk. 2012. Annual Coded-Wire-Tag Program, Washington: missing production groups annual report for 2010. Washington Department of Fish and Wildlife. Prepared for Bonneville Power Administration. Project No. 1982-013-04, Contract No. 55548.

3.0 Wildlife

3.1 Wildlife Operational Impacts

(Attachment 2, Section 3.1)

Current Program: Page 22, Operational Losses

Recommendation: Clarify in the Program Glossary that "Losses" are one-time losses from construction and inundation of the hydrosystem and "Impacts" are the ongoing impacts from operation of the hydrosystem (currently described as Operational Losses), unless legal or procedural rules prevent this clarification.

Measure: BPA should fund the agencies and tribes to complete operational impact assessments using methods that provide a systematic approach to characterize active physical and biological processes in watersheds and describes spatial distributions, histories and linkages among important ecosystem components. A framework for assessing operational impacts shall be in place by 2015 with assessments initiated that same year.

Rationale: Hydropower operational impact assessments are needed to determine the extent and directions of ecological alterations and to institute a standard, rigorous, transferable, and regionally accepted assessment methodology to describe and quantify ecological losses attributable to the FCRPS. The 2009 Program stated that the Council, with F&W managers and BPA, will assess the value of committing program resources on direct operational impacts on wildlife habitat. The Council should use its Wildlife Advisory Committee to convene the wildlife managers and BPA to develop protocols for assessing operational impacts. The WAC should develop/review accepted methods to assess impacts from operations (i.e., functional impairments from lost peak flows, erosion, trophic impacts, changes in species composition, and other impacts identified by Forum). Possible sources for information include recent ISRP reviews and the pilot project nearing completion in the Kootenai Subbasin. The goal of the forum should be to have regionally accepted protocols by 2015 and completed operational loss assessments by the completion of this 5-year Program.

The ecological impacts to wildlife populations due to the loss of fish and the losses caused by the operations of the hydro system have not been assessed. The fish and wildlife resources of the Columbia Basin have been deprived of marine-derived nutrients associated with the return of adult anadromous fish. The implications of this impact, while not yet clearly defined or quantified in terms of wildlife, must be mitigated and the 2009 Program increases this emphasis.

Given the vision of this program, the strong scientific case for a more comprehensive, ecosystem-based approach, and the shift to implementation of this program through provincial and subbasin plans; wildlife mitigation projects should complement fish mitigation projects to the extent practical. Lands protected as part of fish mitigation may be credited to offset wildlife operational losses if the lands protect priority focal wildlife habitats.

Ecosystem management should maintain or recover the biological integrity of the system. Determining the extent to which ecological systems are experiencing anthropogenic disturbance and change in structure and function is critical for long-term conservation or restoration of biotic diversity in the face of changing and compromised landscapes and land use. To determine parameters needed to address ecological integrity, the Council, wildlife managers, and BPA will adopt a framework that can: (1) identify and isolate operational impacts from other basin changes, (2) assess operations-based influences on downstream physical processes, (3) link physical, biological, and ecological processes (4) account for natural floodplain dynamics, and (5) be used in a predictive capacity.

BPA should fund assessments of ecological impacts to wildlife from the reduction or loss of anadromous fish as part of the operational loss assessment. The assessments need to evaluate an array of core ecological parameters (e.g., biological/biotic and physical/abiotic) with the understanding that habitats, communities, and processes are ecologically linked. The results of these assessments will be the basis for quantification of operational impacts and subsequent mitigation obligation. Existing and future habitat actions implemented to benefit anadromous fish may be suitable mitigation for some of these impacts.

3.2 Adequately Fund Wildlife Projects

(Attachment 2, Section 3.2)

Current Program: Pages 20-22, Wildlife Strategies

Recommendation: BPA shall fund existing projects at levels adequate to implement wildlife area management plans.

Rationale: Funding needs to continue to maintain the base level of habitat and credits accomplished to date. BPA will fund existing wildlife projects at levels determined to be consistent with the project management plans. Funding must be sufficient for habitat maintenance and enhancement, and appropriate monitoring as agreed upon in the management plans. Where management plans are not in place, BPA will provide interim funding to manage the wildlife projects and complete the management plans.

3.3 Adequately Fund Wildlife M&E

(Attachment 2, Section 3.3)

Current Program: Pages 20-22, Wildlife Strategies, and Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure: BPA shall fund adequate monitoring, data management, and reporting to answer the following questions in an annual report to Council and the region -

- How many habitat units have been mitigated for FCRPS construction and inundation caused losses of wildlife?
- How many of those habitat units are secured through long term funding?

- How are wildlife species and habitats responding to FCRPS mitigation actions?
- What is the FCRPS mitigation responsibility for wildlife operational impacts?

Recommendation: The Council, through their Wildlife Advisory Committee, should identify and support specific reporting requirements for wildlife and wildlife projects for the Program.

Rationale: It is appropriate for BPA to fund research, monitoring and evaluation of wildlife mitigation projects adequately to assure tracking of crediting, to evaluate trends in ecological functions of managed ecosystems, and provide managers the ability to assess the effectiveness of their mitigation strategies by evaluating species and habitat responses that contributes to broader monitoring efforts. BPA should continue funding HEP surveys on acquired land in support of the Wildlife Advisory Committee to track mitigation implementation progress.

Recommendation: A programmatic evaluation of the Wildlife Section of the Program should occur preceding Program amendments, to determine whether wildlife measures are moving the Program towards its biological objectives for performance.

Rationale: Reporting high level indicators for wildlife, at the scale of the Columbia River Basin, is a daunting challenge. The impact of the BPA funded wildlife mitigation projects, while significant, may not be detectable within the environmental noise of such a large landscape. Individual wildlife populations are generally highly migratory, and trends in population size is not an appropriate indicator of Program success as species ranges are far greater than the individual project areas, and in many cases far greater the Columbia River Basin. Habitat quantity and quality is the currency for implementation of the BPA funded wildlife mitigation program and should be taken into account when developing HLIs for areas within the Program influence.

In 2010, the Council chartered the Wildlife Crediting Forum to provide advice on the quantifying and accounting system (informally known as the Ledger) for the wildlife habitat mitigation credits associated with the construction and inundation impacts of the Federal Columbia River Power System (FCRPS) within the Columbia River Basin. The database that currently houses the Ledger is called Pisces (BPA project accounting and management program/software). The Forum consisted of wildlife co-managers representing the 14 tribes and 3 state fish and game departments (Oregon, Washington, Idaho) impacted by the FCRPS; and representatives of the U.S. Fish and Wildlife Service (USFWS), BPA, and BPA Customers. The State of Montana was not a Forum participant, as wildlife mitigation issues relating to FCRPS losses from construction and inundation have been settled by prior agreement between BPA and that state.

Following the Wildlife Crediting Forum, the co-managers developed a working draft for a reporting framework called the Wildlife Monitoring Implementation Strategy based on three categories of HLIs as determined by the Council. Further work is required to fully develop a reporting mechanism for the Council's needs. The Council identified the following three categories of HLIs:

1) Habitat and Vegetation Types – several metrics would be reported for each cover type that represents status and trend in quality and quantity of the cover type, which can infer benefits to focal species or guilds. While this data is collected by individual wildlife projects within the Program, compilation and reporting will be required at a scale larger than any individual project. Reporting this information would require a designated project to perform the summary, analysis and reporting necessary to provide useful and timely indicators for Council reports.

2) Focal Species – several national/state level data sets could be used to represent relative status of wildlife species in this area. This level of data would be retrieved from national or state databases, and not from the individual projects; however, most of the data is initiated at the project level. Reporting this information would require a designated project to perform the summary, analysis and reporting necessary to provide useful and timely indicators for Council reports.

3) Habitat Units – the BPA HU ledger would continue to be reported as a measure of mitigation actions implemented specific to the Fish and Wildlife Program. The recent completion of the Wildlife Crediting Forum has provided a clean slate for reporting HUs at the project scale, a project may be needed to provide the high level summary of this information similar to the CBFWA Status of the Resource Report and website.

In developing the Wildlife Monitoring Implementation Strategy (WMIS), wildlife managers considered the following concepts:

- Scale integration: data collected can be used at multiple scales of interest for decisions
- Integration across separate monitoring programs: information gathered serves multiple functions and thus reduces costs
- Integration of policy and technical domains: precision of data fits time frames and acceptable risks for decisions
- Species integration: collection of data for multiple species in an efficient manner
- Adequate sample size: sample sizes are statistically adequate to discern differences among populations, across spatial distributions, and across temporal scales relative to varying human-induced and natural environmental stressors

Based on this effort, the wildlife managers are prepared to engage with the Council and BPA to develop biological and environmental performance objectives for the wildlife portion of the Program and establish an annual and five-year reporting process for evaluating implementation success.

4.0 Resident Fish

4.2 Address Management of Non-natives as Resident Fish Mitigation

(Attachment 2, Section 4.2)

Current Program: Page 22-23, Resident Fish Mitigation

Measure: BPA should fund efforts to address all primary limiting factors affecting resident fish including non-native species eradication and suppression and coordinate these efforts with companion efforts that protect anadromous fish from non-native species.

Recommendation: Add Program language to Section 2 and/or Section 7 under Basinwide Strategies: "*The threat of non-native species increasingly complicates the protection, restoration, and enhancement of resident fish species throughout the basin. Competition, predation and hybridization by non-natives often reduces the effectiveness of habitat protection and restoration efforts for native fish populations. Funding should be directed to treat the problem, not the symptoms, including research to better understand food-web interactions. Where non-native species have been identified as a primary limiting factor in subbasin plans, increased effort and funding should be directed to eradicate or suppress non-native species in conjunction with the proven methods that benefit their habitats.*"

4.3 Define Resident Fish Substitution for Anadromous Fish Losses

(Attachment 2, Section 4.3)

Current Program: Page 23-24, Resident Fish Substitution Strategies

Recommendation: The Council should work with the fish and wildlife managers to provide a clearer definition of Program goals, objectives and methodology for addressing anadromous fish losses through resident fish substitution actions, in order to evaluate adequate implementation and effectiveness of this portion of the Program.

Measure: BPA should provide adequate funding for projects such that the following objectives are achieved:

- Restore native fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats and access can be feasibly restored.
- Take action to reintroduce anadromous fish into blocked areas, where feasible (this objective should receive the highest priority).
- Administer 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 (included intensive fisheries within closed or isolated systems).

Rationale: A wide cross section of resident fish substitution projects, particularly in the basins where passage of anadromous adults and juveniles is currently blocked by Federal Columbia River Power System (FCRPS) projects, have been implemented over time without a standard definition of program goals or a methodology for converting anadromous fish losses to resident fish substitution goals where in-kind mitigation projects are not currently possible to implement. Giving clearer Council guidance for these types of efforts seems timely, as these mitigation requirements of BPA have not yet been uniformly and systematically addressed.

The current Program (Sections II. D 7&8) describes both resident fish mitigation and substitution programs. Four principles were outlined for guiding decisions on mitigation strategies to address anadromous fish losses in blocked areas, including the concept of resident fish substitution programs (page 24). These principles range across a wide spectrum of options, from investigating the feasibility of anadromous fish passage, enhancing native resident fish, and where not possible to mitigate with enhancement of native resident fish (e.g., through consumptive and non-consumptive programs including hatchery programs) to finally considering focusing on non-native resident fish populations – guided by an environmental risk assessment template developed with assistance of the Independent Scientific Advisory Board (ISAB) and the current subbasin and basinwide objectives.

While these various types of mitigation programs have merit and may be suitable for a wide variety of geographic areas and environmental conditions, without a common currency for evaluating the extent of a program and establishing program goals and objectives that adequately address the value of anadromous fish that were lost due to the effects of construction and operation of the FCRPS that created the passage blockages initially, full and equitable mitigation for these losses will remain difficult to define.

4.4 Resident Fish Loss Assessments

(Attachment 2, Section 4.4)

Current Program: Page 22-23, Resident Fish Mitigation and Crediting

Measure: BPA should fund the Agencies and Tribes to develop a methodology and complete resident fish loss assessments. The selection of a method should be at the discretion of the entities involved in performing the survey; however, to standardize the process and ensure a consistent level of accuracy across the basin the Council should form a workgroup of resident fish managers to address this issue. A framework for assessing resident fish losses shall be in place by 2015 with assessments initiated that same year.

Rationale: The Northwest Power and Conservation Council's (Council) amended Fish and Wildlife Program (Program) provides for resident fish mitigation "where construction and inundation losses have been assessed and quantified by the appropriate agencies and tribes, mitigation should occur through the acquisition of appropriate interests in real property at a minimum ratio of 1:1 mitigation to lost distance or area." Despite the mitigation provisions, the

Program does not prescribe specific methodology for the calculation of lost resident fish habitat due to construction and inundation. Because of this omission, resident fish managers (i.e., Columbia Basin Fish and Wildlife Authority's (CBFWA) members and non-members) in the Columbia River Basin, working through the CBFWA Resident Fish Advisory Committee (RFAC), developed a methodology to allow for the consistent quantification of inundated resident fish habitat (CBFWA Members Action Notes, October 7, 2009).

The CBFWA sent a letter on October 8, 2009 to the Council suggesting a recommended methodology to calculate the amount of resident fish habitat that has been inundated by the construction of the Federal Columbia River Power System. The inundation methodology could serve as the foundation for future identification of operational losses.

The Council should develop and adopt a standard methodology through a public process that includes independent science review and the participation of the resident fish managers throughout the Columbia River Basin.

5.0 Species Focused Recommendations

5.1 Species recovered in the context of the ecosystem

(Attachment 2, Section 5.1)

The ISAB provides six new principles that are intended to replace the original eight principles on page 9-10 of the current Program, while retaining most of the original content. They are structured to express the theme that sustainability can be enhanced in two ways: first, by building resilience to reduce the probability that an ecosystem will cross a "tipping point" and shift into a new regime; and second, by building adaptability to improve outcomes when such regime shifts do occur. The latter concern is especially relevant in the Columbia River Basin in the face of climate change, human population growth, proliferation of chemicals, hydrosystem development, and the emergence of hybrid food webs due to the spread of non-native and artificially propagated species. (ISAB 2013-1)

The development and operation of the hydropower system has such an impact on the Columbia River ecosystem, that its affects cannot be separated or isolated from the other landscape scale impacts to the system. Addressing one part of the system impacts successive elements and therefore, mitigation actions need to be considered in this larger context. The Council's Program needs to take a larger vision of the entire system in order to prioritize strategies, rather than treating the symptoms or individual elements. The recommendations in Section 2 of this document, explicitly identifying limiting factors and strategies to address them, would help in aligning the individual actions and assessing the effectiveness of specific strategies in a holistic context.

5.2 Integration with Endangered Species Act

(Attachment 2, Section 5.2)

Current Program: Pages 3-4, The Program Framework, and throughout

The purpose of the Endangered Species Act is to conserve the ecosystems upon which endangered species and threatened species depend and to provide a program for the conservation of such species. Furthermore, the ESA states that it is a policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species. The ESA's purpose and policies are complementary to the Council's mandate to develop a program to protect, mitigate and enhance fish and wildlife, included related spawning grounds and habitat, on the Columbia River and its tributaries.

In anticipation of ESA recovery plans, co-managers, including NOAA Fisheries, worked with the Council and subbasin planners to ensure that subbasin plans provided a good foundation for ESA recovery. Thus, as ESA recovery plans emerged, they were built on the foundation of the subbasin plans. The recovery plans were developed by local stakeholder groups including the fishery agencies and tribes, states, local governments and other federal agencies. The final

plans include ESA goals as well as broad sense goals, priority limiting factors, priority actions and costs. These recovery plans provide important context and guidance for the Council's Fish and Wildlife Program and they should be explicitly incorporated into the Program. Following are specific recommendations.

Recommendation 1: Maintain the current language under Program Framework, page 4, expressed in the 2009 Program with modifications shown here in bold:
"*…That is, the Council's Program is designed to link to and accommodate the needs of other programs in the basin that affect fish and wildlife. This includes meeting the needs of the ESA by* ***~~describing the kinds of ecological change needed to improve the survival and productivity of the diverse fish and wildlife populations in the basin.~~ implementing the Program to be consistent with ESA regulatory findings in biological opinions and rulemakings; incorporating ESA recovery criteria into Program biological objectives; and incorporating ESA recovery plans, including implementation plans, into Basin-wide and subbasin management plans and multi-year action plans.***"

Recommendation 2: Update the current language under Implementation and Performance, page 5, expressed in the 2009 Program with modifications shown here in bold:
"The Council comprehensively revised the Program in 2000 with the addition of the current program framework, added specific measures and objectives for the mainstem in 2003, and then developed and adopted the subbasin management plans into the Program in 2004-05. Together, these elements provide a coordinated and integrated plan for fish and wildlife actions across the basin. The federal, state, and tribal governments have been working since then with local partners to expand the subbasin plans into ESA recovery plans for areas of the basin that include ESA-listed populations. ***~~The Council is planning a subsequent amendment process in 2009-2010 to update the subbasin management plans and Program objectives to reflect these and other recent planning developments.~~ Many ESA recovery plans for salmon and steelhead are now complete. Those recovery plans used the 2004-05 subbasin plans and this cycle should continue, so the subbasin plans should now incorporate the final ESA recovery plans."***

Recommendation 3: The ISAB points out a concern that the subbasin planning process was a great idea that has been diminished by the lack of support or continued engagement of the original stakeholders in recent years. The ISAB also recommends that the Council reconsider a planning process that utilizes other existing structures and uses salmon and steelhead recovery domains as an example. The Council should implement the ISAB's recommendations for landscape and subbasin planning, including the need to actively encourage and support a mid-scale (perhaps Province-level which is close to the recovery domains) planning process that supports and utilizes and existing partnerships and organizations.

Recommendation 4: In addition to, and support of, the recommendations provided under Section 2.2 of this document for Biological Objectives, also:

- Adopt the ISAB's recommendation to make the Basin-wide objective of 5 million salmon and steelhead by 2025 more specific with respect to wild and hatchery fish.

- Adopt the ISAB's recommendation to develop productivity objectives that reflect differences among species and populations. Incorporate ESA recovery productivity objectives.
- Adopt the ISAB's recommendation to establish quantitative biodiversity objectives for focal species and habitats. Incorporate ESA biodiversity objectives.
- Add language that states: ***"The Council's Program incorporates the quantitative recovery criteria from ESA recovery plans. It also incorporates the more qualitative broad sense goals in some recovery plans that go beyond ESA delisting."***

Recommendation 5: Maintain the current language under Objectives for Environmental Characteristics, page 13, expressed in the 2009 Program with modifications shown here in bold:
"~~***Allow for biological diversity among and within populations and species***~~ ***Promote the increase of biological diversity among and within populations*** *to increase ecological resilience to environmental variability."*

Recommendation 6: Maintain the current language under Basinwide Strategies, page 14, expressed in the 2009 Program with modifications shown here in bold:
"As discussed in the Program's Implementation Provisions (Section VIII), the Council will work with Bonneville, fish and wildlife managers, and others to develop multi-year action plans for all areas of the Program. ***The multi-year action plans will incorporate priority actions for recovering listed species as described in recovery plans and ESA recovery implementation plans.*** *The Council will work with Bonneville to ensure reasonable implementation of all multi-year action plans*."

Recommendation 7: Under Habitat Strategies, pages 14-15, add a strategy to ***"Establish and implement a consistent process for prioritizing habitat actions."***

Recommendation 8: Maintain the current language under Habitat Protection and Improvement Activities to Address Biological Objectives, page 16, expressed in the 2009 Program with modifications shown here in bold:
"*Habitat work is intended to be consistent with the Program's biological objectives and also with measures contained in subbasin plans* ***and ESA recovery plans***."

Recommendation 9: Recovery plans are also a source for actions that address climate change and toxics. Maintain the current language under Emerging Habitat Issues, page 16, expressed in the 2009 Program with modifications shown here in bold:
"…Specific measures to deal with these emerging issues are included in the mainstem plan, ***recovery plans,*** *and in many of the subbasin plans."*

Recommendation 10: Address the reintroduction of extirpated populations in non-blocked areas above Bonneville Dam. Under Artificial Production Strategies, page 18, maintain the current language with the following modifications shown here in bold:
"*3) to replace lost salmon and steelhead in blocked* ***and unblocked*** *areas.*"

Recommendation 11: In addition to subbasin plans, recovery plans also contain hatchery actions to rebuild natural runs. Under Artificial Production Strategies, page 19, at the end of the second sentence under "*d. Restoration*" insert "***and recovery plans***."

Recommendation 12: Under Updating Existing Subbasin Management Plans, page 58, insert "***A number of recovery plans have been completed. The subbasin management plans will be updated by 2014 to explicitly incorporate final recovery plans. For additional recovery plans completed after 2014, the Council will accept recommendations to incorporate those plans in the appropriate subbasin plans.***"

Recommendation 13: Under Implementation Provisions, page 59, it is important to adhere to the statement that, "*The Council will use the procedures in this section to integrate Bonneville funding for this Program with Endangered Species Act requirements, including the Endangered Species Act mandate for Federal agencies to carry out programs for the conservation of endangered and threatened species."*

Recommendation 14: Under Appendix E: Subbasin and Basinwide Measures, add to Columbia Gorge Province the Mid-Columbia Steelhead Recovery plan and the Lower Columbia Salmon and Steelhead Recovery Plan.

Recommendation 15: The Council should clarify that a) ESA recovery and delisting is consistent with Fish and Wildlife program goals and b) actions to achieve Fish and Wildlife Program goals should not impede ESA delisting.

Rationale: These recommendations encourage the Council to explicitly incorporate ESA goals and objectives for recovery and delisting of threatened and endangered species into the Fish and Wildlife Program. Significant recovery plan and ISAB work has been completed and this work should be reflected deliberately in the Wildlife Program. In most cases, in order to attain broad sense species recovery such that environmental, social, and economic values can be broadly attained, Fish and Wildlife Program goals should exceed the legal step of ESA delisting. However, for listed species, ESA delisting should be an intermediate step towards the longer-term Fish and Wildlife Program goals, and the objectives, plans, as well as quantitative and qualitative measures of delisting-based recovery should be deliberately incorporated into the Program if achievement of this delisting objective is intended to be met.

Supporting Materials:

ISAB (Independent Scientific Advisory Board). 2013. Review of the 2009 Columbia River Basin Fish and Wildlife Program. Northwest Power and Conservation Council Report ISAB 2013-1.

ISAB (Independent Scientific Advisory Board). 2011. Using a Comprehensive Landscape Approach for More Effective Conservation and Restoration. Northwest Power and Conservation Council Report ISAB 2011-4.

NOAA' Pacific Northwest Salmon Recovery Planning & Implementation website. http://www.nwr.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/salmon_recovery_planning.html

5.3 Lamprey

(Attachment 2, Section 5.3)

Current Program: various sections

Recommendation 1: Edit third bullet under *Habitat* on Page 7 to read: "*Ocean conditions should be considered in evaluating freshwater habitat management and to understand all stages of the salmon, steelhead* ***and Pacific lamprey*** *life cycles.*"

Recommendation 2: Insert new second paragraph under *Anadromous Fish Losses* on Page 11 as follows: "***No comparable analysis exists for Pacific lamprey; however, it is apparent that losses have been substantial. The Council recognizes and supports efforts to restore Pacific lamprey numbers, including adoption of the Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin and the USFWS Pacific Lamprey Conservation Agreement into the Fish and Wildlife Program. Restoration of Pacific lamprey numbers and directed mitigation for hydrosystem lamprey losses should incorporate actions recommended in these plans."***

Recommendation 3: Insert new bullet under *Anadromous Fish Losses* on Page 11as follows: ***"Continue restoration of Pacific lamprey by (1) restoring lamprey passage and habitat in the mainstem and in tributaries that historically supported spawning lamprey populations, (2) continuing efforts to translocate adult Pacific lamprey to appropriate areas to reduce upstream passage losses, and (3) evaluating artificial propagation as a way to mitigate for lost lamprey production when passage and habitat improvements alone are insufficient. Attain self-sustaining and harvestable populations of lamprey throughout their historic range."***

Recommendation 4: Revise second bullet under *Objectives for Environmental Characteristics* on Page 13 to read: "*Protect, enhance, restore, and connect freshwater habitat in the Columbia River mainstem and tributaries for the life history stages of naturally spawning anadromous and resident salmonids* ***and Pacific lamprey****."*

Recommendation 5: Revise fourth paragraph under *Habitat Strategies* on Page 14 to read: "*For example, passage through the hydrosystem causes loss to salmon, steelhead, lamprey and resident fish. Measures at the dams can and should be taken to reduce this loss. As an offset for hydrosystem-caused losses, the Program* ***~~may also~~*** ***calls*** *for improvements in spawning and rearing habitats in tributaries, the lower river, and estuary. By restoring these habitats, which were not damaged by the hydrosystem, the Program helps to compensate for the existence of the hydrosystem.****"***

Recommendation 6: Insert new section ***g. Pacific Lamprey Production*** on Page 19:
"The Council recognizes progress in the development of a Framework for Pacific Lamprey Supplementation Research in the Columbia River Basin. Translocation efforts have been successful at increasing adult spawning activity, larval recruitment, and larval distribution and have provided important Pacific lamprey life history information. Current and future translocation actions should be guided by the lessons learned from ongoing efforts.

It is not likely that fragmented, isolated or non-existent lamprey groups within the Columbia River Basin will naturally recolonize the upper portions of their range given the paucity of adult returns and numerous threats, including the existing mainstem environment. Therefore, the long-term restoration of Columbia River Basin lamprey may require the structured release of artificially propagated lamprey in priority areas to achieve a variety of management and conservation objectives.

- ***Continue development and implementation of lamprey translocation in accordance with tribal guidelines as a component of a regional recovery plan***
- ***Evaluate the role of lamprey artificial propagation as a research tool and for supplementation of local groups"***

Recommendation 7: Add sentence to opening paragraph for *Primary Strategy* on Page 31 as follows: "*Identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland actions.* ***This should include evaluating the effects of ocean harvest on Pacific lamprey food resources.***"

Recommendation 8: Revise *Manage for Variability* on Page 31 to include Pacific Lamprey in the text.

Recommendation 9: Revise third bullet under *Estuary Strategies* on Page 32 to include Pacific Lamprey.

Recommendation 10: Revise first paragraph under *Vision of the Mainstem Plan* on page 35 as follows: "*…especially spawning, rearing, resting, migration,* ***and over-wintering habitats*** *for salmon, steelhead, lamprey, sturgeon, and resident fish populations."*

Recommendation 11: Revise second bullet under *2. Specific Objectives…* on Page 36 to read: "*Protect, enhance, restore and connect freshwater habitat in the mainstem for the life history stages of naturally spawning anadromous and resident salmonids* ***and lamprey****. Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains, and uplands in the mainstem."*

Recommendation 12: Revise third bullet under "*Migration and passage conditions for anadromous fish*" on Page 38 as follows: "*The Council will consult with ...to determine the possibility of adopting hydrosystem survival performance standards for non-listed populations of anadromous fish including lamprey.* ***Efforts should be implemented to adopt an interim***

passage standard for adult Pacific lamprey of 80% per mainstem dam to be accomplished within 10 years and to improve passage further in subsequent years."

Recommendation 13: Revise final bullet under *Water Quality* on Page 44 as follows: "*Implementing actions to reduce toxic contaminants in the water to meet state, tribal and federal water quality standards. The federal action agencies should partner with and support federal, tribal, state, and regional agencies' efforts to monitor toxic contaminants in the mainstem Columbia and Snake rivers and evaluate whether these toxic contaminants adversely affect anadromous or resident fish important to this Program. If so, implement actions to reduce these toxic contaminants or their effects if doing so will provide survival benefits for fish in mitigation of adverse effects caused by the hydropower system. In particular, investigate whether exposure to toxics in the mainstem, combined with the stress associated with dam passage, leave juvenile salmon* ***and adult and juvenile lamprey*** *more susceptible to disease and result in increased mortality or reduced productivity."*

Recommendation 14: Revise introductory text under *Lamprey and Sturgeon Passage*, *a. Lamprey*, on Page 47 to read: "***In recent years awareness of the effects of the hydrosystem on lamprey has increased, and the need for substantial additional effort addressing lamprey has become an emerging issue.*** *In the Columbia River Basin…. (retain entire existing paragraph).*

Artificial propagation needs to be evaluated as a tool for restoring lamprey and mitigating for losses. Development of life-cycle and bioenergetics models will help identify critical limiting factors and prioritize recovery actions. Budgets and staffing must be adequate to monitor the effects of actions taken to address lamprey issues."

Recommendation 15: Revise/add bullets under *Lamprey* on Page 47 as follows: "*Bonneville and the Corps, in coordination with federal, state, and tribal fish managers and the Council, should* ***~~implement the following measures to improve adult and juvenile Pacific lamprey passage survival and reduce delays in migration~~ identify, develop, implement, and monitor measures to help restore Pacific lamprey including****:*

- ***~~Identify~~*** *Specific fish passage structures* ***for adult and juvenile lamprey***
- ***Regional approaches to evaluate passage, abundance, distribution, and population structure, including the mainstem Columbia, Snake and Willamette rivers***
- ***Develop tags suitable for adult and juvenile lamprey and a regional lamprey tagging forum***
- ***Develop a regional strategy for monitoring passage into tributaries to better understand differences in counts of adult lamprey between dams***
- ***Increase knowledge regarding the use of the mainstem as spawning habitat***
- *Identify operations at mainstem hydropower dams* ***such as ramping rates and water elevation changes*** *that delay, obstruct, or kill migrating* ***adult and juvenile*** *lamprey*
- ***Monitor and address effects of hydrosystem operations on juvenile lamprey residing in reservoirs***

- *Develop and implement **~~lamprey~~** passage aids **for adult and juvenile lamprey** at known passage obstacles*
- *Monitor lamprey passage at mainstem hydropower dams to evaluate passage improvement actions and to identify additional passage problem areas,*
- *Assess lamprey passage efficiency, direct mortality, and/or other metrics relating to migratory success of lamprey**~~, and~~***
- *Determine predation on **adult and juvenile** lamprey during **~~mainstem passage~~** **migration***
- ***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. Develop adaptation strategies to address these affects, and***
- ***Support the USFWS Pacific Lamprey Conservation Agreement through collaborative development and management of data."***

Recommendation 16: Revise text under *Reintroduction of Anadromous Fish in Blocked Areas* on Page 56 as follows: *"….evaluate the feasibility of salmon, steelhead, **and Pacific lamprey** reintroduction, consistent with the objectives in the appropriate subbasin plans."*

Recommendation 17: Revise first paragraph under *Updating Existing Subbasin Management Plans* on Page 58 as follows: "*The Council recognizes that work has continued in some subbasins to refine and update management plans. The Council also recognizes that work has continued outside the Program, such as recovery planning, and the **Tribal Pacific Lamprey Restoration Plan**, that will influence implementation of the Council's Program at the subbasin level. The Council recognizes the objectives and recommended actions of the Tribal Pacific Lamprey Restoration Plan as updates to subbasin plans."*

Supporting Materials:

USFWS Pacific Lamprey Conservation Initiative website
*(*http://www.fws.gov/pacific/fisheries/sphabcon/lamprey/)

5.4 White Sturgeon

(Attachment 2, Section 5.4)

Current Program: Page 12, 39, 41, 43, 47-49, 53, and 55

Measure: BPA should adequately fund sturgeon recovery and the recommendations from the Council's Columbia Basin White Sturgeon Planning Framework (NPCC 2013).

Recommendation 1: The Program should consolidate measures intended to address sturgeon restoration into set of strategies in the Mainstem Plan. Incorporate recommendations of Oregon's Lower Columbia River and Oregon Coast White Sturgeon Conservation Plan (ODFW 2011) and the Council's Columbia Basin White Sturgeon Planning Framework into the Program. The Framework should be identified as a Program appendix on White Sturgeon.

Rationale: White sturgeon are widely recognized as iconic mainstem fish species severely affected by construction and operation of the hydrosystem (ISAB 2013, NPCC 2013, ISAB programmatic review, Kootenai and select Zone 6 sturgeon reports 1995 and 2012).

About "4% ($9.5 million) of annual direct Fish and Wildlife Program expenditures of $246 million in 2012 were dedicated to white sturgeon. Kootenai sturgeon projects account for the majority of sturgeon-related expenditures ($6.5 million). The remainder is distributed among one general and six accord projects" (NPCC 2013). The Council's Fish and Wildlife Program accounts for just a portion of total expenditures within the basin to restore white sturgeon populations. Four non-FCRPS hydropower entities, Idaho Power Company, Grant PUD, Chelan PUD, and Douglas PUD, fund substantial white sturgeon restoration programs within the reaches impacted by their hydropower projects.

"Of all fish species in the Basin, the status of white sturgeon is most strongly tied to conditions in the mainstem, which are directly affected by the hydrosystem. The white sturgeon has declined greatly in abundance throughout most of the Columbia Basin. Only the population segment below Bonneville Dam still shows substantial natural recruitment, despite the fact that it is affected by hydrosystem operations at all dams upstream. It is anticipated that diminished natural recruitment will be a major factor influencing sturgeon status and the sustainability of harvest fisheries. Natural recruitment of sturgeon is potentially affected by hydrosystem operations directly, through blocked passage or inundation of preferred spawning areas, and indirectly, through the effects of water flow and sediment release on spawning success. In addition, recently documented predation on adult sturgeon by Steller sea lions just below the Bonneville Dam may threaten that population (ISAB 2013)"

In response to a Council request, sturgeon project sponsors recently completed a basin-wide framework plan for white sturgeon that synthesizes existing information and recommends actions to address limiting factors and information gaps. Strategic recommendations should be incorporated in to the mainstem plan as a sturgeon chapter. After ISRP review, the framework should be adopted into the Program.

Recommended Draft Language: Insert the following text into the *Mainstem Plan as Strategies for White Sturgeon:*

"The Program supports a vision of abundant and diverse white sturgeon populations and optimum sustainable fisheries throughout the historical range, achieved by a combination of natural production and careful supplementation, and supported through an adaptive, collaborative, coordinated, science-based mitigation, management, monitoring, and evaluation program to be achieved over the coming 50 years. Seven basic elements are incorporated into this vision: sustainability; natural production; biological characteristics; an inclusive program scope; effective monitoring, research, and evaluation; and rebuilding/mitigation.

To date, the Council has supported sturgeon program efforts that have effectively documented biology, status and limiting factors throughout the region. White sturgeon distribution, abundance, and productivity throughout the Columbia and Snake river basins 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. The Council endorses additional work that contributes to conservation, recovery or mitigation goals identified in the Columbia Basin White Sturgeon Planning Framework (NPCC 2013).

Strategies to achieve the sturgeon vision include:

- *Operate the FCRPS to provide operations consistent with normative river conditions, including increased spring and summer flows and spill. Recruitment in many impounded areas has been positively correlated with high annual discharge April—July. Sturgeon are expected to benefit from court-ordered dam operational measures being implemented for salmon and steelhead.*
- *Continue to utilize and adaptively manage conservation hatchery programs as interim measures to avoid extinction of unique sturgeon populations.*
- *Hatchery production of sturgeon can be an appropriate mitigation strategy to supplement populations where natural recruitment is currently limited. This strategy should: (1) Be conservative and responsible in establishing protocols for source populations and numbers of hatchery fish released; (2) Build on knowledge gained from ongoing hatchery efforts in other areas; (3) Utilize experimental hatchery releases and monitoring to assess ecological factors and population productivity limitations; and (4) 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.*
- *Some opportunities for sturgeon passage improvements exist but benefits are likely to be limited by habitat-related natural recruitment problems in most areas. Passage strategies for white sturgeon should include: (1) Detailed evaluations of costs, benefits and risks of passage improvements relative to other potential strategies; (2) Consideration of 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; (3) Opportunities for non-volitional passage by taking advantage of fish trapped in dewater draft tubes or fish ladders during maintenance; and (4) Continued review of protocols used to prevent fish stranding/mortality during planned maintenance activities at passage facilities.*
- *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.*
- *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.*
- *Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam.*

- *Operate the hydrosystem to reduce mortality on white sturgeon. Develop an operational protocol to block access to turbine draft tubes during turbine dewatering and other maintenance operations to minimize white sturgeon entrainment, dewatering, and mortality.*
- *Conduct dredging operations in a manner minimizing operation-related mortality on white sturgeon.*
- *Conduct research that addresses critical white sturgeon uncertainties identified in the Columbia Basin White Sturgeon Planning Framework.*
- *Monitor and evaluate mitigative white sturgeon restoration actions, and population responses to environmental condition consistent with the Columbia Basin White Sturgeon Planning Framework."*
- *Assess the effects of climate change on basin sturgeon populations and develop adaptation strategies to address these impacts.*

Recommendation 2: The Council should incorporate ISAB recommendations for addressing hydrosystem impacts on Upper Columbia River White Sturgeon:

- Develop a credible white sturgeon habitat model for the UCR to quantify habitat throughout the year in conjunction with mainstem hydrosystem operations
- 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 white sturgeon in the UCR
- Investigate the potential impacts of trace element contamination of UCR sediments on the quality of critical white sturgeon habitat throughout the UCR from Lake Roosevelt upstream to the International Border.

Rationale: White Sturgeon in the Upper Columbia River (UCR) are a considered a 'Species at Risk' by the Canadian federal government, are a species of active research for the Washington Department of Fish and Wildlife (WDFW), and are the focus of a recent UCR White Sturgeon Recovery Plan developed by US and Canada entities. That plan highlights a number of issues as contributing to poor white sturgeon populations and greatly diminished natural recruitment, including but not limited to, habitat diversity, flow regulation, water temperature, water clarity, total dissolved gas (TDG), contaminants, food availability, fish community alteration, predation, exploitation and incidental catch. Selected topics have benefited from recent studies by USGS, US EPA, WDFW, and the Colville and Spokane Tribes, but issues such as habitat diversity, flow regulation effects, temperature and elevated trace-element concentrations in bed sediments are in need of research. Specific to the UCR, the physical habitat for various life stages of white sturgeon have not been characterized or quantified, nor has the potential for trace-element contaminants to compromise critical habitats.

The amount, distribution and complexity of benthic substrates in Lake Roosevelt are currently unknown. Various life stages of white sturgeon are known to utilize and benefit from particular habitat types in the Lower Columbia River, but similar understanding is not available for the UCR. Proper characterization of habitat availability would benefit fisheries managers in

estimating what a sustainable population size should be. Substrate size, location and complexity (as substrate diversity) are key variables currently lacking characterization. Recent additions of detailed bathymetry of the Lake Roosevelt pool and lower portions of the UCR provided by US Bureau of Reclamation, and LiDAR (light detection and ranging) are key tools ready for application in developing a white sturgeon habitat model.

Superimposed on a habitat model for the UCR are the multiple lines of evidence that indicate trace element contamination in the sediments of the UCR may be a critical habitat stressor to the reproductive success of white sturgeon in the reach between Lake Roosevelt and the International Border. Preliminary evidence suggest that hydrosystem controlled conditions in the mainstem river play a controlling factor on exposure of white sturgeon to dissolved trace elements mobilized from river bed sediments.

Supporting Materials:

ISAB (Independent Scientific Advisory Board). 2013. Review of the 2009 Columbia River Basin Fish and Wildlife Program. Northwest Power and Conservation Council Report ISAB 2013-1.

NPCC (Northwest Power and Conservation Council). 2013. Columbia Basin White Sturgeon Planning Framework: February 2013 draft. Prepared for the Northwest Power and Planning Council, Portland, Oregon.

ODFW. 2011. Lower Columbia River and Oregon Coast White Sturgeon Conservation Plan. Oregon Department of Fish and Wildlife Ocean Salmon and Columbia River Program. Clackamas, Oregon.

5.5 Eulachon

(Attachment 2, Section 5.5)

Current Program: Lower Columbia Subbasin Plan (1 paragraph on Page 2-18)

Recommendation 1: Include measurable eulachon objectives in the Fish and Wildlife Program.

Measures: BPA should fund protection, mitigation and enhancement of eulachon through the following measures:

- Develop biological objectives for eulachon that are consistent with recovery.
- Monitor and evaluate eulachon abundance in the Columbia River Basin via annual spawning stock biomass surveys following protocols developed by the Washington Department of Fish and Wildlife and acoustic estimates by NOAA - NWFSC.
- Monitor and evaluate the causal mechanisms and migration/behavior characteristics affecting survival of larval eulachon during their first weeks in the Columbia River estuary, plume, and ocean environments.
- Monitor and evaluate the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of eulachon in the Columbia River Basin.

- Develop an oceanographic indicators ecosystem conditions model to determine the significance of plume and nearshore ocean conditions that affect eulachon survival.
- Adjust the timing, magnitude, and frequency of hydrosystem flows (especially spring freshets) entering the estuary and plume to better reflect the natural hydrologic cycle, improve access to habitats, and provide better transport of coarse sediments and nutrients in the estuary and plume if these are found to be limiting to eulachon life history.

Rationale: The Program currently does not address eulachon, an anadromous fish native to the Columbia River, and a species listed as threatened under the Endangered Species Act. This species has been heavily impacted by changes to the lower mainstem and estuary caused by construction and operation of the hydropower system. Substantial changes to flow, sediment delivery and the food web in the lower river have been well documented.

These measures are needed to address uncertainties regarding the effect of changes in the Columbia River hydrograph on survival, productivity and recovery potential of eulachon. As the Northwest Power Act directs the Council to develop a program to protect, mitigate, and enhance fish and wildlife in the basin affected by the development, operation, and management of hydroelectric projects, the Council should update the Program to include eulachon and develop biological objectives for this species. As eulachon are listed as a threatened species under the Endangered Species Act, NOAA is in the process of developing a recovery plan, and has prepared a Federal Recovery Outline for eulachon that includes recovery tasks as part of a preliminary recovery strategy. The recommended measures are consistent with NOAA's Federal Recovery Outline for eulachon. Recovery of ESA-listed species is consistent with the Program's goals and objectives. Furthermore, measures adopted by the Council and funded by BPA to assist in the recovery of listed species affected by the development, operation, and management of hydroelectric projects is consistent with the Northwest Power Act and the Program.

Recommendation 2: To address changes in the hydrograph of the Columbia River on eulachon productivity and abundance, the Council should:

- Monitor eulachon abundance in the Columbia River via annual spawning stock biomass surveys.
- Link biological data to river discharge.

Recommendation 3: To address changes in the hydrograph of the Columbia River and adverse effects to eulachon egg and larvae survival in the Columbia River and Columbia River plume, the Council should:

- Monitor and evaluate temporal and spatial species composition, abundance, and foraging rates of juvenile eulachon predators at representative locations in the estuary and plume.
- Monitor and evaluate the causal mechanisms and migration/behavior characteristics affecting survival of larval eulachon during their first weeks in the plume/ocean.

- Investigate the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of eulachon in the Columbia River Basin.
- Investigate the causal mechanisms and migration/behavior characteristics affecting survival of larval eulachon during their first weeks in the plume/ocean.
- Develop a hydrodynamic numerical model for the estuary and plume to support critical uncertainties investigations.
- Operate the FCRPS to more closely approximate the shape of the natural hydrograph and to enhance flows and water quality to improve larval survival in the plume and ocean environments.

Recommendation 4: To address passage-related adverse effects at Bonneville Dam, the Council should:

- Monitor and report numbers of adult eulachon observed in samples from the Juvenile Bypass System and observed in the Adult Fish Passage System.

Rationale: The Program currently does not address eulachon, an anadromous fish native to the Columbia River, and a species listed as threatened under the Endangered Species Act. This species has been heavily impacted by changes to the lower mainstem and estuary caused by construction and operation of the hydropower system. Substantial changes to flow, sediment delivery and the food web in the lower river have been well documented.

These measures are needed to address uncertainties regarding the effect of changes in the Columbia River hydrograph on survival, productivity and recovery potential of eulachon. As the Northwest Power Act directs the Council to develop a program to protect, mitigate, and enhance fish and wildlife in the basin affected by the development, operation, and management of hydroelectric projects, the Council should update the Program to include eulachon and develop biological objectives for this species. As eulachon are listed as a threatened species under the Endangered Species Act, NOAA is in the process of developing a recovery plan, and has prepared a Federal Recovery Outline for eulachon that includes recovery tasks as part of a preliminary recovery strategy. The recommended measures are consistent with NOAA's Federal Recovery Outline for eulachon. Recovery of ESA-listed species is consistent with the Program's goals and objectives. Furthermore, measures adopted by the Council and funded by BPA to assist in the recovery of listed species affected by the development, operation, and management of hydroelectric projects is consistent with the Northwest Power Act and the Program.

5.8 Bull Trout

Current Program: Lamprey and Sturgeon Passage (Page 47)
Recommendation: Revise the section header to read "Lamprey, sturgeon and resident fish passage."
Recommendation: Include the following language addressing sturgeon bull trout and resident fish passage.

Provide upstream and downstream passage for white sturgeon, bull trout and resident fish species in conjunction with anadromous passage solutions at the federal hydropower/flood control facilities.

7.0 Habitat

7.1 Fully Incorporate Estuary, Plume and Nearshore Ocean in Program

(Attachment 2, Section 7.1)

Current Program: various sections

Recommendation 1: Add language to the *Scientific Principles*, pages 9 and 10:

- *The Columbia River ecosystem includes the estuary, plume, and near shore ocean environments.*
- *Salmon, steelhead, lamprey, sturgeon and eulachon accommodate ocean mortality and environmental variability by having life histories that have a sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).*

Recommendation 2: Add language to *Plume and Nearshore Ocean Strategies*, page 31. Retain the *Ocean strategies* and add:

- To Primary strategy, "*It is important to continue basic monitoring over time to increase understanding of the estuary, plume and nearshore ocean's role in anadromous fish survival and to have both baseline and real time information that can assist inland management decisions*."
- Add "*Ocean Strategy 3 - Identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland management actions*."

Recommendation 3: Insert the following language into the Fish and Wildlife Program: *"Management of the Columbia River Basin hydropower system directly affects the ocean environment primarily in two ways: 1) it changes the natural hydrograph by development of the hydro-system, and changes estuary and plume habitats along with the timing and quantity of natural flows; and 2) the releases of large numbers of hatchery fish from Columbia River hatcheries may trigger density dependent effects in the estuary, plume and ocean."*

Measure 1: Fund a collaborative forum of scientists and managers to: 1) identify key management questions related to the estuary, plume, and nearshore ocean environments: 2) identify what research and monitoring has already been done that addresses these management questions; 3) identify ongoing baseline monitoring and research priorities; 4) identify opportunities for information sharing between scientists and managers and 5) recommend to the Council ways to improve the utility and in-river freshwater resource management benefits of both ongoing and proposed ocean, estuary and plume research conducted under the Program.

Rationale: Regional coordination between researchers and Columbia Basin managers is necessary for sharing information and for developing scientifically sound recommendations on

monitoring and research priorities that can inform management actions. This forum can help with addressing the following additional measures.

Measure 2: Consider the complete anadromous fish life cycle and critical habitat needs, including the estuary, plume and nearshore ocean when making management decisions. Integrate the effects of future climate change into these decisions and develop adaptation strategies to address these effects.

Rationale: It is important to have a basic understanding of ocean survival in order to better understand freshwater survival and eventual adult returns. Understanding how, where and which anadromous fish experience both growth and mortality in the ocean can provide insights to freshwater management and can test commonly held assumptions about the river conditions for fish. For example, if a particular stock is demonstrating strong abundance, is it due to freshwater habitat restoration actions or specific ocean conditions? A thorough evaluation of the success of freshwater management actions (e.g., freshwater habitat improvements) requires that we know the effects of the ocean on Columbia River anadromous fish. This is consistent with the first Fish and Wildlife Program principle mentioned above; i.e., that the Council views the Columbia River ecosystem to include the estuary, plume, and nearshore ocean environments.

Measure 3: Optimize forecasts of adult returns.

Rationale: Through ocean research, project sponsors have begun to use ocean data to improve forecasting of adult returns. Fisheries managers have several methods for forecasting adult returns (e.g., age structure models, stock-recruit models, ocean indicators). Research has demonstrated that ocean condition indicators can provide helpful information that can be utilized to improve run forecasting accuracy. Forecasting of adult returns can be utilized to trigger conservation actions, set broodstock collection expectations and harvest seasons. In river forecasters typically use a sibling regression for forecasting annual adult returns. Until about ten years ago, this methodology was reasonably accurate for Chinook salmon. Recently, however, this methodology has not been very reliable. Researchers believe that changes in the age structure (age at maturation) of Chinook salmon may be behind the change. Managers are beginning to utilize other methods, often in combination, to more accurately predict adult run size. The NOAA and DFO ocean indicators (stop light chart and multivariate analysis), developed and populated with data from the two ocean research projects, are being used to further salmon run forecasting.

Measure 4: Explore and implement adaptive management experiments to improve survival of anadromous fish.

Rationale: The Council has been interested for some time in ways in which managers can use the results of the ocean research to change/alter freshwater habitat and production management to improve overall survival. It has been suggested that there may be applications

such as changing the timing of hatchery releases or changing migration methods (transport and in-river) to take advantage of optimal plume or ocean conditions and subsequently, to improve survival for these fish. Presently hatchery fish release timing is set by hatchery managers that are considering water temperature, readiness of the fish to migrate and to take advantage of in river flow. It is unclear, however, if potential management strategies are realistic or practical and if the potential survival benefits would outweigh other risks. Further discussions are warranted between researchers and freshwater fisheries and hatchery managers to explore the practical potential of these concepts. There are specific experiments that can be conducted using individual hatcheries that are already investigating variable release timing. Stock-specific information about growth and survival in the ocean should be better linked to stock management in the freshwater.

Measure 5: Continue to research direct and indirect effects of anthropogenic freshwater management on marine ecological attributes affecting anadromous fish habitat, life histories and productivity.

Rationale: Management of the Columbia River Basin hydropower system directly affects the ocean environment by changes in the natural hydrograph and ecological processes caused by development and operation of the hydro-system, and through changes to the estuary and plume habitats due to the timing, quantity and quality of river flows. There is much more to be learned about how to improve conditions and thus survival for anadromous fish in the estuary and plume.

Measure 6: The Program should address the uncertainty regarding the effectiveness of estuarine restoration projects and different types of habitat and whether they contribute to increased juvenile survival and hence increased adult returns.

Rationale: The primary critical uncertainty regarding estuarine restoration projects and different types of habitat is whether they contribute to increased juvenile survival and hence increased adult returns. Good estimates of residence time in rearing habitat, and the quantity and quality of the habitat that will likely influence survival, are generally lacking. Also, how fish move between rearing habitats and the importance of habitat connectivity and spatial distribution are poorly understood. Along these lines, a general understanding of the quantity of available habitat, quality of fish habitat, how fish use them, and how they are distributed throughout the migration and rearing reaches of the Lower Columbia River and estuary are not well known. Another critical uncertainty is to identify status and trends of the ecosystem processes in the Lower Columbia River and estuary to better understand the ecosystems processes and the effects on restoration and mitigation efforts.

Measure 7: Research is needed on forage fish in the lower estuary and nearshore area. The Fish and Wildlife Program should promote projects on forage fish in the lower estuary and nearshore area through the following measures:

- Identify spawning and rearing life history attributes of forage fish in the estuary

- Determine the role of forage fish as alternate prey for birds in the lower estuary
- Elucidate the role eulachon may have as an alternative prey for sea lions
- Determine how restoration projects in the estuary may contribute to reproductive success and rearing of forage fish
- Identify the relation between Columbia River flow and forage fish abundance in the estuary
- Identify role forage fish have in survival of juvenile Chinook salmon, coho, and steelhead
- Determine how climate change, ocean acidification, salinity, estuary turbidity maximum (ETM), and localized hypoxia are likely to affect forage fish in the coming decades

Rationale: The proposed amendment will update the Program to reflect a move toward ecosystem management approach to provide salmon with their total life cycle needs including an adequate food web to support growth and improve survival. Forage fish in the lower estuary include a broad group of species including surf smelt, Pacific sand lance, Pacific herring, eulachon, and juvenile American shad. These species have diverse reproductive strategies but all species can occur in the lower estuary during their life histories. For example, surf smelt and Pacific sand lance may use beaches for spawning while Pacific herring may spawn on nearshore macro-algae. Eulachon and American shad are anadromous and can produce large numbers of juveniles that disperse downstream and enter the estuary. The Fish and Wildlife Program places an emphasis on salmon restoration and forage fish are a major link between habitat and environmental conditions and the survival of salmon.

7.2 Reduce Toxic Contaminants

(Attachment 2, Section 7.2)

Current Program: Page 42-44, Water Quality

Both the Independent Scientific Advisory Board (2013) and the Independent Scientific Review Panel (2013) recommend that the Program take a more active role in ensuring that toxic contamination be addressed. BPA should act on these recommendations and fund the following actions to mitigate for the effects of toxic contamination on fishery resources that are exacerbated in a river system heavily altered by the federal hydropower system:

Recommendation: Insert the following language into the Fish and Wildlife Program that recognizes fishery resources are clearly affected by toxics that have accumulated due to the development and operation of the federal hydropower system:
"Fishery resources are clearly affected by the development and operation of the federal hydropower system. Dam presence can be associated with the accumulation of contaminated sediment (Colas et al., 2013) and the presence of reservoirs and their operations can be a controlling factor on the chemical conditions such as anoxia which impact the distribution and bioavailability of toxics in the system. An example of a specific impact caused by the dams is to

sturgeon; once anadromous, sturgeon are now blocked in reservoirs and subjected to contaminants year-around at contaminant levels exacerbated by the reservoirs."

Measure 1: BPA should fund a programmatic review and assessment of how hydropower projects exacerbate any problems associated with the effects of toxic substances and if any such correlation exists, the Council shall identify opportunities for operational changes or other activities to help mitigate these impacts and reduce toxic contamination. Determine how seasonal anoxia in dam reservoirs controls the release of toxics and other pollutants from the sediments to the water column and how the uptake and transfer of these toxics and pollutants transfer up the food web and negatively impact fish. Evaluate how environmental toxicants impact the reproductive fitness of fish that are impounded behind dams.

Rationale: Feist et al. (2005) evaluated whether evidence of reproductive endocrine disruption could be correlated to specific areas within the Columbia River system and found that fish residing in the reservoirs behind the oldest dams had the highest contaminant loads and incidence of reproductive abnormalities. Their data suggest that endocrine-disrupting chemicals may be accumulating behind dams over time and that the exposure of fish to these chemicals may be affecting the growth and reproductive physiology of fish in impounded areas of the Columbia River.

The ecological risk of mercury toxicity is directly related to the production of the bio-accumulative and toxic organic form, methylmercury, which is driven by specific biogeochemical parameters. Importantly, many of those parameters are directly linked to factors associated with water management activities such as water inundation and wetting and drying cycles, organic carbon and nutrient cycling and inputs from upland terrestrial habitats. Reservoirs are among the most common managed hydrological features on the western landscape with a high likelihood for enhancing methylmercury production, transport, bioaccumulation, and risk to fish, wildlife, and human health. Thus, a better understanding of linkages between reservoir management and mercury risk is needed in order to develop approaches to minimize the environmental risks due to mercury while still meeting critical water needs in the Columbia River Basin.

Studies such as Caton (2012) among others have documented that mercury concentrations in some organisms in aquatic ecosystems and reservoirs of the Columbia River Basin exceed those considered safe for ecosystem and human health. However, little is still known about which factors are most important in driving variation in mercury concentrations among reservoirs, and what management options present the most effective opportunities for controlling mercury risk. Therefore, a research focus that addresses the following items will better inform resource managers and facilitate future amelioration opportunities:

- Levels of mercury and variation in bio-indicator taxa across reservoirs in the Columbia River Basin.

- Influence of seasonal drawdown and flood-up patterns on methylmercury cycling and bioaccumulation in Columbia River Basin reservoirs.
- Influence of lake stratification, dissolved oxygen, and primary production on mercury cycling and bioaccumulation in Columbia River Basin reservoirs.
- The influence of fish growth, condition, and energetics on mercury bioaccumulation rates and fish mercury concentrations in Columbia River Basin reservoirs.
- The influence of food quality and energy content on mercury bioaccumulation rates and fish mercury concentrations in Columbia River Basin reservoirs.
- The role that variation in littoral versus pelagic foraging reliance plays in driving mercury bioaccumulation pathways in Columbia River Basin reservoirs.
- The influence of prey/forage fish community structure and species assemblages on mercury exposure in top predator fishes in Columbia River Basin reservoirs.
- Biochemical, behavioral, and reproductive effects of mercury in fishes and aquatic dependent wildlife in Columbia River Basin reservoirs.

Measure 2: BPA should fund collaborative partnerships through a forum where governmental entities and co-managers can discuss and develop regional toxic-reduction strategies. In addition to whatever priorities are identified at this forum, components of the strategy should include:

- Identification of the principal sources of toxic substances that impact the Basin;
- A coordinated process for identifying emerging contaminants of concern; and
- A 30-year implementation schedule to achieve toxic reduction objectives, with decadal benchmarks, that could be used to inform a state or federal legislative response.

Rationale: Toxic contamination is a complex issue, and a coordinated, common approach by all co-managers is needed to mitigate the threat to fishery resources. The Council is in a position to provide leadership on this issue and to collaborate with ongoing efforts to reduce toxics in the Columbia River Basin. In September 2010, EPA and the Columbia River Basin Toxics Reduction Working Group released the Columbia River Basin Toxics Reduction Action Plan with 5 initiatives and 61 actions to reduce toxics in the Columbia River Basin (EPA, 2010). Collaboration in the past has produced significant advancements in toxics monitoring of fishery resources. In 2007, BPA, the Lower Columbia Estuary Partnership, NOAA Fisheries, and USGS produced the only robust sampling of toxics in juvenile salmon in the Columbia Basin (LCREP, 2007).

Measure 3: Fund studies to determine which toxic contaminants most limit the restoration success of anadromous and resident fish and in particular determine how contaminants interfere with the reproduction and/or rearing success of key species such as white sturgeon and Pacific lamprey that are known to be vulnerable to bioaccumulation of toxins. The footprint of existing contamination and the location of known toxic discharges should be mapped in relationship to fish and wildlife populations and habitat restoration efforts and monitored as part of a basin-wide monitoring program. Assess foodweb transfer, sediment transport, and biological effects of emerging and legacy organic contaminants under current

management regimes, and how those processes affect key Columbia River species and the success of restoration projects within the basin.

Rationale: Various stressors threaten native fishes and other wildlife in the Columbia River basin. Urbanized large aquatic ecosystems are experiencing increasing contamination of water and sediment and ultimately foodwebs. Contaminants of concern include both legacy compounds such as DDT and PCBs that are still present in the system, as well as chemicals of emerging concern (CECs) such as pharmaceuticals and personal care products. Use and release into the environment of CECs is increasing, although little is known about their harmful levels and effects. Several interdisciplinary studies have been carried out in recent years to assess impacts of different classes of contaminants in several levels of the foodweb in the Columbia River.

The USGS Columbia River Contaminants and Habitat Characterization (ConHab) project investigated transport pathways, chemical fate and effects of endocrine disrupting chemicals in the foodweb in the Lower Columbia River and found that bio-magnification of multiple contaminants occurred in resident fish and osprey eggs, environmental quality benchmarks were exceeded in some cases, and reproductive parameters showed impairment at some sites and were significantly negatively correlated with various contaminant concentrations (Nilsen et al., in press; Nilsen and Morace, in press). In some species of vertebrates, these chemicals alter thyroid function, reduce sperm counts, and delay sperm maturation (Kuriyama et al., 2005) among other impacts. NOAA researchers found from studies on juvenile chinook salmon that exposure to urban contaminants was linked to an increase in disease susceptibility (Arkoosh et al., 1998). Better understanding of these effects on key first foods species is needed.

Critical uncertainties in understanding impacts of contaminants on key species and foodwebs in the Columbia River basin include:

- Chemicals of emerging concern (CECs) levels of concern to the health of key species including Pacific lamprey, white sturgeon, and salmonids.
- Impacts of CECs on the carrying capacity of the Columbia River ecosystem for juvenile salmonids and other key species.
- Impacts of contamination on habitat restoration success: Contaminants of concern should be assessed and monitored as part of current and future river restoration programs.
- Role of contamination in reduced rearing success of white sturgeon in impounded pools: Impacts of contaminants on sturgeon reproduction and rearing success within areas of known high productivity. Comparison of potential contaminant impacts on impounded versus unimpounded populations.
- Role of contamination on Pacific lamprey declines compared to threats from hydropower operations, such as dam passage. Assess levels of concern and effects of chemical mixtures.
- Investigate impacts of different hydrologic scenarios and management actions on contaminant distributions and foodweb transfer.

- Distributions, levels, and spatial patterns of contaminants of emerging concern (CECs) in the Columbia River basin including the estuary and coastal ocean.
- Impacts of contamination from abandoned vessels: Abandoned vessels should be inventoried and mapped in relation to potential impacts to aquatic species.

Measure 4: Investigate the cumulative and/or synergistic effects of multiple toxic contaminants particularly pesticides on riparian insects and other organisms that impact the carrying capacity of the Columbia River ecosystem.

Rationale: Mixtures of organophospate and carbamate pesticides are commonly detected in fresh water habitat that supports key species of interest to the Fish and Wildlife program. These pesticides interfere with behaviors that are essential for salmon survival. Some pesticides interact to produce synergistic toxicity in salmon (Laetz et al., 2009) and showed greater degree of synergism at higher exposure concentrations. Several combinations of organophosphates were lethal at concentrations that were sublethal in single-chemical trials. Single chemical risk assessments are likely to underestimate the impacts of insecticides in river systems where mixtures occur.

Measure 5: Recommend, support and fund actions that prevent toxic contamination from entering the Columbia River Basin.

Rationale: The fish and wildlife actions identified in the Columbia Basin Toxics Reduction Action Plan (2010) stresses that measures including pollution prevention and green chemistry need to be supported to achieve a reduction of toxic contaminants in the Columbia River watershed. Pollution prevention measures are less expensive and more effective, efficient and reliable than treating, recycling, or cleaning up pollutants after use. Toxics reduction efforts will contribute to the survival of key species, will complement other activities underway to restore stocks, and will enhance the effectiveness of habitat restoration efforts.

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7.3 Integrate Climate Change

(Attachment 2, Section 7.3)

Current Program: Page 51 – 52, Climate change planning considerations

Measure: Develop a comprehensive strategic plan to address the potential impacts of climate change on the entire system, including the estuary and the ocean and develop a suite of strategies within the amended Program and fund implementation of strategies. (ISAB 2013-1)

Recommendation 1: Review current restoration or habitat projects to ensure their resiliency under predicted future climate scenarios to ensure that investments made today are effective into the future.

Recommendation 2: Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty. (ISAB Program Review, March 7, 2013)

Mainstem Measures: BPA and the Corps of Engineers and the Bureau of Reclamation, in consultation and with and approval from the basin's tribes and the Council should expand funding of climate change related projects and actions that were highlighted in the 2009 Program by including the following:

- Supporting the advancement and implementation of runoff forecasting techniques through the use of advanced statistical methods (e.g. Wood and Lettenmaier 2006; Moradkhahi and Meier 2010) and the use of the most recent hydrological and meteorological data;
- Encourage, monitor, and promote public awareness of pertinent climate change research and adaptation planning to climate change futures;
- Develop and implement a qualitative and quantitative systematic framework to analyze changes in river operations to adapt to climate change. Collaborate with regional (e.g. Oregon Climate Impacts Consortium), national (National Drought Information Center) and international climate science networks (e.g. Pacific Climate Impacts Consortium). Include the following steps:
  - Update and process meterological and hydrological data,
  - Use appropriate downscaled GCMs for regional use,
  - Collect appropriate hydrological data and conduct hydrological modeling using multiple models,
  - Generate streamflow forecasts and bias correct these data,
  - Develop appropriate post processing tools to assess performance,
  - Combine climate models and resulting hydrological models into hydro-regulation models,
  - Assess impacts to ecosystem function using biological and other physical habitat models,
  - Adapt and modify river operations (e.g.flood risk management and hydro-generation) to protect ecosystem functions, and
  - Reassess impacts to ecosystem function from modification of flood risk management and hydro-generation using appropriate models;
- Assess whether climate change effects are altering or likely to alter critical river flows or other habitat attributes in a way that could significantly affect fish or wildlife important to this Program, with critical focus on climate scenarios that project much warmer and drier summer periods;
- Evaluate whether alternative water management scenarios, including changes in flood risk management operations, and hydro generation loads could minimize the potential effects of climate change on mainstem hydrology and ecosystem function;
- Develop engineering plans to install temperature control structures on appropriate federal high head dams (ISAB 2007) i.e. Grand Coulee) as climate change adaptation tools to reduce water temperatures and actively pursue other adaptation actions such as floodplain restoration (e.g. Battin et al. 2006)to create or protect cool water refugia in mainstem reaches or reservoirs;
- Through the use of automated hydrologic and biological models, investigate the feasibility of mitigating climate change impacts in the estuary and plume through changes in river operations, including changes in flood control and hydro-generation management.

- Support climate change impact assessment and adaptation planning for ecosystem function linkages between the mainstem, estuary and ocean (e.g. salmon life history linkages; Fabry et al. 2008);
- Determine how climate change impacts to ecosystem function may be influenced by regional energy capacity versus peak capacity scenarios for basinwide hydro generation. Create adaptation measures to address potential impacts; and
- We recommend amending the Program to include the ISAB recommendations for addressing climate change (p 16, Independent Science Advisory Board (ISAB) Review of the 2009 Columbia River Basin Fish and Wildlife Program. 2013 -1; March 7, 2013).

Rationale: Considerable efforts have been made in the Columbia Basin to develop, implement and evaluate strategies to protect and restore populations of salmon, Pacific lamprey, and resident fish and wildlife, but most of these efforts have generally not addressed climate change impacts and adaptation to these impacts. Climate change is expected to significantly alter the ecology and economy of the Pacific Northwest during the 21st century (Mantua et al. 2009; Schnorbus et al. 2011). Rising air temperatures and erratic changes in precipitation patterns are expected to decrease snowfall and increase rainfall during the winter months, leading to shifts in the timing and quantity of runoff, including increased flooding during the winter when water is already in ample supply, and decreased flows during the summer when water demands are high. These changes will have significant impacts for freshwater and marine fisheries, hydropower production, flood risk management and water supply for agriculture and municipal uses. The impacts from climate change affect fish and wildlife in a number of ways. Some examples include migration patterns being altered, spawning and rearing grounds degraded, dramatic increases in poor habitat and loss of water quality and the increase of predators, aquatic contaminants and invasive species (Mantua et al. 2010). Any of these factors could, if not addressed, lead to species extinction.

Thus, the human dimensions of climate change must be integrated into consideration of climate change impacts and adaptation on basin ecosystem function (Miles et al. 1999).
The Program should acknowledge that climate change is likely to significantly alter the basin's hydrology and that provides adaptive management and operational tools to meet this eventuality. Various climate models fore-tell increased volatility, and increased uncertainty in temperatures, flows, and recharge. The models forecast:

- Higher winter temperatures which are projected to cause more precipitation to fall as rain instead of snow. This would decrease snow accumulation and the resulting reduction in available snowpack (and thus water) could increase the risk of drought during normally dry summers.
- Higher temperatures that will likely contribute to earlier snowmelt and major changes in the timing of runoff. As a result, the peak of spring runoff is projected to shift 20 to 40 days earlier by the end of the century.
- Warmer and drier summers.

- Warmer temperatures which are projected to cause more precipitation to fall as rain. Overall winter precipitation is projected to increase. These changes would increase winter flood risks.
- Changing streamflows that would strain water management and worsen existing competition for water. Competing demands for water in the Northwest currently include hydropower, agricultural irrigation, municipal and industrial uses, and protection of ecosystems and threatened or endangered species. Increasing temperatures and population could increase demand and further stress urban water supplies.
- Decreasing summer streamflows that would reduce hydroelectric supply and stress electricity supplies. About 70% of electricity in the Northwest is supplied by hydroelectricity. Rising temperatures would increase electricity demand for air conditioning and refrigeration.

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7.4 Implement Predator Control

(Attachment 2, Section 7.4)

Current Program: Page 52, Piscivorous predator control

Measure 1: BPA should continue to implement annually the base piscivorous predator-control program and expand northern pikeminnow (*Ptychocheilus oregonensis*) removals to other mainstem dams in the Lower Columbia River i.e., expand program to include northern pikeminnow removals at McNary and Bonneville dams. The action agencies should evaluate the effectiveness of focused pikeminnow removals for these expanded efforts and implement as warranted.

Rationale: The construction and operation of the hydrosystem has altered historical habitats and have created habitats more suitable for native and non-native piscivorous fish species. Disorientated salmonids that pass over or through the hydrosystem are easy prey for native northern pikeminnow in dam tailraces. The northern pikeminnow angler reward program has been successful in reducing the prey rates on native salmonids, but public access in boat restricted zones at hydropower projects is not feasible. The Predator Control Program's dam angling effort by contracted fishers should be expanded in all tailraces where elevated northern pikeminnow predation rates are known to occur.

- Predation by northern pikeminnow and their relative abundance are assessed annually throughout the Lower Columbia and Snake rivers and continue to remain lower than those observed prior to the implementation of the Predator Control program
- To date, it is not evident that compensation in predation, growth, or reproduction by surviving northern pikeminnow, or by other resident fish predators has occurred system-wide in response to Predator Control program fisheries, however, continued implementation emphasizes the need for continued evaluation efforts to monitor piscivore community dynamics and locally occurring compensatory mechanisms.
- From 1990-2012, Predator Control fisheries have harvested more than 4 million northern pikeminnow, with annual exploitation for fish $\geq$ 250 mm averaging 13.7% (range: 8.5–19.5%) since 1991. The minimum goal of 10% exploitation has been exceeded every year since 1998 with a mean of 17.2%. Modeling efforts to describe northern pikeminnow annual exploitation, while assuming all other variables are constant, suggest a reduction in median percent predation by northern pikeminnow on juvenile salmon of 28% to 40%, as compared to pre-program levels since 1996.

Measure 2: BPA (and action agencies) should work cooperatively with NOAA Fisheries, USFWS, states, tribes and the Council to develop and implement system wide strategies to manage and reduce non-native fishes that compete and feed on native fish in mainstem and in tributaries. This also applies to section II.D.2 Non-Native Species Strategies, page 18.

Rationale: The Program, as currently implemented by BPA, is anadromous fish centric should more strongly consider impacts to native resident fish. The program seems to call out or emphasize focus on several non-native species, but this focus should not de-emphasize the need to address other non-native species in the Basin that have an effect on native fish populations (ie. northern pike, white crappie, yellow perch, etc…).

- Non-native fish have significant impact to native resident fish species
- Northern pike have greatly reduced native fish populations in the Pend Oreille system
- Walleye and smallmouth bass have reduced native resident populations in Lake Roosevelt
- Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation
- The decades of emphasis on northern pikeminnow control has narrowed piscivorous predation to a singular focus with very little emphasis on baseline studies on populations, habitat use, and diets in the mainstem and major tributaries
- White crappie predation on juvenile spring Chinook salmon in Lookout and Hills Creek reservoirs may significantly increase mortality rates
- Lake trout threaten bull trout and other native trout in areas where lake trout have been introduced into native trout habitat
- The Program should support, and BPA should fund, additional research into the overall magnitude of the impacts of non-native predators including abundance, diel and temporal distributions, and food web interactions in order to help guide improved management of non-natives.

Current Program: Page 52, Avian predator control

Measure: The Council should adopt into the Program, and BPA and the action agencies should fund, the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.

Rationale: The 2009 program called for the development of management plans for avian populations that have significant effect to native fish populations. The results of these efforts need to be included in the next iteration of the Program. Avian predators in the basin must be reduced in number and held to a level that promotes a greater survival of listed and non-listed salmonids and Pacific lamprey.

- Annual combined losses of out-migrating juvenile salmonids from Caspian terns and double crested cormorants nesting at East Sand Island have exceeded 15 million smolts since 2009. These losses equate to 15-20% of the basin's entire annual juvenile outmigration.
- East Sand Island is host to the largest colony of Caspian terns in world, despite efforts to reduce the overall size of the colony to a management goal of ~3,355 pairs, the population in 2012 was double this goal.
- Double crested cormorants on East Sand Island form the largest colony in North America. Since 2003 it has exceeded the 1997-2011 average of ~10,000 breeding pairs. Annually since 2010, the colony has consumed a minimum of 19 million smolts.

- A relatively small colony (~300 pairs) of Caspian terns nesting on Goose Island in Potholes Reservoir travel over 30 miles to the Columbia River to prey on out-migrating Upper Columbia steelhead. Impacts in recent years average 10-15% of the entire outmigration.

Current Program: Page 52-53, Pinniped predator control

Measure: Identify opportunities to reduce fish losses through pinniped predator management.

Recommendation: Program language should be revised to establish funding responsibility:

"*The Corps [or Bonneville] should fund* federal and state agencies ~~*also should*~~ *to* evaluate the extent of pinniped predation on salmonids, sturgeon, and Pacific lamprey in the Lower Columbia River from below Bonneville Dam to the mouth of the river."

Measure: Implement and fund strategies resulting from evaluation.

Rationale: The current program identifies a need for a river-wide assessment of pinniped predation, but it does not identify BPA or the Corps as having a funding responsibility.

7.5 Prevent Establishment of Aquatic Invasive Species

(Attachment 2, Section 7.5)

Current Program: Page 18, Non-Native Species Strategies

Measure: In order to protect the federal Columbia River Power System assets, the Northwest Power and Conservation Council's Fish and Wildlife Program should direct the Bonneville Power Administration (BPA) to provide proportionate funding for prevention activities that are known to be effective at stopping the invasion and spread of zebra and quagga mussels, and invasive aquatic plants such as Eurasian milfoil and flowering rush. Funding should be equally provided through the Program and Operations and Maintenance budgets from Power Operations within BPA. These activities include, but are not limited to, inspection and decontamination of boats moored in infested waters and then transported on our roadways in the region.

Recommendation: The Northwest Power and Conservation Council should continue to play a regional leadership role in coordinating stakeholder groups around the issue of aquatic invasive species, particularly those that pose the greatest risk to the Columbia River Basin ecosystem and industries. In particular, the Fish and Wildlife Program should include specific language supporting the work of the 100th Meridian Initiative Columbia River Basin Team, which is coordinated by the Pacific States Marine Fisheries Commission. This group has provided strong, successful leadership on invasive species prevention efforts in the region. We recommend the Council ask for regular reports from 100th Meridian Initiative Columbia River Basin Team on the following items:

1. Current efforts for inspection and decontamination
2. Research priorities relative to invasive species control and prevention
3. Opportunities for collaboration and lessons learned

Rationale: The Council must shift its current BPA funds from population control research to infestation prevention. It is imperative that the Region prevent further degradation of ecosystem function and to ensure protections for species recovery investments, water delivery infrastructure, and hydropower production from the potentially devastating impacts of invasive species, such as the infectious salmon anemia virus, zebra and quagga mussels, etc.. Our recommendations relate to increased funding for enhanced inspection and decontamination efforts in the region, stronger measures to prevent the inadvertent spread of invasive species resulting from habitat research and restoration activities, and maintaining the Council's leadership role as the key convener and coordinator in the Columbia Basin for science, policy and outreach.

7.6 Reintroduction of Anadromous Fish into Blocked Areas

(Attachment 2, Section 7.6)

Current Program: Page 56, Strategies in Specific areas

The language regarding restoration of anadromous fish passage should be moved to its own section under Section II, Basinwide Provisions, II-D. Basinwide Strategies entitled "Reintroduction of Anadromous Fish into Blocked Areas." Include the following measures:

Measure: BPA should fund collaboration with the sovereigns and other responsible partners and managers of hydropower projects (investor owned, non-federal, and publically-owned) to explore the feasibility of and development of new programs for reintroduction of anadromous fish, and fund reintroduction of adult and juvenile life stages, into historical but currently blocked habitat.

Rationale: The coordinated development and operation of the Columbia River Basin by the U.S. and Canada has directly and indirectly decimated and blocked access to substantial portions of the historical range of anadromous and resident fish. This outcome similarly harmed the culture, health, economy and spirituality of many Native American tribes.

The 2009 Fish & Wildlife Program includes language (page 56) to investigate "Reintroduction of anadromous fish into blocked areas." With innovative passage techniques completed and/or under development and testing throughout the US (e.g., Round Butte on the Deschutes River and several Willamette River Basin projects in Oregon; Howard Hanson Dam and Swift Reservoir, in Washington) it is timely to fully define this aspect of the Council's Program to require more active collaboration of the Bonneville Power Administration with the sovereigns and other responsible partners of hydro projects (investor owned, non-federal, and publically-owned) creating blockages to anadromous fish in the Columbia River Basin, to explore the feasibility of and to develop and implement new programs for the reintroduction of anadromous fish, include passage of adult and juvenile life stages, into these historical but currently blocked habitats.

Passage and reintroduction of anadromous fish is a key element of a truly integrated watershed approach to the Columbia River Basin and to the NPCC's Fish and Wildlife Program. For example, at each blocked area of the basin, reintroduction of anadromous fish would be assessed and if feasible, reintroduction and passage would proceed in an incremental, phased approach (planning and design, testing, construction, evaluation and adaptation), progressing to later phases upon successful conclusions or outcomes from previous phases. These types of assessments would determine the feasibility of anadromous fish reintroductions, including costs, partnership opportunities among responsible parties and potential timelines for initiation of these programs.

7.7 Implement Experimental Spill Management

Recommendation: The Program should implement an experimental evaluation of increased spill operations on Smolt to Adult survival.

Key elements of the experimental spill management should include:

1. Implementing voluntary spill levels greater than historical levels, particularly in lower flow years. Implementation should include these facets:
   - What: Increase spill to 125% of total dissolved gas level or biological constraints. As 125% total dissolved gas exceeds water quality criterion, criteria modifications through regulatory processes are required.
   - When: During spring operations (3 April through 20 June) for a period of 10 years with a comprehensive assessment after 5 years.
   - Where: At Lower Snake and Lower Columbia River Hydroelectric projects -- Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles and Bonneville dams.
2. Utilizing the Comparative Survival Studies PIT-tag monitoring framework.
3. Monitoring Smolt-to-Adult survival rates.
4. Comparing survival rates against both past survival rates and prospective model predictions.
5. Evaluating whether empirical observations are consistent with the predicted benefits of higher voluntary spill levels.
6. Inclusion of sideboards or "off-ramps" to ensure hydro system power generation viability as well as "on-ramps" that facilitate non-hydro renewable energy sources into the power system to offset impacts from increased spill levels.

Rationale: Under recent operations and configuration of the Federal Columbia River Power System (FCRPS), smolt-to-adult return rates (SARs) have averaged 0.9% for wild spring-summer Chinook salmon (*Oncorhynchus tshawytscha*) from the Snake River, well below the Northwest Power and Conservation Council (NPCC) average SAR goal of 4% (Tuomikoski et al. 2012). In addition, Snake River wild spring-summer Chinook salmon have achieved the NPCC minimum SAR goal of 2% in only two years out of the seventeen years that have been

monitored. Similarly, SARs have averaged 1.6% and achieved the 2% minimum in only seven of thirteen years for wild steelhead (*Oncorhynchus mykiss*) from the Snake River. These results indicate that recent operations and configuration of the FCRPS have been insufficient to achieve the regional SAR goals defined by the NPCC. As a result, nearly all populations that constitute the Snake River Evolutionarily Significant Units (ESUs) remain at high risk of extinction.

Several recent studies have examined the environmental factors that influence SARs of Snake River spring-summer Chinook salmon and steelhead. Petrosky and Schaller (2010) analyzed long (40 to 60 years) time series of SAR estimates to find that both river and ocean environmental factors influenced SARs of Snake River Chinook salmon and steelhead. The river factors that were identified included water velocity, proportions of river flows that were spilled over the dams of the FCRPS, whether juvenile fish were collected and transported by barge, and the number of times juvenile fish pass through the bypass and collection facilities. They concluded that improving in-river migration conditions with increased water velocity and spill levels (thereby decreasing the number of times fish pass through the power houses) could improve SARs to levels sufficient to recover ESA-listed salmon and steelhead populations. They suggested seasonal spills could be increased experimentally and survival responses would be monitored using the existing Comparative Survival Study methods. A study by Haeseker et al. (2012) analyzed a nine-year time series of river survival, ocean survival, and SAR estimates and similarly found that river and ocean environmental factors influenced ocean survival rates and SARs of Snake River Chinook salmon and steelhead. They concluded that improvements in SARs may be achievable across a range of marine conditions through increasing spill percentages and reducing water transit times during juvenile salmon out-migration. While the data set analyzed by Petrosky and Schaller (2010) differed from the data set analyzed by Haeseker et al. (2012), their results that river and ocean factors influenced SARs were consistent across the two studies.

Several workshops were held to present and discuss the results, attended by regional, national, and international scientists (Marmorek et al. 2011, Hall and Marmorek 2013). The first workshop (Marmorek et al. 2011) synthesized available information on the relative importance of various factors including FCRPS operations and environmental conditions in both the ocean and freshwater in determining the survival rates of Snake River Chinook salmon and steelhead. The first workshop also began the process of building tools that evaluate and optimize FCRPS operations for anadromous fish to meet established NPCC objectives for listed Snake River and upper Columbia River salmon and steelhead SARs. The second workshop reviewed a draft design for conducting a rigorous, planned spill management experiment where spill levels are increased above recent levels in order to improve SARs of anadromous populations that migrate through the FCRPS. The draft design included a detailed assessment of the spill levels that could be implemented at each dam, the expected changes in SARs across spill levels and a range of flow conditions, and the methods that could be used to monitor the resulting changes in survival.

Four experimental spill management scenarios were evaluated: the Biological Opinion spill levels currently in place, spill levels defined by dissolved gas levels of 115% in the forebay

and 120% in the tailrace, spill levels defined by dissolved gas levels of 120% in the tailrace, and spill levels defined by dissolved gas levels of 125% in the tailrace. These scenarios evaluate spill levels that progressively increase from the Biological Opinion being the lowest to the 125% in the tailrace being the highest. Smolt Monitoring Program data collected over the past fifteen years have indicated that dissolved gas levels of 125% have resulted in low levels (~ 2%) and low severity of gas bubble trauma among samples of outmigrating juvenile salmon and steelhead. Across a range of possible future flow and ocean conditions (i.e., low, medium and high flow years, poor, medium and good ocean conditions), the evaluation found that higher spill levels are expected to increase the probability of meeting the regional goals set by the NPCC for Chinook salmon and steelhead SARs, and decrease the probability of extremely low SARs. The projected benefits of increased spill were particularly pronounced during years of low flows. In particular, substantial increases in SARs are predicted when increasing spill from the Biological Opinion spill scenario to the 120% and 125% TDG scenarios. Simulations at the 125% spill level projected average SARs of 4.1% for steelhead and 3.4% for Chinook salmon – well above the 1.6% and 0.9% recent averages that have been observed under the Biological Opinion spill program. Simulations at the 125% spill level also projected that 74% of the steelhead SARs and 62% of the Chinook salmon SARs would be greater than the NPCC minimum SAR goal of 2%.

The experimental spill management design we recommend uses the principles of adaptive management to help improve the ability to achieve the biological objectives that have been defined by the region and the NPCC on a landscape scale. Both hatchery and wild salmon and steelhead are expected to benefit from increased voluntary spill levels. The analyses that have been conducted suggest that anadromous stocks that encounter the FCRPS throughout the Columbia River Basin would benefit from the proposed spill management experiment including Upper Columbia River, Middle Columbia River, and Snake River populations. Based on the analyses that have been conducted to date, implementation at the 125% tailrace dissolved gas spill level would be the most likely spill level to achieve the NPCC SAR objectives for ESA-listed Snake River Chinook salmon and steelhead, as well as the few remaining unlisted populations.

The State of Oregon acknowledges that the target 125% TDG level exceeds Oregon and Washington water quality criteria. The experiment is subject to the Clean Water Act. Obtaining approvals for TDG criteria modification from the Oregon Environmental Quality Commission and the Washington Department of Ecology through regulatory processes is necessary to conduct the experiment. The ODFW will explore options with Oregon Department of Environmental Quality on TDG criteria modification.

The State of Oregon recognizes that an experiment of this type will result in water bypassing the dams' powerhouses, thereby decreasing the amount of electricity that can be generated during its duration. The Council's Resource Adequacy Advisory Committee should take into account the spill levels proposed in this experiment as it conducts its regional electricity resource assessment. Currently the Council's adequacy standard states that the region's electricity resources are adequate if the chances of potential periods of shortfall, when energy resources fail to meet demand, are calculated to be 5 percent or

less. Oregon acknowledges the Council's 5 percent Loss of Load Probability standard and the protocol of the spill test should be designed so that the Council's standard is not violated.

Supporting Materials:

For additional background information, here are links to: A) presentations from the CSS annual meeting held in Vancouver, Washington, April 30, 2013 (http://www.fpc.org/documents/CSS/Presentations%20from%20the%202013%20CSS%20Annual%20Meeting.pdf), and B) a presentation by Dr. S. L. Haeseker and Dr. M. Filardo at a meeting of the Northwest Power and Conservation Council held in Coeur D'Alene, Idaho, September 10, 2013 (http://www.nwcouncil.org/media/6877229/2.pdf).

Haeseker, S. L., J.A. McCann, J. Tuomikoski, B. Chockley. 2012. Assessing Freshwater and Marine Environmental Influences on Life-Stage-Specific Survival Rates of Snake River Spring–Summer Chinook Salmon and Steelhead. Transactions of the American Fisheries Society 141(1):121-138.

Hall, A. and D. Marmorek. 2013. Comparative Survival Study (CSS) 2013 Workshop Report. Prepared by ESSA Technologies Ltd., Vancouver, B.C. for the Fish Passage Center (Portland OR) and U.S. Fish and Wildlife Service (Vancouver WA). 47 pp. + Appendices.

Marmorek, D., Hall, A., and M. Porter. 2011. Comparative Survival Study (CSS) Workshop Report. Prepared by ESSA Technologies Ltd., Vancouver, B.C. for the Fish Passage Center (Portland OR) and U.S. Fish and Wildlife Service (Vancouver WA), 147 pp.

Petrosky, C.E., and H.A. Schaller. 2010. Influence of river conditions during seaward migration and ocean conditions on survival rates of Snake River Chinook salmon and steelhead. Ecology of Freshwater Fish 10:520-536.

Tuomikoski, J. and eleven co-authors. 2012. Comparative Survival Study (CSS) of PIT-tagged Spring/Summer Chinook and Summer Steelhead 2012 Annual Report. Prepared by the Fish Passage Center, BPA Contract #19960200, 392 pp.

8.0 Implementation Provisions

8.1 Clarify BPA In-lieu Restrictions

(Attachment 2, Section 8.1)

Current Program: Page 7, Planning Assumptions

Recommendation: The Council should establish the in-lieu funding policy which shall be applied by BPA, and add it to the Program. In-lieu decisions by BPA should be reviewed by Council through a public process. Input from the Council is needed as the Fish and Wildlife Program is reviewed and updated to ensure that critical FCRPS mitigation efforts receive the necessary funding from BPA for successful and timely implementation.

Rationale: Section 4(h)(10)(A) of the Northwest Power Act requires BPA to protect, mitigate and enhance fish and wildlife to the extent affected by the development and operation of the hydropower projects of the Federal Columbia River Power System (FCRPS) in a manner consistent with Council's fish and wildlife program and the purposes of the Act. The "in Lieu" provision of section 4(h)(10)(A) states that "Expenditures of the Administrator pursuant to this paragraph shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of Law."

BPA has interpreted this "In Lieu" provision of the Act by drafting an In Lieu Policy (June 2007) and assigning ratings to both new and ongoing projects. Since establishing this policy, BPA has made decisions not to initiate new efforts deemed as in lieu while ramping back on funding levels for other ongoing efforts (e.g., Burns Paiute Tribe - Malheur River Resident Fish Project No. 1997-019).

With this call for policy guidance from the Council, we recognize the critical need to focus ratepayer funding on fish and wildlife mitigation efforts that address FCRPS impacts and that this funding not supplant another entities legal responsibility for funding and implementation of fish and wildlife efforts. However, there are numerous permutations and interpretations of funding responsibility of entities for fish and wildlife efforts as well as the reality of what, if any specific funding has been required, made available, or appropriated for these efforts.

We also understand Congress' intent for the Northwest Power Act, in general, as filling the gaps among the myriad of fish and wildlife and environmental programs and laws currently within the extent of the Columbia River Basin.

8.2 Review Implementation of Program Measures

(Attachment 2, Section 8.2)

Current Program: Page 63, Program Reporting

Recommendation 1: The Council should work with fish and wildlife managers and partners to provide a periodic review of implementation of Fish and Wildlife Program measures and provide an annual report of the measures that were implemented and those which were not. In addition, because of the importance of Subbasin plans, progress towards implementation of these plans should be reported on periodically. This could be as simple as documenting which measures are currently funded and those which have not been funded.

Rationale: We recommend that the Council reassert their role, as described in the Power Act, to provide direction regarding funding levels to BPA. In addition, the Council should use existing tracking tools to report on which elements of the Program are funded (and at what level) and which are currently unfunded. As new measures are added to the Program, funding mechanisms need to be identified. To address the need for new funding, we recommend that the Council use their convening role to coordinate and leverage funding for new and existing measures in the Program.

- The Council's Program, though tied to ESA listed species, is broader than recovery of those species.
- Effort and funding needs to be balanced within the Program to ensure that all aspects of the Program move forward within the foreseeable future, though perhaps not within the next five years.
- The Council can uniquely address the needs of the ecosystem from the sub basin or basin wide perspective.
- BPA has large discretion regarding funding levels, but the measures listed in the Program are presumed to be funded, at some level. Tracking of these measures needs to be transparent.
- In addition, it is critical that the cost of administering the Program be kept low. It is important that in an annual review of implementation, an accounting for Program administration costs be reviewed, as well.

Recommendation 2: The Council should work with fish and wildlife managers and land and water management entities to identify opportunities to coordinate BPA project funding with other funding sources as appropriate to accomplish shared goals. Fish and Wildlife Program funds could leverage shared investments that support implementation of subbasin plans, recovery plans, salmon strongholds, and other mitigation and conservation strategies. The Fish and Wildlife Program and Council should:

- Create a liaison position to assist project sponsors in identifying complimentary (cost-share) grants, and
- Develop complimentary or shared grant application formats to standardize and simplify proposal development and submission. Standard formats would also facilitate proposal review and consideration by local watershed partnerships.

Rationale: The ISAB Report "Using a Comprehensive Landscape Approach for More Effective Conservation and Restoration" provides several case histories of programs that that employ

socioeconomic engagement, a landscape perspective, governance and collaboration to work across traditional boundaries, leverage limited resources, and foster adaptive management (ISAB 2011-4). Among the reported lessons learned is that local organizations can be challenged to identify and generate funds needed to sustain investments, subbasin social engagement, integrated collaborative science and governance, and adaptive management. Tasking Council staff to reach out and coordinate with local watershed partnerships to help identify additional grant opportunities could better leverage BPA investments. Simplified or standardized formats for on the ground work could allow sponsors to efficiently and effectively communicate integrated project objectives and strategies to granting entities and facilitate proposal review by local watershed partnerships.

Supporting Material:

ISAB (Independent Scientific Advisory Board). 2011. Using a Comprehensive Landscape Approach for More Effective Conservation and Restoration. Northwest Power and Conservation Council Report ISAB 2011-4.

8.3 Re-Establish a Regional Coordination Forum

(Attachment 2, Section 8.3)

Current Program: Page 64, Program Coordination

Recommendation 1: Council should continue as a regional convener of issues related to the Columbia Basin mitigation. Council should create an annual forum for states, tribes and partners to coordinate and discuss annual work priorities. The forum would result in the creation of an annual work plan to ensure that we are collectively engaged in discussions on what is most important to the Council and the region. Through the five years of this program, we recommend the following priority topics, as others as they arise, for Council engagement:

- Monitoring and Evaluation – In order to get a handle on M&E costs within the Program, specific information needs at each level of Program reporting should be clearly identified and incorporated to ensure cost effective and efficient data collection, data management, and data sharing.
- Research - What are the critical questions we need to answer? How do we improve reporting and integration into decision making? How can we improve funding mechanisms such that research projects are finished and new projects are identified?
- Wildlife Mitigation – moving into the future, how do we ensure continued value of BPA investments?
- Zebra and Quagga Mussels – focus on prevention.
- Habitat Restoration – How can we leverage existing projects to understand effectiveness of habitat restoration on populations?
- Science/Policy forums – variety of topics including climate change, toxics, eulachon
- BPA funded assets – What are the long term challenges of maintaining BPA funded infrastructure and how can we begin addressing them? This topic should include

identification of short-term and long-term O&M costs for existing and new facilities, including fish collection facilities, fish passage facilities, hatcheries, temperature control structures, and others.

- Non-native species – suppression and eradication; where successful, where not: need to keep lines of communication open
- Coordinated Assessments – identify additional species for process

Rationale:

- The role of the Council has evolved over time to meet the needs of the Basin and to address endangered species listings in concert with BPA.
- The disbanding of CBFWA leaves a gap in regional coordination as no one state or tribe can play a regional coordinating role, with the consequence that States and Tribes work more directly with Council Members.
- As such, it falls to the Council and Council staff to play a greater coordinating role that meets the needs of all regional partners in serving and informing Council decisions.
- An annual work plan would provide sufficient advance notice to improve preparation and participation, ensuring that all parties benefit fully from the exchanges.

Recommendation 2: We recommend that the Council continue the inclusion of Fish and Wildlife Program Coordination funding in the updated program amendment process. Program Coordination funding is important to the region's fish and wildlife managers, particularly for the Columbia River Basin's Tribes. The lack of any Columbia River Basin fish and wildlife entity to provide this basis for coordination makes it more critical to provide funding directly to those individual state and tribal managers who can provide their time and expertise. This coordination funding is also important for many of the tribes because it helps build capacity and levels the playing field, particularly for smaller tribes across the basin. It allows for important avenues for participation and travel to meetings, efforts that would not occur without this level of funding support.

Rationale: The current 2009 Council Fish and Wildlife Program describes the need for coordination funding provided by BPA for the purpose of various activities that support Program implementation. Activities range from activities such as data management and reporting, monitoring and evaluation, facilitating and participating in focus workgroups on Program issues, review of technical documents and processes, and information dissemination.

The Council in 2012 reviewed coordination projects and provided a decision on BPA coordination funding. In that decision document the Council included a table of detailed coordination activities appropriate for BPA funding. Those coordination tasks were designated by the Council as meeting priority needs for program coordination for the next two years, FY2013-2014. With this decision the Council indicated that these activities were well suited for program-level regional coordination funding and recognized that they would need the assistance from partners throughout the region. In addition the Council stated that all of the work was intended to be of benefit at a basinwide or regional scale and should inform the

Council for policy, program performance evaluation, and implementation decisions. The Council also recommended that this work should be accomplished by the appropriate fish and wildlife agencies and tribes recognized in the program and other entities such as Tribal Consortia that have the experience and capacity to coordinate this work at a basinwide scale.

NPA. Section 839b(h)(2)(C). [The Council shall request…] fish and wildlife management coordination and research and development (including funding) which, among other things, will assist protections, mitigation, and enhancement of anadromous fish at, and between, the region's hydroelectric dams.

8.4 Streamline ISRP Scientific Review

(Attachment 2, Section 8.4)

Current Program: P 65-66, Independent Scientific Review Panel

Recommendation: Modify the current language in the Program as follows:

- First bullet at the top of p. 65, add "new" to read, *"Review **new** projects proposed for Bonneville funding to implement the Council's Program."*
- Add a second bullet: ***"The Council, Action Agencies, and co-managers should jointly develop a new ISRP review process for mature projects, long-term projects, and Fish Accords projects."***
- Additionally, the Program should continue to support the existing strategic frameworks developed by the umbrella projects that have developed review processes for selection, prioritization and technical and science review of projects in coordination with local stakeholders, tribes and agencies.

Rationale: The existing ISRP review process is inefficient, labor-intensive, needlessly duplicative, and extremely frustrating for all involved. In the absence of clear guidance by the Council, the ISRP has been left to develop or modify its review process. The proposed recommendation would put process development under policy guidance and would allow the relevant parties to develop new review protocols that 1) keep the ISRP focused on what is necessary by law, 2) allow the parties to develop alternative review processes that take advantage of annual science and management conferences, and 3) could result in reviews that add value to proposed and ongoing projects.

For ongoing projects, consider an entirely different review regime that would make the reviewers partners in the local basins (as opposed to distant adversaries) with the mutual goal of improving subbasin programs and making them more successful. For example, four (or more) regional review panels – one each for the upper Columbia, Snake, mid-Columbia, and Lower Columbia - might be composed of two at-large members nominated by the subbasin co-managers, one or two representatives from NOAA-Fisheries, a tribal representative, and maybe two members assigned to the subbasin by the ISRP. Members of these regional review panels would be required to attend project review conferences to thoroughly understand the sub-

basins, co-manager objectives, and the existing spectrum of implementation projects. Following the annual conference, a day would be dedicated to address concerns, discuss progress and ideas for making the program better, review recovery implementation issues, etc. Action items and a formal record would be kept and would become part of the review the following year. This type of review could be used to satisfy all of the legal review requirements for ongoing projects, including ESA permit compliance. A review panel so constituted would have a baseline understanding of local basin issues, advance knowledge of their respective concerns, and could come to reviews prepared to ask the questions needing answers. This informed dialogue would eliminate misunderstandings and the lost time that goes into the back-and-forth of the present review response loop.

8.5. Assure Adequate funding to meet mitigation responsibilities

Current program: pg. 14

Recommendation 1*:* Specify that Council plays a pivotal role in ensuring adequate funding to meet mitigation responsibilities including those that are not tied to Bonneville Power Administration's requirements under the Endangered Species Act.

Rationale*:* The Council's role, as described in the Power Act, is to recommend which projects are to be funded by BPA. Recently, the Council has moved away from recommending funding levels for projects which has resulted in some Council recommendations either being inadequately funded or unfunded.

Recommendation 2: The Council and BPA have made significant infrastructure investments including fish screens, hatcheries, wildlife areas, and other capital improvements. BPA and the Council will work with the States and Tribes to create a process for capital refurbishment over the next ten years.

Measure 1: Council should direct funding for replacement and repair beyond current operation and maintenance to ensure the continued value of existing infrastructure investment in fish passage, hatcheries and wildlife areas.

Rationale: Existing fish screens, hatcheries and capital improvements on wildlife areas are aging and exhibiting the need for additional money beyond the yearly operation and maintenance budgets. If we begin now, we can plan for upcoming costs in a rationale and coordinated fashion. An overall plan for replacement will need input from all fish and wildlife managers as we prioritize and allocate resources accordingly.

Measure 2: The Council will allocate adequate money for mitigation responsibilities. Specifically:

a. Adequate funding to provide for hatchery mitigation programs, hatchery conservation programs, and associated monitoring. For instance, maintain funding for Coded Wire Tagging.
b. Ensure mitigation responsibilities include mitigation from power line impacts. For example, Greater Sage Grouse populations are particularly impacted by power line

corridors that effectively carve up sage grouse habitat, increase predation, and impair nesting and dispersal, reducing the likelihood of recovery.

Measure 3: Maintain adequate funding for Select Areas Fishery Enhancement (SAFE) as a core mitigation responsibility and selective harvest as a tool to protect listed species.

Rationale: The SAFE project has effectively reduced fishing impacts to listed anadromous fish in the mainstem Columbia River while mitigating for loss productivity upstream. The Council's continued support for this program is critical to mitigating the impacts of the dams on commercial and recreational fishing opportunity.

Measure 4: Council will increase funding to achieve the objectives and goals of the resident fish section of the Program.

Supporting Materials:

ISAB 2011-4. Using a Comprehensive Landscape Approach for More Effective Conservation and Restoration

9.0. Strategies in Specific Areas

9.1 Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish

Current Program: Pages 18-19, Artificial Production Strategies.

Recommendation: As mitigation for lost fishery opportunities resulting from construction and operation of the hydrosystem, the Program should continue to fund, develop and maintain fisheries in off-channel areas of the Lower Columbia River estuary where impacts from straying are reduced -- given decreased spawning interactions with upriver stocks; and where the return on mitigation investment is improved -- given that fish are not exposed to hydrosystem passage losses.

Current Program: Page 32, Estuary Strategies.

Recommendation: Continue funding of the Select Area Fisheries Enhancement program (SAFE) at a level sufficient to achieve current SAFE deliverables through and beyond 2017 as a mitigation measure for lost fishery opportunities resulting from construction and operation of the hydrosystem.

Rationale: Selective fisheries provide harvest opportunities by promoting the increased harvest of hatchery fish and minimizing the impact to natural-origin stocks (consistent with Program Strategy 3c). These fisheries can reduce the ratio of hatchery to natural-origin fish on spawning grounds by two methods: 1) releases of hatchery fish can be reprogrammed from watersheds of concern to off-channel sites and 2) highly efficient fisheries remove a greater proportion of returning hatchery-origin adults (consistent with Program Strategy 4b). They provide benefits consistent with the Northwest Power Act by mitigating for lost fishing opportunities while reducing negative effects of hatchery fish straying (consistent with Program Strategy 3c). Promotion of hatchery fish harvest is consistent with provisions of the FCRPS BiOp (RPA 62) and with recent ISAB reviews (ISAB 2005-4, ISAB 2010-44, and ISAB 2011-4). Given potential negative effects associated with hatchery fish straying and

post-release mortality associated in fisheries, projects should provide evidence that fisheries are not adversely affecting non-local and local natural-origin stocks (ISAB 2010-44) (consistent with Program Strategy 4c).

Supporting Materials:

Project 1993-060-00 Select Area Fisheries Enhancement (SAFE).

ISAB. 2005. Report on Harvest Management of Columbia Basin Salmon and Steelhead. Document ISAB 2005-4. Report to the Northwest Power and Conservation Council. Portland, OR http://www.nwcouncil.org/fw/isrp/isrp2010-44/

ISRP & IEAB. 2007. Review of the Select Area Fishery Evaluation Project Reports: Final Completion Report, October 1993 to October 2005 (April 2006) and Economic Analysis Study (November 2006). Document ISRP & IEAB 2007-3. Report to the Northwest Power and Conservation Council. Portland, OR

Whisler, G., G. Gale, P. Hulett, J. Wilson, S. Meshke, A. Dietrichs, and T. Miethe. 2009. Select Area Fishery Enhancement Project. 2007-2008 Annual Report, project # 199306000 prepared for the Bonneville Power Administration, Portland, Oregon.

Hulett P., J. Wilson, G. Whisler, G. Gale, S. Meshke, A. Dietrichs, and T. Miethe. 2010. Select Area Fishery Enhancement Project. 2009 Annual Report, project # 199306000 prepared for the Bonneville Power Administration, Portland, Oregon.

9.2 Implement Willamette Basin Mitigation

Current Program: Page 44, Strategies in Specific Areas.

Recommendation: Revise language in the current program that appears to place a Lower priority for Willamette Mitigation:

"The Council recognizes that NOAA Fisheries' Willamette River Biological Opinion requires additional capital improvements at the Willamette projects operated by the Corps. ~~Priority work at the Columbia River and Snake dams funded through the Columbia River Fish Mitigation Program (CRFM) should not go unfunded because of the diversion of CRFM funds to implement the Willamette Biological Opinion. If necessary, the~~ The Council urges ~~encourages the Corps to seek alternative funding for~~ the Action Agencies to fully fund their Willamette Biological Opinion implementation and mitigation obligations."

Recommendation: The Program should adopt ESA delisting goals and broad sense goals of the *Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead* (ODFW and NMFS 2011) as Biological Objectives.

Table 9.2.1. Viable Salmonid Population (VSP) scenarios from the *Upper Willamette Conservation and Recovery Plan for Chinook Salmon and Steelhead* (Recovery Plan). This table summarizes the VSP Extinction Risk for abundance and productivity (A&P), diversity (DIV), and spatial structure (SS) for each population under current conditions, at delisting, and at broad sense recovery. This information is summarized from Tables 6-11 through 6-21 and Table 10-1

in the Recovery Plan. The Recovery Plan also details threat reduction scenarios and ESA threats delisting criteria.

Species and Population Chinook	Current VSP Extinction Risk				Desired VSP Extinction Risk at Delisting[1]					Broad Sense Recovery VSP Extinction Risk[2]				
	A&P	DIV	SS	Overall Current Status	A&P	DIV	SS	Overall Status at Delisting	Abundance Target at Delisting	A&P	DIV	SS	Overall Status - Broad Sense	Broad Sense Abundance Target
Clackamas	M	M	L	Moderate	VL	L	L	Very Low	2,314	VL+	L	L	Very Low+	5,618
Molalla	VH	H	H	Very High	H	H-M	L	High	699	VL	L	L	Very Low	2,627
N Santiam	VH	H	H	Very High	L	L	L	Low	5,428	*	*	*	Very Low	*
S Santiam	VH	M	M	Very High	M	M	L	Moderate	3,116	*	*	*	Very Low	*
Calapooia	VH	H	VH	Very High	H	H-M	L	High	598	VL+	L	L	Very Low+	1,815
McKenzie	VL	M	M	Low	VL+	L	L	Very Low+	10,916	VL+	L	L	Very Low+	13,613
MF Willamette	VH	H	H	Very High	L	L	L	Low	5,820	*	*	*	Very Low	*
Steelhead														
Molalla	VL	M	M	Low	VL	L	L	Very Low	3,226	VL+	L	L	Very Low+	19470
N Santiam	VL	M	H	Low	VL	L	L	Very Low	8,362	VL+	L	L	Very Low+	10,013
S Santiam	VL	M	M	Low	VL	L	L	Very Low	3,912	VL+	L	L	Very Low+	5,371
Calapooia	M	M	VH	Moderate	M	M	M	Moderate	522	VL+	L	L	Very Low+	4,471

[1]From the Recovery Plan Chapter 6: Delisting Goals, Criteria and Scenarios

[2]From the Recovery Plan Chapter 10: Broad Sense Recovery

*specific target not developed

Rationale: The *Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead* has been completed since the last update to the Council's Fish and Wildlife Program. This Recovery Plan includes ESA delisting goals, broad sense goals, priority limiting factors, priority actions, and costs. The Program should adopt as biological objectives The table below describes the ESA delisting criteria and broad sense recovery goals as detailed in the Recovery Plan. These criteria should be incorporated into the Program's biological objectives. This is consistent with Recommendations 4 and 12 in section 5.2 of the Columbia River Basin Fish and Wildlife Manager's Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations, and language that states: "The Council's Program incorporates the quantitative recovery criteria from ESA recovery plans. It also incorporates the more qualitative broad sense goals in some recovery plans that go beyond ESA delisting."

Recommendation: Include identification of short-term and long-term O&M costs for existing and new facilities in the Willamette Basin, including fish collection facilities, brood holding facilities, fish passage facilities, hatcheries, temperature control structures, and others, as a

priority topic for consideration under the Regional Coordination Forum. The Council should urge the Action Agencies to adequately fund the long-term O&M needs of these facilities.

Recommendation: Priority actions identified in the *Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead* to address priority limiting factors should be identified as measures to be funded under the Program.

Adopt the following high priority **measures** (summarized below and detailed in Tables 9.2.2-9.2.6) as an update to the Council's Willamette Subbasin Plan:

Develop and implement passage solutions for reintroducing anadromous fish above the following federal hydropower facilities: Dexter Dam, Lookout Dam, Hills Creek Dam, Foster Dam, Green Peter Dam, Big Cliff Dam, and Detroit Dam. *Willamette Subbasin Plan references:* Section 5.2.2.1. Deal with the Dams; Table 5.3 Aquatic Strategies (Connect Favorable Habitats). The relevant reintroduction actions from the Recovery Plan are 191-SUB-SSA, 202-SUB-SSA, 162-SUB-NS, 177-SUB-NS, 229-SUB-MK, 230-SUB-MK, 240-SUB-MF, 249-SUB-MF, 235-SUB-MF, 10-ESU-ADM. The relevant RPAs from the Willamette BiOp include: 4.1, 4.13, 6.2.3.

Implement safe and effective downstream passage for anadromous and resident fish populations including lamprey and listed bull trout at the federal flood control and hydroelectric projects and reservoirs in the Upper Willamette River Subbasin. Projects include Detroit and Big Cliff dams, Cougar Dam, Fall Creek Dam, Lookout Point and Dexter dams, and Foster Dam. (Recovery Plan action 183-SUB-SSA, 157-SUB-NS, 212-SUB-MK, 215-SUB-MK, 236-SUB-MF, 237-SUB-MF, and 238-SUB-MF; and BiOp RPA 2.8, 2.10, 4.12, 4.12.1, 4.12.2, 4.12.3, 4.13, 4.8, 8.1, and 9.3)

Operate and maintain Upper Willamette fish hatcheries to ensure fisheries, mitigation, and conservation and recovery goals are achieved including adequate funding of operations, production targets, and baseline and uncertainty monitoring. (Recovery Plan action 212-SUB-MK, 215-SUB-MK, 229-SUB-MK, 230-SUB-MK, 177-SUB-NS, 202_SUB-SSA, 183-SUB-SSA, 184-SUB-SSA, 190-SUB-SSA, 191-SUB-SSA, 249-SUB-MF, 236-SUB-MF, 238-SUB-MF, 29-ESU-ADM, 30-ESU-ADM; and RPA 6.1.2, 6.1.3, 6.1.4, 9.5, and 9.5.1)

Reduce pre-spawn mortality by reducing injury and stress related to fish handling and brood holding environment at and above USACE facilities. Improved collection facilities have been completed at Cougar Dam and Minto Collection Facility on the North Santiam. A new collection facility at Foster Dam is currently under construction. Improved adult handling, brood holding environment and passage facilities are still needed at Dexter Dam, Willamette Hatchery and Fall Creek Dam. (Recovery Plan action 239-SUB-MF; and BiOp RPA 4.6)

Reduce pre-spawn mortality by reducing injury and stress related to fish handling at and above USACE facilities. Improved collection facilities have been completed at Cougar Dam and Minto Collection Facility on the North Santiam. A new collection facility at Foster Dam is currently under construction. Improved adult handling and passage facilities are still needed at Dexter Dam and Fall Creek Dam. (Recovery Plan action 239-SUB-MF; and BiOp RPA 4.6)

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. Operate federal flood control and hydroelectric projects to minimize adverse effects of ramping on fish stranding, redd desiccation, and loss of habitat. (Recovery Plan action 102-FW-ALL, 199-SUB-SSA, 173-SUB-NS, and 242-SUB-MF; and BiOp RPA 2.3, 2.4, 2.4.2, 2.4.3, 2.4.4, 2.5, 2.6, and 2.7)

Evaluate and implement structural or operational changes to release water that more closely resembles normative water temperatures, reduces TDG exceedences, and meets TMDL temperature targets downstream of dams and operating dams to maximize benefits to Chinook and steelhead. (Recovery Plan actions 175-SUB–NS, 167-SUB–NS, 201-SUB–SSA, 228-SUB–MK, 241-SUB–MF, 248-SUB–MF, 120-MST/SUB-AMO, 69–EST-ALL, 70–EST-ALL, and 111-MST-ALL; and BiOp RPA 2.7, 5.1, 5.2, 5.3, and 5.4)

Protect and restore aquatic habitat function in tributaries, mainstem, and confluence areas of the Willamette River including but not limited to removing unnecessary revetments, increasing setback areas, restoring structure and function to strategic natural riparian reaches, and increase overall channel complexity, floodplain connectivity, and flood storage to improve salmonid rearing and migration habitat. (Recovery Plan actions 110-MST-ALL, 112–MST-AMO, 113– MST-AMO, 116-MST-AMO, and 219-SUB-MK; and BiOp RPA 7.1, 7.1.2, 7.1.3, 7.2, and 7.4)

Expand population and project implementation monitoring to track status and trends of salmon and steelhead VSP metrics and improve understanding of natural origin spawners, other life history information, habitat status and utilization, and evaluation of actions implemented to address limiting factor threats described in the recovery plan. Continue monitoring efforts to track status and trends of bull trout in relevant Upper Willamette subbasins. Secure funding sources to implement RM&E for baseline and post action monitoring and to answer critical uncertainties related to the assumptions under which the recovery plan was developed. (Recovery Plan action 13–ESU-ADM, 22-ESU-ADM, and 23–ESU-ADM; and BiOp RPA 9.1, 9.2, 9.3, 9.4, 9.5, 9.5.1, 9.5.2, and 9.6)

Adopt the following **measures** consistent with the Council's Willamette Subbasin Plan:

Provide upstream and downstream passage for bull trout and resident fish species in conjunction with anadromous passage solutions at the federal hydropower/flood control facilities.

Complete feasibility assessment and subsequent steps for reintroduction of bull trout above federal hydropower/flood control facilities in the Santiam Basin.

Determine if anadromous and resident salmonid passage alternatives are suitable for lamprey passage. Reintroduce lamprey into areas blocked by the hydrosystem.
Willamette Subbasin Plan references: Section 3.2.4.6 Pacific Lamprey; Section 5.2.2.1. Deal with the Dams; Table 5.3 Aquatic Strategies (Connect Favorable Habitats).

Determine the extent of lamprey spawning habitat downstream of hydrosystem projects and determine the effects operation has on spawning, incubating and rearing lamprey.
Willamette Subbasin Plan references: Section 3.2.4.6 Pacific Lamprey

Supporting Materials:

ODFW and NMFS. 2011. Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead. Available: http://www.dfw.state.or.us/fish/CRP/upper_willamette_river_plan.asp.

NMFS 2008. 2008 Willamette Project Biological Opinion. http://www.nwr.noaa.gov/hydropower/willamette_opinion/index.html

The tables below represent actions from the *Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead* (ODFW and NMFS 2011) that are considered high priority to implement (fully or in part) in the Willamette Basin within the term of the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program. The tables also include a reference to the associated Willamette Project Biological Opinion (WP BiOp) RPA, if appropriate, as many of the high priority Recovery Plan actions area also included in the WP BiOp. The Recovery Plan also includes numerous other actions that should be adopted into the Fish and Wildlife Program as recommended in Section 5.2, of the Columbia River Basin Fish and Wildlife Manager's Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations.

Table 9.2.2. High priority recovery actions for the South Santiam subbasin from the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011). The table summarizes the recovery plan action, including potential sub-actions, listing factor and limiting factor addressed, strategy and VSP objective, and also references the associated Willamette Project Biological Opinion RPA (NMFS 2008).

Action ID and Priority	Recovery Action	Sub Action or Task	Associated BiOp RPA Measure
183 - SUB -SSA	Improve downstream passage through Foster reservoir and dam for juveniles and kelts.	1. Implement WP-RPA's 2.8 and 2.10) to evaluate the Foster Dam Spring Spill window for improved passage of CHS and STW. 1.1. based on these studies, implement WP-RPA 4.8 requiring interim downstream fish passage measures 1.2. if more extensive improvements are needed, WP BiOP Action Agencies will proceed with evaluation through COP process, described in WP-RPA 4.13 (COP studies)	2.8 2.10 4.8 4.13
199 - SUB -SSA	(WP BiOp WQ RPA's) 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.	1. Operate facilities to minimize adverse effects of ramping on fish stranding, redd desiccation, and loss of habitat.	2.1 2.3 9 2.4 2.5 2.6 2.7 2.10
201 - SUB -SSA	Evaluate feasibility and effectiveness of interim operational temperature control at Foster and Green Peter dams.	1. Consider temperature control structure at most appropriate dam in next term of the WP BiOp, if not effective at restoring normative conditions or reducing the LFT. 1.1. resolve potential conflicts between meeting TMDL temperature targets downstream of dams and operating dams to maximize benefits to Chinook and steelhead	5.1 5.1.2

			5.1.3
202 - SUB -SSA	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.	1. In the long term the VSP CHS diversity target is to maintain an average total basin pHOS rate <30%, which is coupled with improvements in access and passage and other LFT's affecting capacity and productivity. 1.1. promote a short and long term conservation hatchery strategy that will lead to a viable naturally-produced population	6.1.1 6.2.2
		2. In the short term, implement actions and associated RME below Foster facility that will reduce genetic and demographic risk to extant NOR population: 2.1. improving trap attraction, operation, and sorting at new Foster facility 2.2. minimize the recycling of HOR fish entering trap, maximize the recycling of "true" NOR fish 2.3. adjust juvenile rearing and release strategies as feasible 2.4. modifying other hatchery rearing practices 2.5. increase harvest of HOR fish while minimizing risk to NOR fish 2.6. maintain HOR tagging efforts and CHS spawning surveys to support above efforts 2.7 adopt new ODFW recommendations for level of integration of NOR broodstock and look for annual opportunities to "outplant" NOR fish to other locales in lower subbasin	6.1.2 6.1.3 6.2.2 6.2.4 4.3
		3. Over long term, increase NOR production below Foster through WP BiOp RPA water quality/quantity improvements and other actions addressing LFT's. Further develop a conservation supplementation (reintroduction) program (CSP) or set of strategies to be implemented above Foster and Green Peter dams. 3.1. adopt as template the new ODFW recommendations for reintroduction and modify as needed based on results of scientific review of program type	6.2.3
		4. After Recovery Plan is adopted, develop a new HGMP with conservation details.	6.1.1

Table 9.2.3. High priority recovery actions for the North Santiam subbasin from the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011). The table summarizes the recovery plan action, including potential subactions, listing factor and limiting factor addressed, strategy and VSP objective, and also references the associated Willamette Project Biological Opinion RPA (NMFS 2008).

Action ID and Priority	Recovery Action	Sub Action or Task	Associated BiOp RPA Measure
157 - SUB -NS	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.	1: Study conceptual alternatives for downstream passage through dam complex and fish distribution in reservoir(s). 1.1. based on studies and design alternatives, construct and operate new downstream fish passage facility by 2023 or sooner	4.8 4.10 4.11 4.12.3 (relation to RPA 5.2)
167 - SUB -NS	(see LFT 2b for handling actions) Resolve uncertainty of any remaining pre-spawn mortality not associated with injury and stress associated with Minto Collection facility.	1: Improve water quality in subbasin below Big Cliff Dam by implementing the WP RPA's 5.1, 5.2 and 5.3 for water quality to meet adult fish needs by resolving inadequacies of temperature and TDG profiles. 1.1. build temperature control structure at Detroit Dam; WP- RPA 5.2.	5.1 5.1.1 5.1.2 5.1.3 5.1.4 5.1.5 5.2
		2. Monitor metrics of fish health at different times and locations above Willamette Falls to further delineate whether the problem is solely related to Flood Control/hydropower effects, or is exacerbated by other issues that impact fish condition and maturity (i. e. disease, toxins).	no RPA measure
173 - SUB -NS	(WP BiOp Water Quality RPA's) 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.	1. Operate facilities to minimize adverse effects of ramping on fish stranding, redd desiccation, and loss of habitat.	2.1 2.3 9 2.4 2.5 2.6 2.7 2.10

175 - SUB -NS	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 and steelhead.	1. Resolve any potential conflicts between meeting TMDL temperature targets downstream of dams and operating dams to maximize benefits to steelhead.	5.2
177 - SUB -NS	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.	1. In the long term the VSP diversity target is to maintain an average total basin pHOS rate <10%, which is coupled with improvements in access and passage and other LFT's affecting capacity and productivity. 1.1. promote a short and long term conservation hatchery strategy that will lead to a viable naturally-produced population.	6.1.1 6.2.2
		2. In the short term, implement actions and associated RME below Minto facility that will reduce genetic and demographic risk to extant NOR population 2.1. improve trap attraction, operation, and sorting at new Minto facility; (open earlier and longer) 2.2. modify hatchery fish recycling program (end sooner)? 2.3. acclimate, release, or evaluate other rearing strategy modifications 2.4 modify other hatchery rearing practices 2.5. encourage greater harvest of hatchery fish above Upper Bennett Dam 2.6. maintain HOR tagging efforts and CHS spawning surveys to support above efforts 2.7. adopt new ODFW recommendations for level of integration of NOR broodstock 2.8. look for annual opportunities to "outplant" NOR fish to other locales in lower subbasin	6.1.2 6.1.3 6.2.2 6.2.4 4.3
		3. Over long term, increase NOR production below Minto through WP BiOp RPA water quality/quantity improvements at Detroit, and other actions addressing LFT's. 3.1. further develop a conservation supplementation (reintroduction) program (CSP) or set of strategies to be implemented above Detroit dam 3.2. adopt as template the new ODFW recommendations for reintroduction and modify as needed based on results of scientific review of program type	6.2.3
		4: If above actions and WP BiOp RPA actions related to access, temperature, and flow do not get pHOS to acceptable levels below Minto, and after a period of 2 life cycles (depending on ocean conditions) install and operate sorter at Upper and Lower Bennett Dams and modify angling regulations accordingly.	no RPA measure
		5: After Recovery Plan is adopted, develop a new HGMP with conservation details.	6.1.1

Table 9.2.4. High priority recovery actions for the McKenzie subbasin from the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011). The table summarizes the recovery plan action, including potential subactions, listing factor and limiting factor addressed, strategy and VSP objective, and also references the associated Willamette Project Biological Opinion RPA (NMFS 2008).

Action ID and Priority	Recovery Action	Sub Action or Task	Associated BiOp RPA Measure
212 - SUB -MK	Restore adult access of natural origin fish to historic habitat blocked by large dams.	3. Since the new trap below Cougar Dam has been constructed, implement WP-RPA's 4.3, 4.4, and 4.5 to improve handling and transport protocols.	4.5
		4. Implement WP-RPA 4.7 to improve and increase the number of suitable "outplanting=release" sites above Cougar Dam.	4.7
		5. Continue to provide appropriate temperatures to attract adults into the SF Mckenzie River.	5.4
215 - SUB -MK	Provide safe and effective downstream passage through Cougar reservoir and dam.	1. Implement WP-RPA 4.12.1 that studies and reports on conceptual alternatives for downstream passage through dam complex and fish distribution in Cougar Reservoir. 1.1. based on studies and design alternatives, construct and operate a new downstream fish passage facility	4.12.1
219 - SUB -MK	Increase retention and sourcing of gravels and other materials below USACE facilities with a combination of habitat improvements, targeted flows, and augmentation.	1. Improve channel complexity below dams with existing habitat restoration and enhancement program on USACE lands.	7.2
		2. Augment depleted areas below dams with most appropriate source and size composition. 2.1. provide appropriate channel complexity to retain material.	no RPA measure
		3. Prioritize some projects within the comprehensive habitat restoration program to include projects that improve incubation habitat.	7.1.2
		4. Implement to collect large wood in USACE reservoirs, and strategically promote placement of this wood in areas below dams that promote sourcing of incubation gravels.	7.3
		5. To the extent that restoration at revetment sites implemented through WP RPA 7.4 leads to greater interaction and movement of floodplain substrates, fund as high priority projects those that produce incubation gravels.	7.4
		6. Couple these improvements with Environmental Flow opportunities as described in RPA 2.7. to distribute gravel and other materials.	2.7

228 - SUB -MK	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.	1. Temperature control is now possible at Cougar Dam with the Selective Withdrawal Tower installed in 2005 1.1. use RME under WP RPA 5.4 to evaluate the effects of the Cougar temperature structure operation on TDG 1.2. resolve remaining issues with ODEQ regarding TMDL temperature targets 1.3. evaluate whether temperature control at other WP facilities in the subbasin are needed in the future	5.4
		2: Monitor TDG below each large dam to identify the operating and background conditions causing high TDG. 2.1. based on monitoring TDG, design structural and/or operational modifications to dams to reduce project-related TDG exceedences	5.4
230 - SUB -MK	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	1. In the long term the VSP diversity target is to maintain an average total basin pHOS rate <10%, which is coupled with improvements in access and passage and other LFT's affecting capacity and productivity. To achieve this, promote a wild fish management zone for the subbasin above Leaburg Dam that has a feasible pHOS target of <5%.	6.1.1 6.2
		2.1. adopt new ODFW recommendations for lower level of integration of NOR broodstock, and pass only NOR fish above Leaburg Dam. 2.2. improve attraction flows and entry to McKenzie Hatchery 2.3. modify Leaburg Hatchery ladder facility to assist in removing HOR CHS and collecting NOR CHS for passage above Leaburg 2.4. minimize the recycling of HOR adults entering traps at Leaburg ladder and the hatcheries 2.5. increase harvest of HOR fish below Leaburg dam while minimizing risk to NOR fish 2.6. evaluate pHOS reduction effectiveness of the on-going partial program relocation (SAFE) 2.7. explore opportunities/feasibility of acclimating and releasing juvenile CHS at sites in lower McKenzie subbasin; modify harvest regulation zones as needed to shift fishery effort to those areas. 2.8. resolve technical/feasibility issues of upgrading Leaburg Dam EWEB facility with engineering subgroup to achieve better sorting and handling of wild fish, resolve any funding uncertainties with BPA 2.9. maintain HOR tagging efforts and CHS spawning surveys to support above efforts	6.1.4 6.1.3 6.2.2 6.2.4 4.3
		3. Over long term, increase NOR fish production below and above Leaburg through WP BiOp RPA water quality/quantity improvements and other actions addressing LFT's. 3.1. once adult and juvenile passage issues are resolved at Cougar Dam through WP BiOP RPA's, develop a conservation strategy and allocation schedule where it is defined under what demographic conditions and passage improvement conditions the HOR outplants above Cougar Dam could be phase out and replaced with reintroduction of NOR fish that enter the South Fork Mckenzie River.	6.2.3

Table 9.2.5. High priority recovery actions for the Middle Fork Willamette subbasin from the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011). The table summarizes the recovery plan action, including potential subactions, listing factor and limiting factor addressed, strategy and VSP objective, and also references the associated Willamette Project Biological Opinion RPA (NMFS 2008).

Action ID and Priority	Recovery Action	Sub Action or Task	Associated BiOp RPA Measure
236 - SUB -MF	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.	1. Manage reservoir levels for more normative flows (pre-dam flows) to pass inflow year round, except during flood control operations. Alternatives to be considered in the WP BiOp 2008 are: 1.1. WP-RPA 4.8: Evaluates interim measures to improve downstream passage within Project constraints, within COP process. Measures could include partial or full reservoir drawdown, and use of spillway. Includes evaluating dam & facility constraints on how far down the reservoirs could be dropped. Need to assess cost/benefits of this action, relative to authorizations, storage loss for flow augmentation, and pollution abatement. Therefore it is unclear that a drawdown alternative will be chosen method to aid downstream migrants and that WP-RPA 4.8 will result in meaningful improvements.	4.8
		2. Build, evaluate, and report on effectiveness of Head of Reservoir (HOR) prototype above Lookout Pt. Dam. Permanent HOR does not occur if not effective at increasing overall productivity above Lookout Point.	4.9
		3. Supporting studies to evaluate passage improvement alternatives through Lookout Pt/Dexter reservoirs and dams	4.10
			4.11
		4. Investigate feasibility of fish passage at Lookout Pt. Dam. Based on studies and design alternatives, construct new downstream fish passage facility by 2021. - does not secure guarantee structural downstream passage improvements at Lookout Pt. Dam	4.12.2
237 - SUB -MF	Provide safe and effective downstream passage through Fall Creek reservoir and dam.	1. Implement WP-RPA 4.8.1 to drawdown in autumn as an operational measure to reduce smolt injury, supported by effectiveness RME. 1.1. WP BiOp entities clarify timeline and standard for evaluating this drawdown option.	4.8.1
		2. If drawdown is deemed insufficient to provide safe and effective passage, evaluate other operational measures through WP-RPA 4.8 and WP-RPA 4.13 (COP process). 2.1. study conceptual alternatives for downstream passage through dam complex based on fish distribution	4.8

		in the reservoir. 2.2. based on COP studies and design alternatives, consider construction and operation of structural protections and/or fish bypass facilities	4.13
238 - SUB -MF	Provide safe and effective downstream passage through Hills Creek reservoir and dam.	1. Within WP-RPA's 4.10 and 4.11, assess passage through Hills Creek reservoir and dam.	4.8 4.10 4.11
		2. Use these data and results within language of WP-RPA 4.12 to support SLAM modeling to reduce uncertainty regarding need to improve downstream survival in the future - needed to support decisions regarding need to construct and operate new downstream fish passage facility at Hills Creek Dam in next term of the WP BiOp	4.12
239 - SUB -MF	(see relation to LFT 2m) Reduce pre-spawn mortality by reducing injury and stress related to fish handling at and above USACE facilities.	1. WP-RPA 4.6 to rebuild, operate, and maintain the Adult Fish Collection and handling facilities below Dexter and Fall Creek dams for expanded and improved sorting and handling of wild and hatchery fish.	4.6.3 4.6.4
		2. Support objective of WP-RPA 4.6 by implementing WP-RPA's 4.3, 4.4, and 4.5 to improve and standardize handling and transport protocols, and by implementing WP- RPA 4.7 to improve and increase the number of suitable outplanting sites above Lookout Pt. Dam, Hills Creek Dam, and Fall Creek dams. 2.1. assess through RME whether these show demonstrable improvement	4.3 4.4 4.5 4.7
241 - SUB -MF	(see LFT 2e for handling actions) Resolve uncertainty of any remaining pre-spawn mortality not associated with injury and stress associated with Middle Fork Willamette Collection facilities.	1. Improve water quality in subbasin below MF Willamette dams by implementing WP RPA's 5.1 and 5.2 for water quality to meet adult fish needs by resolving inadequacies of temperature and TDG profiles.	5.1 5.1.2 5.1.3 5.1.4 5.1.5 5.2
		2. Monitor metrics of fish health at different times and locations above Willamette Falls to further delineate whether the problem is solely related to Flood Control/hydropower effects, or is exacerbated by other issues that impact fish condition and maturity (i. e. disease, toxins). - this is not a current WP BiOp RPA)	no RPA measure
242 - SUB -MF	(same as for LFT 7c [NS] and 7e [MK]) Increase retention and sourcing of gravels and other materials below USACE facilities with a combination of habitat improvements, targeted flows, and augmentation.	1. Improve channel complexity below dams with existing habitat restoration and enhancement program on USACE lands.	7.2
		2. Augment depleted areas below dams with most appropriate source and size composition. 2.1. provide appropriate channel complexity to retain material.	no RPA measure
		3. Prioritize some projects within the comprehensive habitat restoration program to include projects that improve incubation habitat.	7.1.2
		4. Implement to collect large wood in USACE reservoirs, and strategically promote placement of this wood in areas below dams that promote sourcing of incubation gravels.	7.3

		5. To the extent that restoration at revetment sites implemented through WP RPA 7.4 leads to greater interaction and movement of floodplain substrates, fund as high priority projects those that produce incubation gravels.	7.4
		6. Couple these improvements with Environmental Flow opportunities as described in RPA 2.7. to distribute gravel and other materials.	2.7
248 - SUB -MF	Operate WP flows in MF subbasin to mimic the natural temperature regime in the fall	'- A water Temperature Control Facility would presumably need to be constructed, which is not a certainty in current term of the WP BiOp	
New Action	(WP BiOp Water Quality RPA's) 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.	1. Operate facilities to minimize adverse effects of ramping on fish stranding, redd desiccation, and loss of habitat.	2.1 2.3 9 2.4 2.5 2.6 2.7 2.1
249 - SUB -MF	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.	1. In the long term the VSP CHS diversity target is to maintain an average total basin pHOS rate <10%, which is coupled with improvements in access and passage and other LFT's affecting capacity and productivity. Promote a short and long term conservation hatchery strategy that will lead to a viable naturally-produced population, focused in the area above MF Willamette dams.	6.1.1 6.2.2
		2. Actions and goals to control pHOS are modest below Dexter and Falls Creek dams (unless pseudo-isolation becomes an issue) but to minimize further genetic risk impacts for a future reintroduction effort using MF Willamette HMP stock, actions in the short term could include: 2.1. improve trap attraction, operation, and sorting at new Dexter facility 2.2. adjust juvenile rearing and release strategies as feasible 2.3. evaluate and Implement HGTG guidelines for reducing genetic impacts 2.4. maintain HOR tagging efforts and CHS spawning surveys to support above efforts 2.5 adopt new ODFW recommendations for level of integration of NOR broodstock	6.1.2 6.1.3 6.2.2 6.2.4 4.3
		3. Over long term, further develop a conservation supplementation (reintroduction) program (CSP) or set of strategies to be implemented above Fall Creek, Lookout Pt., and Hills Creek dams. 3.1. improve other LFT's associated with passage and pre-spawn mortality, then commence reintroduction 3.2. adopt as template the new ODFW recommendations for reintroduction and modify as needed based on results of scientific review of program type	6.2.3
		4: After Recovery Plan is adopted, develop a new HGMP with conservation details.	6.1.1

235 - SUB -MF	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)	- Current WP BiOp does not formalize specific passage improvements for Hills Creek Dam, but indicates outplant sites may be established above dam, presumably from collections at new Dexter facility. In support of determining future passage needs in next term of BiOp, implement actions in current WP BiOp: 1. As other LFT's improve and NOR abundance increases above Lookout Pt., monitor adult fish movement below Hills Creek dam to determine if large numbers of Chinook congregate below Hills Creek. 1.1. if so, evaluate within COP studies the feasibility of a future adult fish facility below the dam, relative to the benefits of continued trap-and-haul from the new Dexter facility 1.2. in support of this effort, implement the juvenile downstream passage assessments described in WP-RPA's 4.10 and 4.11	4.10 4.11
		2. Use these data and results within language of WP-RPA 4.12 to support BRT SLAM modeling to reduce uncertainty regarding need to improve downstream survival at Hills Creek - needed to support decisions regarding need to construct and operate new downstream fish passage facility at Hills Creek Dam in next term of the WP BiOp	4.12

Table 9.2.6. High priority recovery actions for the Upper Willamette ESU/DPS from the Upper Willamette River Conservation and Recovery Plan for Chinook Salmon and Steelhead (ODFW and NMFS 2011). The table summarizes the recovery plan action, including potential subactions, listing factor and limiting factor addressed, strategy and VSP objective, and also references the associated Willamette Project Biological Opinion RPA (NMFS 2008).

Action ID and Priority	Recovery Action	Sub Action or Task	Associated BiOp RPA Measure
102 - FW-ALL	(In coordination with supporting actions for LFT 9a) 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.	1. Designate instream flow targets at the mouth of the tributaries (or other appropriate passage bottleneck) to ensure sufficient water is available for fish. 1.1. Planning Team subgroup to ID priority or problem reaches and future designation of target flows 1.2. ID process to get designation established 1.3. Encourage RME of flow needs for various life stages	2.3 9
		2. OWRD to pass rules to enforce and protect stored water released from USACE reservoirs for fish purposes, and ensure that water is not diverted by water users with natural water rights or by illegal water use. And 6. OWRD to complete conversion of Minimum Perennial Streamflows for stored water (in USACE/USBOR reservoirs) to instream water rights in NS, SSA, MK, and MF subbasins.	2.9
		5. Revise integrated flow management or water diversion plan to ensure sufficient water remains instream for fish during critical periods. Plan should define coordination among the management agencies and users (USACE, USBOR, OWRD, ODFW, irrigation districts, and local water users). 5.1. ensure future USBOR water service contracts do not reduce instream flow protections. 5.2. USBOR water service contracts should allow for interruption of service during low water years to protect instream flows 5.3. release additional flows from storage dams to meet USBOR water service contracts while still meeting instream flows 5.4. for non USBOR contracts, OWRD stop issuing new live flow rights	3 3.1 3.2 3.3 3.4

22 - ESU-ADM	Expand monitoring of populations to track status and trends of VSP metrics and improve understanding of the composition of natural spawners (what type/pHOS? how many? where from? timing?), other life history information, and habitat.	1. Coordinate with WP BiOp monitoring.	no specific RPA
13 – ESU-ADM	Adequately fund and implement RME needed to answer critical uncertainties related to the assumptions under which the recovery plan was developed.	TBD	n/a
23 – ESU-ADM	Determine funding sources and strategies to implement monitoring needed to track progress towards achieving recovery goals.	TBD	n/a
116 - MST-AMO	Protect and restore aquatic habitat function at confluence areas of Willamette River tributaries.	1. Prioritize some BPA funding of the WP BiOp habitat restoration projects (WATER HTT) to these areas. See WP-RPA's 7.1.2 and 7.1.3. 2: Identify other funding or coordination opportunities so that restoration at confluence sites is substantial enough to provide meaningful ecological benefits to anadromous fishes. (see action 37-ESU-PHQ)	7.1.1 7.1.2 7.1.3
120 - MST/SUB-AMO	Evaluate the potential for releasing habitat-forming flows from WP Project storage dams to complement habitat restoration activities in the mainstem Willamette River.	1. WP BiOp RPA 2.7; Work through WATER Flow Management Team to identify opportunities to provide environmental pulse flows that can create new and sustain existing fish habitat in the lower subbasins and the mainstem Willamette River 1.1. these types of flows may not be met in low flow years, so evaluate the likely occurrence and magnitude of these flows.	2.7
		2. Complete The Nature Conservancy's Sustainable Rivers study process. 2.1. implement and evaluate the study recommendations in Coast Fork and Middle Fork, and conduct similar Nature Conservancy studies in other subbasins where flows have been significantly modified	7.1.2
110 - MST-ALL	Look for opportunities to remove unnecessary revetments or increasing setbacks in the Mainstem Willamette and in subbasins. Minimize new ones in the future.	1. For sites that were funded or placed by the USACE, the WP BiOp Action Agencies conduct assessment to identify high priority revetment through WP BiOp RPA 7.4, and fund restoration at these sites. 2. Replace revetment segments with bioengineering and natural features such as vegetation, and large wood structures.	7.4

69 – EST-ALL	Manage flow during dry years to maintain and improve habitat conditions for ESA-listed species.	TBD	FCRPS RPA14
111 - MST-ALL	Release flows from WP dams and other storage dams to meet flow targets in mainstem Willamette River for rearing and migration.	1. Ensure sufficient spring flows to allow downstream migration of juveniles, including those in side channels. 2. Coordinate annual flow operations with ODFW and NMFS and other parties to optimize project operations for UWR ESU's, while meeting flood control and other mandatory project purposes.	n/a
113 – MST-AMO	Increase overall channel complexity, floodplain connectivity, and flood storage to the mainstem Willamette River to increase and improve salmonid rearing and migration habitat.	1. Work with regional federal and state entities to resolve larger issues related to future increased channel meandering and the factors that inhibit it now. 2. Use multiple analytical and planning sources to ID the type of projects and reaches where restoration success will be high. 3. Find opportunities within these priority reaches with willing landowners by offering economic incentives, conservation easements, leases, or acquisition. Provide technical assistance and analyses on risks and benefits to landowners.	n/a

Columbia River Basin Fish and Wildlife Manager's Draft Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations

FINAL

August 23, 2013

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1.0 Overview and Background

The "Columbia River Basin Fish and Wildlife Manager's Draft Reference for Developing 2014 Fish and Wildlife Program Amendment Recommendations" document is a collaborative effort among the Columbia Basin fish and wildlife managers to find common language for recommendations to the 2009 Fish and Wildlife Program (Program, Council Document 2009-09) amendment process. In June 2013, representatives from Oregon Department of Fish and Wildlife (ODFW) and Washington Department of Fish and Wildlife (WDFW) issued a broad invitation to the Basin's federal, state and tribal fish and wildlife managers to participate in a roundtable discussion of recommendations for the Fish and Wildlife Program. Co-managers developed this document to be used as a reference for each individual entity's recommendations. While the document was developed collaboratively, it is not a "consensus document." It serves as a source from which each entity may pull language as they see fit. The common language is intended to help us communicate effectively with the Northwest Power and Conservation Council (Council) so that they may better understand our common positions and shared views.

The participating agencies and tribes attempted to be consistent in the use of the terms "measures" and "recommendations" throughout the document. The term "measure" generally refers to actions or activities that should be funded by BPA; while the term "recommendation" was used to refer to edits to the language in the Fish and Wildlife Program or actions or activities that the Council should undertake.

The document was created through three roundtable meetings that were well attended. Listed here are the fish and wildlife management entities who participated, to some degree, in developing this document:

Burns-Paiute Tribe
Columbia River Inter-Tribal Fish Commission
Confederated Salish and Kootenai Tribes of the Flathead Reservation
Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of Grand Ronde
Confederated Tribes of the Colville Reservation
Confederated Tribes of the Umatilla Indian Reservation
Cowlitz Indian Tribe
Kootenai Tribe of Idaho
Montana Fish Wildlife and Parks
Nez Perce Tribe
NOAA Fisheries
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service
Upper Columbia United Tribes
Upper Snake River Tribes
Washington Department of Fish and Wildlife
Other interested partners

2.0 Program Performance Objectives

2.1 Restructure the Program to Better Support Implementation of Adaptive Management

Current Program: Page 3, Program Framework, and throughout

Recommendation: Restructure the Fish and Wildlife Program to contain or have provisions to explicitly develop or track the following essential adaptive management steps:

1) Update the current status and trends of the fish and wildlife resources the Program is intended to protect, mitigate, and enhance;
2) Adopt biological objectives and document the current gaps between Program objectives and status for the fish and wildlife resources identified in step 1;
3) Quantify the limiting factors and threats, in terms of their relationship to the biological objectives with associated assumptions, hypotheses and critical unknowns;
4) Adopt strategies and measures linked to limiting factors and threats with a quantification of expected outcomes toward the filling of the gaps identified in step 2;
5) Develop and maintain Research, Monitoring, and Evaluation Plans that will track the status and trends of focal species and their threats and limiting factors, collect the information necessary to test assumptions and hypotheses, address critical uncertainties, and evaluate the implementation of measures;
6) Share through reports, web tools, and other sources the accumulated monitoring and research data and information which will be used to carry out steps 7 and 8;
7) Develop an evaluation process that deliberately contemplates the information from steps 1–6 to verify or adjust assumptions and hypotheses, adjusts biological objectives, and adjusts strategies and measures; and,
8) Establish a process for adjusting the implementation of the Program to align with the changes identified in step 7.

Each of these eight steps is required to support a transparent, accountable, and effective planning, implementation and evaluation process. In this process, *measures* are the actions, or prescriptions for actions. They implement strategies to address the limiting factors that create the gaps in biological productivity of the focal populations.

Rationale: Adaptive management is built on the principle of learning by doing. Natural resource management is not an exact science. Therefore, the premise of this Program should be to state hypotheses then implement measures contained therein and monitor, report, and evaluate outcomes to provide a clear sequential structure to decisions required in the continuing evolution and implementation of the Program. Together, these steps will provide accountability for the Fish and Wildlife Program and are likely to increase the realized benefits for the region's overall investment in fish and wildlife restoration.

2.2 Biological Objectives in the Program

Current Program: Pages 11-14, Biological Objectives, and Page 63, Program Reporting

Recommendations:
The Council should follow through on the existing language in the 2009 Program, page 11, to initiate a science based process to inform policy choices on biological objectives as supported by the ISAB. Until that time:

- Maintain the existing language from the 2009 Program listed below with modifications shown in bold. These are important general targets for highest level Program evaluation and should be maintained.
    - *"Increase total adult salmon and steelhead runs, in a manner consistent with achieving recovery of ESA listed populations and prevents additional listings of listed species, above Bonneville Dam by 2025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest, 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.* ***Increase total adult runs for listed lower Columbia salmon and steelhead to achieve 75 percent of recovery goals (NOAA 2013) by 2025."***
    - *"Within 100 years achieve population characteristics that, while fluctuating due to natural variability, represent on average full mitigation for losses of anadromous fish caused by development and operation of hydroelectric facilities in the Columbia Basin."*
- Maintain the current basinwide biological objectives expressed in the 2009 Program with modifications shown here in bold (to represent a 10-year implementation plan for these recommendations):
    - "*Halt declining trends in Columbia River Basin salmon and steelhead populations* ***by 2024,*** ~~***especially those that originate above Bonneville Dam***~~*. Significantly improve the smolt-to-adult return rates (SARs) for Columbia River Basin salmon and steelhead, resulting in productivity well into the range of positive population replacement.* ***Restore healthy characteristics*** ~~***Continue restoration***~~ *of lamprey,* ***sturgeon, and eulachon*** *populations.*
    - *"Restore the widest possible set of healthy, naturally reproducing and sustaining populations of salmon and steelhead in each relevant ecological province* ***by 2024."***
- Continue to recognize productivity objectives for salmon and steelhead:
    - *"****As an interim goal****, ****contribute to*** *achieving smolt-to-adult survival rates (SARs) in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead."*
- The Program should also continue to recognize the mitigation responsibility for areas where anadromous fish have been extirpated (see Substitution for Anadromous Fish Losses):
    - Replace existing introductory paragraphs at the top of page 12 with the following: "***Part of the anadromous fish losses has occurred in the blocked areas. A corresponding part of the mitigation for these losses must occur in those areas. The Program has a "Resident Fish Substitution Policy" for areas where***

anadromous fish have been extirpated. Given the large anadromous fish losses in the blocked areas, these actions have not adequately mitigated these losses. The following objectives address anadromous fish losses and mitigation requirements in all blocked areas:

- ***~~Investigate reintroduction of~~ Take action to reintroduce*** *anadromous fish into blocked areas,* ***where feasible****.*
- *Restore and increase the abundance of native resident fish species* ***(subspecies, stocks and populations)*** *throughout their historic ranges when* ***~~original~~ appropriate*** *habitat conditions exist or can be feasibly restored or improved.*
- ***~~Develop~~ Administer*** *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* ***(includes intensive fisheries within closed or isolated systems)****."*

- Add biological objectives that address the reintroduction of extirpated populations in non-blocked areas above Bonneville Dam.
- Expand anadromous goals to the Subbasin and Province levels and add specific and measurable objectives for resident fish and wildlife to support high level indicators.
- The Council should report annually on progress towards achieving the Basin-Level Biological Objectives as presented in the Program. The reporting section of the Program (Section VII.E) should be expanded to include reporting high level indicators that represent the Program's basin-level biological objectives as reported in Section II.C of the current Program.
- Add explicit measurable biological objectives to support the more general Program goals consistent with ISAB recommendations (ISAB 2013-1). Also refer to Section 5 of this document, Species Focused Recommendations. These should integrate with the current Council high level indicators and would clarify how to report against current biological objectives:
  - Halt declining trends in salmon and steelhead populations
    - Graph trends in representative populations' abundance over time and determine whether populations are increasing, decreasing, or stable
  - Increase total runs that support tribal and non-tribal harvest
    - Report abundance of fish runs annually
    - Report tribal and non-tribal harvest in all fisheries annually
  - Achieve 5 million fish above Bonneville dam and 75 percent of recovery goals for LCR ESUs by 2025
    - Report annually total abundance by ESU for salmon and steelhead populations including harvest and other mortality
  - Achieve SARs of 2-6% with an average of 4% for Snake River and Upper Columbia River populations
    - Report annually appropriate dam to dam SARs for representative populations to determine if cumulative hydrosystem actions are achieving the targeted level of survival
  - Restore the widest set of salmon and steelhead populations in each province
    - Report population status by province including reintroduction goals

- Restore lamprey, sturgeon and eulachon
  - Create a monitoring framework and report status of lamprey, sturgeon, and eulachon across the Columbia River Basin on a regular basis
- Restore lamprey production, passage and habitat
  - Report passage counts at dams annually and map lamprey distribution every 5 years

Rationale: The current Program, on page 11, calls for a process to assess the value of these goals. This should be implemented as called for. The Program should restate the call to assess the value of quantitative biological objectives and to develop an updated and scientifically rigorous set of such quantitative objectives. Reviewing and refining the adult fish return and SAR goals is appropriate to assure that these are correctly scaled to evaluate the Program. Measureable objectives provide:

- Quantitative targets to support the Program vision, moving the program from the abstract to the concrete;
- A method to track program progress (a report card); and
- A measure of improvement needed in the program.

The above actions and metrics along with importance, feasibility, and cost components, help inform future funding priorities to achieve specific goals. This contributes to policy discussions to prioritize funding to achieve specific goals. It is currently possible to report progress against the basin-level biological objectives that are stated in the Program. Establishing a consistent, transparent, reliable report using metrics to demonstrate progress of Program implementation is required to support true adaptive management at the basin-wide scale. The data currently exists to report against the objectives; however, the data management capacity and practices are not in place to support efficient, cost effective reporting.

Reference:

National Marine Fisheries Service (NMFS). 2013. ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead. Prepared by the National Marine Fisheries Service, Northwest Region, June 2013.

2.3 Coordinated Assessments Monitoring and Reporting

Current Program: Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure 1: The Council should adopt and BPA should fund full implementation of the Coordinated Assessments project to **report** on the indicators of natural origin spawners (NOR), smolt to adult return (SAR), adult to adult recruitment (AAR), and juveniles per spawner (JpS) for Columbia River salmon and steelhead populations.

Measure 2: BPA should fund expansion of the Coordinated Assessments project to include indicators for resident fish and wildlife.

Rationale: Approximately 78 million dollars are spent annually on anadromous monitoring in the Columbia Basin. This information is used to determine a population status and trend,

effectiveness of habitat restoration, and for many other purposes. A variety of anadromous population data has been collected across various life stages and is reported by individual project sponsors in their annual reports. While this reporting is valuable at the project reporting scale, it is difficult to synthesize for reporting at the larger geographic scales such as the population, subbasin, province, major population, DPS/ESU, or Columbia Basin scales. In addition, there are many possible indicators that could be used for reporting. In 2010, fisheries agencies and tribes started the Coordinated Assessments (CA) project to standardize indicators for reporting across spatial scales and a data exchange standard to facilitate the associated data sharing. This was followed up with a pilot project that successfully demonstrated the proof of concept for this project. The CA project has now moved to the implementation phase, which includes modifying and developing new agency databases for storing raw and summarized data, analysis tools, and reporting databases. The agreed upon CA indicators track specific life stage survival and/or abundance of salmon and steelhead to provide the information needed for adaptive management process in the Columbia Basin and provide the necessary data for the FCRPS BiOP. These are the key indicators used for population status and trend analysis and for NOAA to determine population status under the ESA. The Program should continue to support this successful effort and expand the CA process to develop data sharing standards for resident fish and wildlife data.

2.4 Data Management

Current Program: Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure 1: BPA should fund adequate data management projects with the agencies and tribes to support regional reporting requirements for evaluation of Program activities that are additional to the agencies' and tribes' routine data management activities. There are data specifically collected, managed, and analyzed due to the existence and operation of the FCRPS and its impact on fish and wildlife.

Measure 2: BPA should fund adequate reporting at the Council level to provide annual, and periodic, reporting of Program actions and effectiveness which supports Program scale adaptive management.

Rationale: The Council, tribal, state and federal natural resource managers agree that an information feedback process is required to inform management decisions about the use of fish and wildlife resources. Often this feedback process is characterized as "Adaptive Management," but this activity has not been funded or implemented.

A clear set of measurable biological objectives at various scales within the Program (high level indicators) could provide a top-down monitoring framework with which to guide data management infrastructure. A plan and process for reporting against those objectives could serve as an adaptive management tool for evaluating success of strategies and actions within the Program at each level.

A critical part of an adaptive management process is the collection, storage and analysis, and presentation of information about natural resources in a way that is useful to decision makers. Yet this critical activity has received little recognition and even less support in the Fish and Wildlife Program. The following actions are needed to rectify this oversight:

- Restructure and simplify the Program to provide Goals, Measurable Objectives, Strategies and Measures at the Basinwide, Province and Subbasin scale. All measures should be linked back to specific measurable objectives. The goals and objectives should then guide the development of a data management framework to support specific annual, bi-annual, and five year reporting requirements;
- Use a Regional Coordination forum including BPA, Council, tribal, state, and federal resource managers, and data management leaders to develop and review regional restoration progress reports, discuss options to improve reporting, and provide policy guidance for data management efforts;
- Use the StreamNet and Pacific Northwest Aquatic Monitoring Partnership (PNAMP) forums for development of the technical issues and tools necessary for coordinated data management. Extend this forum over time to include wildlife and terrestrial habitat data and other key sources of fish and wildlife related data sources (especially the Corps and LSRCP, but others such as the USFS, BLM, BOR, NRCPs, etc.);
- Use the updated F&W Program as the starting point for developing a coordinated data management system based on explicit reporting requirements adopted by the Council.
- Expand the Coordinated Assessment Project effort (under StreamNet and PNAMP) to develop data standards and sharing processes for derived data to support ESA and Fish and Wildlife Program reporting needs;
- Incorporate concepts consistent with the Council staff Draft Guidance for Information Management, Evaluation and Reporting; and
- Incorporate concepts consistent with the Council staff Draft Guidance for a Balanced and Coordinated Approach for Conducting Monitoring and Research Activities.

2.5 Hatchery Effectiveness Monitoring

Current Program: Pages 18-19, Artificial Production Strategies, and Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure: The Council should adopt and BPA should fund hatchery effectiveness monitoring and reporting for Columbia Basin hatcheries.

Recommendation: Insert a new bullet under *Artificial Production Strategies* (page 19), or under *Reporting and Data Management* (page 25) as follows:
"Hatchery Effectiveness Monitoring: The minimum reporting indicators for successful hatcheries to meet the Council's Artificial Production Review are: 1) the number of juveniles released by life stage, and 2) the components of total adult hatchery production, which include the number of hatchery adults returning to the hatchery, spawning in rivers, and caught in fisheries. These indictors can be used to assess the conservation and/or harvest benefits common of all hatchery programs. In addition to compiling this information for reporting, we also recommend a reporting database for these hatchery indicators be developed and funded to allow tracking of hatchery performance."

Rationale: Currently, approximately 26 million dollars are spent annually on hatcheries in the Columbia Basin to mitigate for losses cause by the FCRPS and it is important for the Council to track the effectiveness of hatchery programs. Hatcheries and individual hatchery programs in the

Columbia River have been reviewed by NOAA through the Columbia Basin Hatchery Environmental Impact Statement and Hatchery Genetic Management Plans, the Hatchery Science Review Group, and Independent Science Review Panel. In addition, the Council has developed an Artificial Production Review (ARP) Process (NPCC 1999). The NPCC (2004) judged a hatchery program to be successful if it met the following conditions: 1) it must produce a healthy and viable hatchery population; 2) it must make a sustainable contribution of adult returns to conservation and/or harvest; 2) its potential effects on wild and native populations and the environment must be understood, and 4) it must collect, record, evaluate, and disseminate information pertaining to the first three conditions so that decision-makers may be informed about the benefits and risks of the program relative to other means of achieving similar conservation and harvest goals. While it is the responsibility of hatchery operators and funders to develop specific hatchery goals, the purpose of this amendment is to develop interim indicators that provide measures hatchery performance for the Council's role in hatchery oversight and to meet its reporting requirements. The minimum reporting indicators for successful hatcheries are 1) the number of juveniles released by life stage, and 2) the components of total adult hatchery production, which include the number of hatchery adults returning to the hatchery, spawning in rivers, and caught in fisheries as these can be used to assess the conservation and harvest benefits of all hatchery programs. In addition, to compiling this information in a report (see Roler 2012 for an example of total adult production report), we recommend a reporting database for these hatchery indicators be funded possibly through StreamNet.

References cited:

Northwest Power Planning Council. 1999. Artificial Production Review. Council document 99-15, Northwest Power Planning Council, Portland, OR.

Northwest Power Planning Council. 2004. Artificial Production Review: Final Basin Level Report. Council document 2004-17, Northwest Power Planning Council, Portland, OR.

Roler, R., and E. Olk. 2012. Annual Coded-Wire-Tag Program, Washington: missing production groups annual report for 2010. Washington Department of Fish and Wildlife. Prepared for Bonneville Power Administration. Project No. 1982-013-04, Contract No. 55548.

3.0 Wildlife

3.1 Wildlife Operational Impacts

Current Program: Page 22, Operational Losses

Recommendation: Clarify in the Program Glossary that "Losses" are one-time losses from construction and inundation of the hydrosystem and "Impacts" are the ongoing impacts from operation of the hydrosystem (currently described as Operational Losses); unless legal or procedural rules prevent this clarification.

Measure: BPA should fund the agencies and tribes to complete operational impact assessments using methods that provide a systematic approach to characterize active physical and biological processes in watersheds and describes spatial distributions, histories and linkages among important ecosystem components. A framework for assessing operational impacts shall be in place by 2015 with assessments initiated that same year.

Rationale: Hydropower operational impact assessments are needed to determine the extent and directions of ecological alterations and to institute a standard, rigorous, transferable, and regionally accepted assessment methodology to describe and quantify ecological losses attributable to the FCRPS. The 2009 Program stated that the Council, with F&W managers and BPA, will assess the value of committing program resources on direct operational impacts on wildlife habitat. The Council should use its Wildlife Advisory Committee to convene the wildlife managers and BPA to develop protocols for assessing operational impacts. The WAC should develop/review accepted methods to assess impacts from operations (i.e., functional impairments from lost peak flows, erosion, trophic impacts, changes in species composition, and other impacts identified by Forum). Possible sources for information include recent ISRP reviews and the pilot project nearing completion in the Kootenai Subbasin. The goal of the forum should be to have regionally accepted protocols by 2015 and completed operational loss assessments by the completion of this 5-year Program.

The ecological impacts to wildlife populations due to the loss of fish and the losses caused by the operations of the hydro system have not been assessed. The fish and wildlife resources of the Columbia Basin have been deprived of marine-derived nutrients associated with the return of adult anadromous fish. The implications of this impact, while not yet clearly defined or quantified in terms of wildlife, must be mitigated and the 2009 Program increases this emphasis. Given the vision of this program, the strong scientific case for a more comprehensive, ecosystem-based approach, and the shift to implementation of this program through provincial and subbasin plans; wildlife mitigation projects should complement fish mitigation projects to the extent practical. Lands protected as part of fish mitigation may be credited to offset wildlife operational losses if the lands protect priority focal wildlife habitats.

Ecosystem management should maintain or recover the biological integrity of the system. Determining the extent to which ecological systems are experiencing anthropogenic disturbance and change in structure and function is critical for long-term conservation or restoration of biotic diversity in the face of changing and compromised landscapes and land use. To determine

parameters needed to address ecological integrity, the Council, wildlife managers, and BPA will adopt a framework that can: (1) identify and isolate operational impacts from other basin changes, (2) assess operations-based influences on downstream physical processes, (3) link physical, biological, and ecological processes (4) account for natural floodplain dynamics, and (5) be used in a predictive capacity.

BPA should fund assessments of ecological impacts to wildlife from the reduction or loss of anadromous fish as part of the operational loss assessment. The assessments need to evaluate an array of core ecological parameters (e.g., biological/biotic and physical/abiotic) with the understanding that habitats, communities, and processes are ecologically linked. The results of these assessments will be the basis for quantification of operational impacts and subsequent mitigation obligation. Existing and future habitat actions implemented to benefit anadromous fish may be suitable mitigation for some of these impacts.

3.2 Adequately Fund Wildlife Projects

Current Program: Pages 20-22, Wildlife Strategies

Measure: BPA shall fund existing projects at levels adequate to implement wildlife area management plans.

Rationale: Funding needs to continue to maintain the base level of habitat and credits accomplished to date. BPA will fund existing wildlife projects at levels determined to be consistent with the project management plans. Funding must be sufficient for habitat maintenance and enhancement, and appropriate monitoring as agreed upon in the management plans. Where management plans are not in place, BPA will provide interim funding to manage the wildlife projects and complete the management plans.

3.3 Adequately Fund Wildlife M&E

Current Program: Pages 20-22, Wildlife Strategies, and Pages 24-26, Monitoring, Evaluation, Research, and Reporting Strategies

Measure: BPA shall fund adequate monitoring, data management, and reporting to answer the following questions in an annual report to Council and the region -

- How many habitat units have been mitigated for FCRPS construction and inundation caused losses of wildlife?
- How many of those habitat units are secured through long term funding?
- How are wildlife species and habitats responding to FCRPS mitigation actions?
- What is the FCRPS mitigation responsibility for wildlife operational impacts?

Recommendation: The Council, through their Wildlife Advisory Committee, should identify and support specific reporting requirements for wildlife and wildlife projects for the Program.

Rationale: It is appropriate for BPA to fund research, monitoring and evaluation of wildlife mitigation projects adequately to assure tracking of crediting, to evaluate trends in ecological functions of managed ecosystems, and provide managers the ability to assess the effectiveness of

their mitigation strategies by evaluating species and habitat responses that contributes to broader monitoring efforts. BPA should continue funding HEP surveys on acquired land in support of the Wildlife Advisory Committee to track mitigation implementation progress.

Recommendation: A programmatic evaluation of the Wildlife Section of the Program should occur preceding Program amendments, to determine whether wildlife measures are moving the Program towards its biological objectives for performance.

Rationale: Reporting high level indicators for wildlife, at the scale of the Columbia River Basin, is a daunting challenge. The impact of the BPA funded wildlife mitigation projects, while significant, may not be detectable within the environmental noise of such a large landscape. Individual wildlife populations are generally highly migratory, and trends in population size is not an appropriate indicator of Program success as species ranges are far greater than the individual project areas, and in many cases far greater the Columbia River Basin. Habitat quantity and quality is the currency for implementation of the BPA funded wildlife mitigation program and should be taken into account when developing HLIs for areas within the Program influence.

In 2010, the Council chartered the Wildlife Crediting Forum to provide advice on the quantifying and accounting system (informally known as the Ledger) for the wildlife habitat mitigation credits associated with the construction and inundation impacts of the Federal Columbia River Power System (FCRPS) within the Columbia River Basin. The database that currently houses the Ledger is called Pisces (BPA project accounting and management program/software). The Forum consisted of wildlife co-managers representing the 14 tribes and 3 state fish and game departments (Oregon, Washington, Idaho) impacted by the FCRPS; and representatives of the U.S. Fish and Wildlife Service (USFWS), BPA, and BPA Customers. The State of Montana was not a Forum participant, as wildlife mitigation issues relating to FCRPS losses from construction and inundation have been settled by prior agreement between BPA and that state.

Following the Wildlife Crediting Forum, the co-managers developed a working draft for a reporting framework called the Wildlife Monitoring Implementation Strategy based on three categories of HLIs as determined by the Council. Further work is required to fully develop a reporting mechanism for the Council's needs. The Council identified the following three categories of HLIs:

1) Habitat and Vegetation Types – several metrics would be reported for each cover type that represents status and trend in quality and quantity of the cover type, which can infer benefits to focal species or guilds. While this data is collected by individual wildlife projects within the Program, compilation and reporting will be required at a scale larger than any individual project. Reporting this information would require a designated project to perform the summary, analysis and reporting necessary to provide useful and timely indicators for Council reports.

2) Focal Species – several national/state level data sets could be used to represent relative status of wildlife species in this area. This level of data would be retrieved from national or state databases, and not from the individual projects; however, most of the data is

initiated at the project level. Reporting this information would require a designated project to perform the summary, analysis and reporting necessary to provide useful and timely indicators for Council reports.

3) Habitat Units – the BPA HU ledger would continue to be reported as a measure of mitigation actions implemented specific to the Fish and Wildlife Program. The recent completion of the Wildlife Crediting Forum has provided a clean slate for reporting HUs at the project scale, a project may be needed to provide the high level summary of this information similar to the CBFWA Status of the Resource Report and website.

In developing the Wildlife Monitoring Implementation Strategy (WMIS), wildlife managers considered the following concepts:

- Scale integration: data collected can be used at multiple scales of interest for decisions
- Integration across separate monitoring programs: information gathered serves multiple functions and thus reduces costs
- Integration of policy and technical domains: precision of data fits time frames and acceptable risks for decisions
- Species integration: collection of data for multiple species in an efficient manner
- Adequate sample size: sample sizes are statistically adequate to discern differences among populations, across spatial distributions, and across temporal scales relative to varying human-induced and natural environmental stressors

Based on this effort, the wildlife managers are prepared to engage with the Council and BPA to develop biological and environmental performance objectives for the wildlife portion of the Program and establish an annual and five-year reporting process for evaluating implementation success.

4.0 Resident Fish

4.1 Address the Threat of Climate Change to Resident Fish

Current Program: Page 22-23, Resident Fish Mitigation

Measure: BPA should fund perpetual land protection which includes conservation easements, land purchases, or other long term measures to combat climate change impacts on resident fish.

Rationale and proposed Program language to be added to Section 7 of Basinwide Strategies on Page 22: *"Climate change threatens the existence of native resident fish in the Columbia basin. The ISAB directs the Council to consider requiring project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty. Perpetual land protection efforts are one of the most effective ways to combat climate change. By protecting and restoring key habitat features such as riparian shading, channel morphology and improved base flows, population resiliency increases. Targeting those parcels with the combination of connectivity and intact healthy riparian and stream habitat will give those systems more resiliency as climate change and variability take effect."*

4.2 Address Management of Non-natives as Resident Fish Mitigation

Current Program: Page 22-23, Resident Fish Mitigation

Measure: BPA should fund efforts to address all primary limiting factors affecting resident fish including non-native species eradication and suppression and coordinate these efforts with companion efforts that protect anadromous fish from non-native species.

Rationale and proposed Program language to be added to Section 2 and/or Section 7 under Basinwide Strategies: "*The threat of non-native species increasingly complicates the protection, restoration, and enhancement of resident fish species throughout the basin. Competition, predation and hybridization by non-natives often reduces the effectiveness of habitat protection and restoration efforts for native fish populations. Funding should be directed to treat the problem, not the symptoms, including research to better understand food-web interactions. Where non-native species have been identified as a primary limiting factor in subbasin plans, increased effort and funding should be directed to eradicate or suppress non-native species in conjunction with the proven methods that benefit their habitats."*

4.3 Define Resident Fish Substitution for Anadromous Fish Losses

Current Program: Page 23-24, Resident Fish Substitution Strategies

Recommendation: The Council should work with the fish and wildlife managers to provide a clearer definition of Program goals, objectives and methodology for addressing anadromous fish losses through resident fish substitution actions, in order to evaluate adequate implementation and effectiveness of this portion of the Program.

Measure: BPA should provide adequate funding for projects such that the following objectives are achieved:

- Restore native fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored.
- Take action to reintroduce anadromous fish into blocked areas, where feasible (this objective should receive the highest priority).
- Administer 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 (included intensive fisheries within closed or isolated systems).

Rationale: A wide cross section of resident fish substitution projects, particularly in the basins where passage of anadromous adults and juveniles is currently blocked by Federal Columbia River Power System (FCRPS) projects, have been implemented over time without a standard definition of program goals or a methodology for converting anadromous fish losses to resident fish substitution goals where in-kind mitigation projects are not currently possible to implement. Giving clearer Council guidance for these types of efforts seems timely, as these mitigation requirements of BPA have not yet been uniformly and systematically addressed.

The current Program (Sections II. D 7&8) describes both resident fish mitigation and substitution programs. Four principles were outlined for guiding decisions on mitigation strategies to address anadromous fish losses in blocked areas, including the concept of resident fish substitution programs (page 24). These principles range across a wide spectrum of options, from investigating the feasibility of anadromous fish passage, enhancing native resident fish, and where not possible to mitigate with enhancement of native resident fish (e.g., through consumptive and non-consumptive programs including hatchery programs) to finally considering focusing on non-native resident fish populations – guided by an environmental risk assessment template developed with assistance of the Independent Scientific Advisory Board (ISAB) and the current subbasin and basinwide objectives.

While these various types of mitigation programs have merit and may be suitable for a wide variety of geographic areas and environmental conditions, without a common currency for evaluating the extent of a program and establishing program goals and objectives that adequately address the value of anadromous fish that were lost due to the effects of construction and operation of the FCRPS that created the passage blockages initially, full and equitable mitigation for these losses will remain difficult to define.

4.4 Resident Fish Loss Assessments

Current Program: Page 22-23, Resident Fish Mitigation and Crediting

Measure: BPA should fund the Agencies and Tribes to develop a methodology and complete resident fish loss assessments. The selection of a method should be at the discretion of the entities involved in performing the survey; however, to standardize the process and ensure a consistent level of accuracy across the basin the Council should form a workgroup of resident

fish managers to address this issue. A framework for assessing resident fish losses shall be in place by 2015 with assessments initiated that same year.

Rationale: The Northwest Power and Conservation Council's (Council) amended Fish and Wildlife Program (Program) provides for resident fish mitigation "where construction and inundation losses have been assessed and quantified by the appropriate agencies and tribes, mitigation should occur through the acquisition of appropriate interests in real property at a minimum ratio of 1:1 mitigation to lost distance or area." Despite the mitigation provisions, the Program does not prescribe specific methodology for the calculation of lost resident fish habitat due to construction and inundation. Because of this omission, resident fish managers (i.e., Columbia Basin Fish and Wildlife Authority's (CBFWA) members and non-members) in the Columbia River Basin, working through the CBFWA Resident Fish Advisory Committee (RFAC), developed a methodology to allow for the consistent quantification of inundated resident fish habitat (CBFWA Members Action Notes, October 7, 2009).

The CBFWA sent a letter on October 8, 2009 to the Council suggesting a recommended methodology to calculate the amount of resident fish habitat that has been inundated by the construction of the Federal Columbia River Power System. The inundation methodology could serve as the foundation for future identification of operational losses.

The Council should develop and adopt a standard methodology through a public process that includes independent science review and the participation of the resident fish managers throughout the Columbia River Basin.

5.0 Species Focused Recommendations

5.1 Species recovered in the context of the ecosystem

The ISAB provides six new principles that are intended to replace the original eight principles on page 9-10 of the current Program, while retaining most of the original content. They are structured to express the theme that sustainability can be enhanced in two ways: first, by building resilience to reduce the probability that an ecosystem will cross a "tipping point" and shift into a new regime; and second, by building adaptability to improve outcomes when such regime shifts do occur. The latter concern is especially relevant in the Columbia River Basin in the face of climate change, human population growth, proliferation of chemicals, hydrosystem development, and the emergence of hybrid food webs due to the spread of non-native and artificially propagated species. (ISAB 2013-1)

The development and operation of the hydropower system has such an impact on the Columbia River ecosystem, that its affects cannot be separated or isolated from the other landscape scale impacts to the system. Addressing one part of the system impacts successive elements and therefore, mitigation actions need to be considered in this larger context. The Council's Program needs to take a larger vision of the entire system in order to prioritize strategies, rather than treating the symptoms or individual elements. The recommendations in Section 2 of this document, explicitly identifying limiting factors and strategies to address them, would help in aligning the individual actions and assessing the effectiveness of specific strategies in a holistic context.

5.2 Integration with Endangered Species Act

Current Program: Pages 3-4, The Program Framework, and throughout

The purpose of the Endangered Species Act is to conserve the ecosystems upon which endangered species and threatened species depend and to provide a program for the conservation of such species. Furthermore, the ESA states that it is a policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species. The ESA's purpose and policies are complementary to the Council's mandate to develop a program to protect, mitigate and enhance fish and wildlife, included related spawning grounds and habitat, on the Columbia River and its tributaries.

In anticipation of ESA recovery plans, co-managers, including NOAA Fisheries, worked with the Council and subbasin planners to ensure that subbasin plans provided a good foundation for ESA recovery. Thus, as ESA recovery plans emerged, they were built on the foundation of the subbasin plans. The recovery plans were developed by local stakeholder groups including the fishery agencies and tribes, states, local governments and other federal agencies. The final plans include ESA goals as well as broad sense goals, priority limiting factors, priority actions and costs. These recovery plans provide important context and guidance for the Council's Fish and Wildlife Program and they should be explicitly incorporated into the Program. Following are specific recommendations.

Recommendation 1: Maintain the current language under Program Framework, page 4, expressed in the 2009 Program with modifications shown here in bold:
"*…That is, the Council's Program is designed to link to and accommodate the needs of other programs in the basin that affect fish and wildlife. This includes meeting the needs of the ESA by* ~~***describing the kinds of ecological change needed to improve the survival and productivity of the diverse fish and wildlife populations in the basin.***~~ ***implementing the Program to be consistent with ESA regulatory findings in biological opinions and rulemakings; incorporating ESA recovery criteria into Program biological objectives; and incorporating ESA recovery plans, including implementation plans, into Basin-wide and subbasin management plans and multi-year action plans.***"

Recommendation 2: Update the current language under Implementation and Performance, page 5, expressed in the 2009 Program with modifications shown here in bold:
"The Council comprehensively revised the Program in 2000 with the addition of the current program framework, added specific measures and objectives for the mainstem in 2003, and then developed and adopted the subbasin management plans into the Program in 2004-05. Together, these elements provide a coordinated and integrated plan for fish and wildlife actions across the basin. The federal, state, and tribal governments have been working since then with local partners to expand the subbasin plans into ESA recovery plans for areas of the basin that include ESA-listed populations. ~~***The Council is planning a subsequent amendment process in 2009-2010 to update the subbasin management plans and Program objectives to reflect these and other recent planning developments.***~~ ***Many ESA recovery plans for salmon and steelhead are now complete. Those recovery plans used the 2004-05 subbasin plans and this cycle should continue, so the subbasin plans should now incorporate the final ESA recovery plans."***

Recommendation 3: The ISAB points out a concern that the subbasin planning process was a great idea that has been diminished by the lack of support or continued engagement of the original stakeholders in recent years. The ISAB also recommends that the Council reconsider a planning process that utilizes other existing structures and uses salmon and steelhead recovery domains as an example. The Council should implement the ISAB's recommendations for landscape and subbasin planning, including the need to actively encourage and support a mid-scale (perhaps Province-level which is close to the recovery domains) planning process that supports and utilizes and existing partnerships and organizations.

Recommendation 4: In addition to, and support of, the recommendations provided under Section 2.2 of this document for Biological Objectives, also:

- Adopt the ISAB's recommendation to make the Basin-wide objective of 5 million salmon and steelhead by 2025 more specific with respect to wild and hatchery fish.
- Adopt the ISAB's recommendation to develop productivity objectives that reflect differences among species and populations. Incorporate ESA recovery productivity objectives.
- Adopt the ISAB's recommendation to establish quantitative biodiversity objectives for focal species and habitats. Incorporate ESA biodiversity objectives.
- Add language that states: *"**The Council's Program incorporates the quantitative recovery criteria from ESA recovery plans. It also incorporates the more qualitative broad sense goals in some recovery plans that go beyond ESA delisting."***

Rationale: These recommendations encourage the Council to incorporate ESA goals and objectives for recovery and delisting of threatened and endangered species into the Fish and Wildlife Program. In most cases, ESA delisting is not an ultimate goal and Fish and Wildlife Program goals should exceed and be broader than achieving ESA delisting. However, for listed species, ESA delisting should be an intermediate step towards the Fish and Wildlife Program goals. At any rate, the Council should clarify that a) ESA recovery and delisting is consistent with Fish and Wildlife program goals and b) actions to achieve Fish and Wildlife Program goals should not impede ESA delisting.

Recommendation 5: Maintain the current language under Objectives for Environmental Characteristics, page 13, expressed in the 2009 Program with modifications shown here in bold:
"~~***Allow for biological diversity among and within populations and species***~~ ***Promote the increase of biological diversity among and within populations*** *to increase ecological resilience to environmental variability."*

Recommendation 6: Maintain the current language under Basinwide Strategies, page 14, expressed in the 2009 Program with modifications shown here in bold:
"As discussed in the Program's Implementation Provisions (Section VIII), the Council will work with Bonneville, fish and wildlife managers, and others to develop multi-year action plans for all areas of the Program. ***The multi-year action plans will incorporate priority actions for recovering listed species as described in recovery plans and ESA recovery implementation plans.*** *The Council will work with Bonneville to ensure reasonable implementation of all multi-year action plans*."

Recommendation 7: Under Habitat Strategies, pages 14-15, add a strategy to ***"Establish and implement a consistent process for prioritizing habitat actions."***

Recommendation 8: Maintain the current language under Habitat Protection and Improvement Activities to Address Biological Objectives, page 16, expressed in the 2009 Program with modifications shown here in bold:
"*Habitat work is intended to be consistent with the Program's biological objectives and also with measures contained in subbasin plans* ***and ESA recovery plans****."*

Recommendation 9: Recovery plans are also a source for actions that address climate change and toxics. Maintain the current language under Emerging Habitat Issues, page 16, expressed in the 2009 Program with modifications shown here in bold:
"…Specific measures to deal with these emerging issues are included in the mainstem plan, ***recovery plans,*** *and in many of the subbasin plans."*

Recommendation 10: Address the reintroduction of extirpated populations in non-blocked areas above Bonneville Dam. Under Artificial Production Strategies, page 18, maintain the current language with the following modifications shown here in bold:
"*3) to replace lost salmon and steelhead in blocked* ***and unblocked*** *areas.*"

Recommendation 11: In addition to subbasin plans, recovery plans also contain hatchery actions to rebuild natural runs. Under Artificial Production Strategies, page 19, at the end of the second sentence under "*d. Restoration*" insert "***and recovery plans***."

Recommendation 12: Under Updating Existing Subbasin Management Plans, page 58, insert "***A number of recovery plans have been completed. The subbasin management plans will be updated by 2014 to explicitly incorporate final recovery plans. For additional recovery plans completed after 2014, the Council will accept recommendations to incorporate those plans in the appropriate subbasin plans."***

Recommendation 13: Under Implementation Provisions, page 59, it is important to adhere to the statement that, "*The Council will use the procedures in this section to integrate Bonneville funding for this Program with Endangered Species Act requirements, including the Endangered Species Act mandate for Federal agencies to carry out programs for the conservation of endangered and threatened species."*

Recommendation 14: Under Appendix E: Subbasin and Basinwide Measures, add to Columbia Gorge Province the Mid-Columbia Steelhead Recovery plan and the Lower Columbia Salmon and Steelhead Recovery Plan.

5.3 Lamprey

Current Program: various sections

Recommendation 1: Edit third bullet under *Habitat* on Page 7 to read: "*Ocean conditions should be considered in evaluating freshwater habitat management and to understand all stages of the salmon, steelhead* ***and Pacific lamprey*** *life cycles.*"

Recommendation 2: Insert new second paragraph under *Anadromous Fish Losses* on Page 11 as follows: "***No comparable analysis exists for Pacific lamprey; however, it is apparent that losses have been substantial. The Council recognizes and supports efforts to restore Pacific lamprey numbers, including adoption of the Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin and the USFWS Pacific Lamprey Conservation Agreement into the Fish and Wildlife Program. Restoration of Pacific lamprey numbers and directed mitigation for hydrosystem lamprey losses should incorporate actions recommended in these plans."***

Recommendation 3: Insert new bullet under *Anadromous Fish Losses* on Page 11as follows: ***"Continue restoration of Pacific lamprey by (1) restoring lamprey passage and habitat in the mainstem and in tributaries that historically supported spawning lamprey populations, (2) continuing efforts to translocate adult Pacific lamprey to appropriate areas to reduce upstream passage losses, and (3) evaluating artificial propagation as a way to mitigate for lost lamprey production when passage and habitat improvements alone are insufficient. Attain self-sustaining and harvestable populations of lamprey throughout their historic range."***

Recommendation 4: Revise second bullet under *Objectives for Environmental Characteristics* on Page 13 to read: "*Protect, enhance, restore, and connect freshwater habitat in the Columbia*

River mainstem and tributaries for the life history stages of naturally spawning anadromous and resident salmonids ***and Pacific lamprey****."*

Recommendation 5: Revise fourth paragraph under *Habitat Strategies* on Page 14 to read: "*For example, passage through the hydrosystem causes loss to salmon, steelhead, lamprey and resident fish. Measures at the dams can and should be taken to reduce this loss. As an offset for hydrosystem-caused losses, the Program* ***~~may also~~ calls*** *for improvements in spawning and rearing habitats in tributaries, the lower river, and estuary. By restoring these habitats, which were not damaged by the hydrosystem, the Program helps to compensate for the existence of the hydrosystem.****"***

Recommendation 6: Insert new section ***g. Pacific Lamprey Production*** on Page 19:
"The Council recognizes progress in the development of a Framework for Pacific Lamprey Supplementation Research in the Columbia River Basin. Translocation efforts have been successful at increasing adult spawning activity, larval recruitment, and larval distribution and have provided important Pacific lamprey life history information. Current and future translocation actions should be guided by the lessons learned from ongoing efforts.

It is not likely that fragmented, isolated or non-existent lamprey groups within the Columbia River Basin will naturally recolonize the upper portions of their range given the paucity of adult returns and numerous threats, including the existing mainstem environment. Therefore, the long-term restoration of Columbia River Basin lamprey may require the structured release of artificially propagated lamprey in priority areas to achieve a variety of management and conservation objectives.

- ***Continue development and implementation of lamprey translocation in accordance with tribal guidelines as a component of a regional recovery plan***
- ***Evaluate the role of lamprey artificial propagation as a research tool and for supplementation of local groups"***

Recommendation 7: Add sentence to opening paragraph for *Primary Strategy* on Page 31 as follows: *"Identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland actions.* ***This should include evaluating the effects of ocean harvest on Pacific lamprey food resources.***"

Recommendation 8: Revise *Manage for Variability* on Page 31 to include Pacific Lamprey in the text.

Recommendation 9: Revise third bullet under *Estuary Strategies* on Page 32 to include Pacific Lamprey.

Recommendation 10: Revise first paragraph under *Vision of the Mainstem Plan* on page 35 as follows: "…*especially spawning, rearing, resting, migration,* ***and over-wintering habitats*** *for salmon, steelhead, lamprey, sturgeon, and resident fish populations."*

Recommendation 11: Revise second bullet under *2. Specific Objectives…* on Page 36 to read: "*Protect, enhance, restore and connect freshwater habitat in the mainstem for the life history*

stages of naturally spawning anadromous and resident salmonids ***and lamprey****. Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains, and uplands in the mainstem."*

Recommendation 12: Revise third bullet under "*Migration and passage conditions for anadromous fish*" on Page 38 as follows: "*The Council will consult with ...to determine the possibility of adopting hydrosystem survival performance standards for non-listed populations of anadromous fish including lamprey.* ***Efforts should be implemented to adopt an interim passage standard for adult Pacific lamprey of 80% per mainstem dam to be accomplished within 10 years and to improve passage further in subsequent years."***

Recommendation 13: Revise final bullet under *Water Quality* on Page 44 as follows: "*Implementing actions to reduce toxic contaminants in the water to meet state, tribal and federal water quality standards. The federal action agencies should partner with and support federal, tribal, state, and regional agencies' efforts to monitor toxic contaminants in the mainstem Columbia and Snake rivers and evaluate whether these toxic contaminants adversely affect anadromous or resident fish important to this Program. If so, implement actions to reduce these toxic contaminants or their effects if doing so will provide survival benefits for fish in mitigation of adverse effects caused by the hydropower system. In particular, investigate whether exposure to toxics in the mainstem, combined with the stress associated with dam passage, leave juvenile salmon* ***and adult and juvenile lamprey*** *more susceptible to disease and result in increased mortality or reduced productivity."*

Recommendation 14: Revise introductory text under *Lamprey and Sturgeon Passage*, *a. Lamprey*, on Page 47 to read: "***In recent years awareness of the effects of the hydrosystem on lamprey has increased, and the need for substantial additional effort addressing lamprey has become an emerging issue.*** *In the Columbia River Basin…. (retain entire existing paragraph).*

Artificial propagation needs to be evaluated as a tool for restoring lamprey and mitigating for losses. Development of life-cycle and bioenergetics models will help identify critical limiting factors and prioritize recovery actions. Budgets and staffing must be adequate to monitor the effects of actions taken to address lamprey issues."

Recommendation 15: Revise/add bullets under *Lamprey* on Page 47 as follows: "*Bonneville and the Corps, in coordination with federal, state, and tribal fish managers and the Council, should* ***~~implement the following measures to improve adult and juvenile Pacific lamprey passage survival and reduce delays in migration~~ identify, develop, implement, and monitor measures to help restore Pacific lamprey including****:*

- ***~~Identify~~*** *Specific fish passage structures* ***for adult and juvenile lamprey***
- ***Regional approaches to evaluate passage, abundance, distribution, and population structure, including the mainstem Columbia, Snake and Willamette rivers***
- ***Develop tags suitable for adult and juvenile lamprey and a regional lamprey tagging forum***
- ***Develop a regional strategy for monitoring passage into tributaries to better understand differences in counts of adult lamprey between dams***
- ***Increase knowledge regarding the use of the mainstem as spawning habitat***

- *Identify operations at mainstem hydropower dams* ***such as ramping rates and water elevation changes*** *that delay, obstruct, or kill migrating* ***adult and juvenile*** *lamprey*
- ***Monitor and address effects of hydrosystem operations on juvenile lamprey residing in reservoirs***
- *Develop and implement* ~~***lamprey***~~ *passage aids* ***for adult and juvenile lamprey*** *at known passage obstacles*
- *Monitor lamprey passage at mainstem hydropower dams to evaluate passage improvement actions and to identify additional passage problem areas,*
- *Assess lamprey passage efficiency, direct mortality, and/or other metrics relating to migratory success of lamprey*~~***, and***~~
- *Determine predation on* ***adult and juvenile*** *lamprey during* ~~***mainstem passage***~~ ***migration***
- ***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. Develop adaptation strategies to address these affects, and***
- ***Support the USFWS Pacific Lamprey Conservation Agreement through collaborative development and management of data."***

Recommendation 16: Revise text under *Reintroduction of Anadromous Fish in Blocked Areas* on Page 56 as follows: "*....evaluate the feasibility of salmon, steelhead,* ***and Pacific lamprey*** *reintroduction, consistent with the objectives in the appropriate subbasin plans."*

Recommendation 17: Revise first paragraph under *Updating Existing Subbasin Management Plans* on Page 58 as follows: "*The Council recognizes that work has continued in some subbasins to refine and update management plans. The Council also recognizes that work has continued outside the Program, such as recovery planning, and the* ***Tribal Pacific Lamprey Restoration Plan****, that will influence implementation of the Council's Program at the subbasin level. The Council recognizes the objectives and recommended actions of the Tribal Pacific Lamprey Restoration Plan as updates to subbasin plans."*

5.4 White Sturgeon

Current Program: Page 12, 39, 41, 43, 47-49, 53, and 55

Measure: BPA should adequately fund sturgeon recovery and the recommendations from the Draft 2013 Framework.

Recommendation 1: The Program should consolidate measures intended to address sturgeon restoration into set of strategies in the Mainstem Plan. Incorporate recommendations of Oregon's White Sturgeon Conservation Plan and the White Sturgeon Framework Plan into the Program. The Framework should be identified as a Program appendix on White Sturgeon.

Rationale: White sturgeon are widely recognized as iconic mainstem fish species severely affected by construction and operation of the hydrosystem (ISAB 2013, Draft framework 2013, ISAB programmatic review, Kootenai and select Zone 6 sturgeon reports 1995 and 2012). About "4% ($9.5 million) of annual direct Fish and Wildlife Program expenditures of $246 million in 2012 were dedicated to white sturgeon. Kootenai sturgeon projects account for the

majority of sturgeon-related expenditures ($6.5 million). The remainder is distributed among one general and six accord projects" (Draft Framework 2013). The Council's Fish and Wildlife Program accounts for just a portion of total expenditures within the basin to restore white sturgeon populations. Four non-FCRPS hydropower entities, Idaho Power Company, Grant PUD, Chelan PUD, and Douglas PUD, fund substantial white sturgeon restoration programs within the reaches impacted by their hydropower projects.

"Of all fish species in the Basin, the status of white sturgeon is most strongly tied to conditions in the mainstem, which are directly affected by the hydrosystem. The white sturgeon has declined greatly in abundance throughout most of the Columbia Basin. Only the population segment below Bonneville Dam still shows substantial natural recruitment, despite the fact that it is affected by hydrosystem operations at all dams upstream. It is anticipated that diminished natural recruitment will be a major factor influencing sturgeon status and the sustainability of harvest fisheries. Natural recruitment of sturgeon is potentially affected by hydrosystem operations directly, through blocked passage or inundation of preferred spawning areas, and indirectly, through the effects of water flow and sediment release on spawning success. In addition, recently documented predation on adult sturgeon by Steller sea lions just below the Bonneville Dam may threaten that population (ISAB 2013)"

In response to a Council request, sturgeon project sponsors recently completed a basin-wide framework plan for white sturgeon that synthesizes existing information and recommends actions to address limiting factors and information gaps. Strategic recommendations should be incorporated in to the mainstem plan as a sturgeon chapter. After ISRP review, the framework should be adopted into the Program.

Recommended Draft Language: Insert the following text into the *Mainstem Plan as Strategies for White Sturgeon:*

"The Program supports a vision of abundant and diverse white sturgeon populations and optimum sustainable fisheries throughout the historical range, achieved by a combination of natural production and careful supplementation, and supported through an adaptive, collaborative, coordinated, science-based mitigation, management, monitoring, and evaluation program to be achieved over the coming 50 years. Seven basic elements are incorporated into this vision: sustainability; natural production; biological characteristics; an inclusive program scope; effective monitoring, research, and evaluation; and rebuilding/mitigation.

To date, the Council has supported sturgeon program efforts that have effectively documented biology, status and limiting factors throughout the region. White sturgeon distribution, abundance, and productivity throughout the Columbia and Snake river basins 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. The Council endorses additional work that contributes to conservation, recovery or mitigation goals identified in the Columbia Basin White Sturgeon Planning Framework (NPCC 2013).

Strategies to achieve the sturgeon vision include:

- *Operate the FCRPS to provide operations consistent with normative river conditions, including increased spring and summer flows and spill. Recruitment in many impounded areas has been positively correlated with high annual discharge April—July. Sturgeon are expected to benefit from court-ordered dam operational measures being implemented for salmon and steelhead.*
- *Continue to utilize and adaptively manage conservation hatchery programs as interim measures to avoid extinction of unique sturgeon populations.*
- *Hatchery production of sturgeon can be an appropriate mitigation strategy to supplement populations where natural recruitment is currently limited. This strategy should: (1) Be conservative and responsible in establishing protocols for source populations and numbers of hatchery fish released; (2) Build on knowledge gained from ongoing hatchery efforts in other areas; (3) Utilize experimental hatchery releases and monitoring to assess ecological factors and population productivity limitations; and (4) 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.*
- *Some opportunities for sturgeon passage improvements exist but benefits are likely to be limited by habitat-related natural recruitment problems in most areas. Passage strategies for white sturgeon should include: (1) Detailed evaluations of costs, benefits and risks of passage improvements relative to other potential strategies; (2) Consideration of 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; (3) Opportunities for non-volitional passage by taking advantage of fish trapped in dewater draft tubes or fish ladders during maintenance; and (4) Continued review of protocols used to prevent fish stranding/mortality during planned maintenance activities at passage facilities.*
- *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.*
- *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.*
- *Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam.*
- *Operate the hydrosystem to reduce mortality on white sturgeon. Block access to turbine draft tubes during turbine dewatering and other maintenance operations to minimize white sturgeon entrainment and mortality.*
- *Conduct dredging operations in a manner minimizing operation-related mortality on white sturgeon.*
- *Conduct research that addresses critical white sturgeon uncertainties identified in the Columbia Basin White Sturgeon Planning Framework.*

- *Monitor and evaluate mitigative white sturgeon restoration actions, and population responses to environmental condition consistent with the Columbia Basin White Sturgeon Planning Framework."*
- *Assess the effects of climate change on basin sturgeon populations and develop adaptation strategies to address these impacts.*

Recommendation 2: The Council should incorporate ISAB recommendations for addressing hydrosystem impacts on Upper Columbia River White Sturgeon:

- Develop a credible white sturgeon habitat model for the UCR to quantify habitat throughout the year in conjunction with mainstem hydrosystem operations
- 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 white sturgeon in the UCR
- Investigate the potential impacts of trace element contamination of UCR sediments on the quality of critical white sturgeon habitat throughout the UCR from Lake Roosevelt upstream to the International Border.

Rationale: White Sturgeon in the Upper Columbia River (UCR) are a considered a 'Species at Risk' by the Canadian federal government, are a species of active research for the Washington Department of Fish and Wildlife (WDFW), and are the focus of a recent UCR White Sturgeon Recovery Plan developed by US and Canada entities. That plan highlights a number of issues as contributing to poor white sturgeon populations and greatly diminished natural recruitment, including but not limited to, habitat diversity, flow regulation, water temperature, water clarity, total dissolved gas (TDG), contaminants, food availability, fish community alteration, predation, exploitation and incidental catch. Selected topics have benefited from recent studies by USGS, US EPA, WDFW, and the Colville and Spokane Tribes, but issues such as habitat diversity, flow regulation effects, temperature and elevated trace-element concentrations in bed sediments are in need of research. Specific to the UCR, the physical habitat for various life stages of white sturgeon have not been characterized or quantified, nor has the potential for trace-element contaminants to compromise critical habitats.

The amount, distribution and complexity of benthic substrates in Lake Roosevelt are currently unknown. Various life stages of white sturgeon are known to utilize and benefit from particular habitat types in the lower Columbia River, but similar understanding is not available for the UCR. Proper characterization of habitat availability would benefit fisheries managers in estimating what a sustainable population size should be. Substrate size, location and complexity (as substrate diversity) are key variables currently lacking characterization. Recent additions of detailed bathymetry of the Lake Roosevelt pool and lower portions of the UCR provided by US Bureau of Reclamation, and LiDAR (light detection and ranging) are key tools ready for application in developing a white sturgeon habitat model.
Superimposed on a habitat model for the UCR are the multiple lines of evidence that indicate trace element contamination in the sediments of the UCR may be a critical habitat stressor to the reproductive success of white sturgeon in the reach between Lake Roosevelt and the International Border. Preliminary evidence suggest that hydrosystem controlled conditions in the

mainstem river play a controlling factor on exposure of white sturgeon to dissolved trace elements mobilized from river bed sediments.

5.5 Eulachon

Current Program: Lower Columbia Subbasin Plan (1 paragraph on Page 2-18)

Recommendation: Include measurable eulachon objectives in the Fish and Wildlife Program.

Measures: BPA should fund protection, mitigation and enhancement of eulachon through the following measures:

- Develop biological objectives for eulachon that are consistent with recovery.
- Monitor and evaluate eulachon abundance in the Columbia River via annual spawning stock biomass surveys following protocols developed by the Washington Department of Fish and Wildlife and acoustic estimates by NOAA - NWFSC.
- Monitor and evaluate the causal mechanisms and migration/behavior characteristics affecting survival of larval eulachon during their first weeks in the Columbia River estuary, plume, and ocean environments.
- Monitor and evaluate the ecological importance of the tidal freshwater, estuary, plume, and nearshore ocean environments to the viability and recovery of eulachon in the Columbia River Basin.
- Develop an oceanographic indicators ecosystem conditions model to determine the significance of plume and nearshore ocean conditions that affect eulachon survival.
- Adjust the timing, magnitude, and frequency of hydrosystem flows (especially spring freshets) entering the estuary and plume to better reflect the natural hydrologic cycle, improve access to habitats, and provide better transport of coarse sediments and nutrients in the estuary and plume if these are found to be limiting to eulachon life history.

Rationale:
The Program currently does not address eulachon, an anadromous fish native to the Columbia River, and a species listed as threatened under the Endangered Species Act. This species has been heavily impacted by changes to the lower mainstem and estuary caused by construction and operation of the hydropower system. Substantial changes to flow, sediment delivery and the food web in the lower river have been well documented.

These measures are needed to address uncertainties regarding the effect of changes in the Columbia River hydrograph on survival, productivity and recovery potential of eulachon. As the Northwest Power Act directs the Council to develop a program to protect, mitigate, and enhance fish and wildlife in the basin affected by the development, operation, and management of hydroelectric projects, the Council should update the Program to include eulachon and develop biological objectives for this species. As eulachon are listed as a threatened species under the Endangered Species Act, NOAA is in the process of developing a recovery plan, and has prepared a Federal Recovery Outline for eulachon that includes recovery tasks as part of a preliminary recovery strategy. The recommended measures are consistent with NOAA's Federal Recovery Outline for eulachon. Recovery of ESA-listed species is consistent with the Program's

goals and objectives. Furthermore, measures adopted by the Council and funded by BPA to assist in the recovery of listed species affected by the development, operation, and management of hydroelectric projects is consistent with the Northwest Power Act and the Program.

6.0 Renewable Energy Integration into the Fish and Wildlife Program

Measure: The Council should develop, and BPA should fund:

1) Programs and processes to evaluate the impacts on fish and wildlife resources of all renewable energy sources (past, proposed and potential) and associated transmission infrastructure;
2) A region-wide assessment of suitability for siting terrestrial and aquatic renewable energy projects, prioritize possible sites, and examine potential site-specific and system-wide impacts to fish and wildlife. The outputs from this analysis should include a map of priority power generation development sites and power generation exclusion zones or protected areas, as was done for hydropower;
3) Explicit evaluation of transmission system expansion and its potential to impact fish and wildlife as part of development scenarios and assessments; and
4) Identification, assessment and analyses of appropriate fish and wildlife mitigation.

Rationale: The Northwest Power and Conservation Council (Council) was established by the Northwest Power Act (Act). The Act directs the Council to conduct regional planning for power generation[1] and for fish and wildlife, to mitigate for the impacts of the hydrosystem.[2]

In recent years power planning has increasingly emphasized renewable power sources (wind, solar, geothermal, wave, etc.).[3] However, renewable power planning has often failed to fully and adequately consider its effects on fish and wildlife.

Sound energy management— siting, design, construction, production, storage, transmission, conservation, and mitigation—includes development of a systemic and holistic vision of energy resources and their potential use. This vision must treat power generation and transmission as an integrated system that includes consideration of: temporal and geographic elements of power demands; all forms of energy production (hydro, wind, solar, wave, nuclear, geothermal, etc.);

[1] Section 839 contains the "Congressional declaration of purpose." Among the purposes is [Section 839(3)] "to provide for the participation and consultation of the Pacific Northwest States, local governments, consumers, customers, users of the Columbia River System (including Federal and State fish and wildlife agencies and appropriate Indian tribes), and the public at large within the region in . . . [Section 839(3)(B)] facilitating the orderly planning of the region's power system . . .." Northwest Power Act, §2(3)(B), 94 Stat. 2698.

[2] *See* Section 839(3)(A), specifying participation and consultation by regional parties in "the development of regional plans and programs related to energy conservation, renewable resources, other resources, and protecting, mitigating, and enhancing fish and wildlife resources." Northwest Power Act, §2(3)(A), 94 Stat. 2697. Regional plans are to fulfill the purpose of the Act "to protect, mitigate and enhance the fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries, particularly anadromous fish which are of significant importance to the social and economic well-being of the Pacific Northwest and the Nation and which are dependent on suitable environmental conditions 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" Northwest Power Act, §2(6), 94 Stat. 2698 (Section 839(6)).

[3] *See* Section 839(1)(B), which identifies as a purpose "encourage[ing]" "the development of renewable resources within the Pacific Northwest." Northwest Power Act, §2(1)(B), 94 Stat. 2697.

transmission siting and construction impacts; direct and indirect impacts to fish, wildlife, and their habitat.

The purpose of the proposed amendment to the Fish and Wildlife Program is to identify and highlight the issue of renewable power's fish and wildlife impacts. Draft amendment language aims to provide additional guidance and direction to the Council on how to address renewable power's fish and wildlife impacts and incorporate it into overall planning efforts.

For example, the amendment could mandate establishing areas protected from wind power generation as was done for hydropower development.[4] Initial steps to accomplish this could be studies that identify and characterize critically-important regional fish and wildlife resources likely to be affected by wind power projects.

Additionally, amendment language should require consideration wildlife and their habitat that are potentially at risk from impacts from wind and solar energy projects. It should also explicitly identify linkages between energy development and fish and wildlife life histories. For example, wave energy development might be identified as potential affecting anadromous fish, which already suffer from the effects of Columbia River mainstem and tributary energy projects.

The Northwest Power Act calls for the Council to facilitate the orderly planning and development of the region's power system including development of renewable resources within the Columbia River Basin, while protecting, mitigating and enhancing fish and wildlife resources. The power system includes the vast transmission grid that supports the efficient delivery of power to the region's ratepayers.

[4] 2009 Program, Protected areas, page 15-16. "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 designated certain river reaches in the basin 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. The Council expects the Federal Energy Regulatory Commission, in the exercise of its licensing authority under the Federal Power Act, to take the Council's protected areas decision 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. The standards, and the conditions relating to that protection, are identified in Appendix B to this Program titled "Hydroelectric Development Conditions."

7.0 Habitat

7.1 Fully Incorporate Estuary, Plume and Nearshore Ocean in Program

Current Program: various sections

Recommendation 1: Add language to the *Scientific Principles*, pages 9 and 10:

- *The Columbia River ecosystem includes the estuary, plume, and near shore ocean environments.*
- *Salmon, steelhead, lamprey, sturgeon and eulachon accommodate ocean mortality and environmental variability by having life histories that have a sufficient level of productivity and a wide range of biological diversity (i.e., resiliency).*

Recommendation 2: Add language to *Plume and Nearshore Ocean Strategies*, page 31. Retain the *Ocean strategies* and add:

- To Primary strategy, "*It is important to continue basic monitoring over time to increase understanding of the estuary, plume and nearshore ocean's role in anadromous fish survival and to have both baseline and real time information that can assist inland management decisions*."
- Add "*Ocean Strategy 3 - Identify the effects of ocean conditions on anadromous fish survival and use this information to evaluate and adjust inland management actions*."

Recommendation 3: Insert the following language into the Fish and Wildlife Program: *"Management of the Columbia River Basin hydropower system directly affects the ocean environment primarily in two ways: 1) it changes the natural hydrograph by development of the hydro-system, and changes estuary and plume habitats along with the timing and quantity of natural flows; and 2) the releases of large numbers of hatchery fish from Columbia River hatcheries may trigger density dependent effects in the estuary, plume and ocean."*

Measure 1: Fund a collaborative forum of scientists and managers to: 1) identify key management questions related to the estuary, plume, and nearshore ocean environments: 2) identify what research and monitoring has already been done that addresses these management questions; 3) identify ongoing baseline monitoring and research priorities; 4) identify opportunities for information sharing between scientists and managers and 5) recommend to the Council ways to improve the utility and in-river freshwater resource management benefits of both ongoing and proposed ocean, estuary and plume research conducted under the Program.

Rationale: Regional coordination between researchers and Columbia Basin managers is necessary for sharing information and for developing scientifically sound recommendations on monitoring and research priorities that can inform management actions. This forum can help with addressing the following additional measures.

Measure 2: Consider the complete anadromous fish life cycle and critical habitat needs, including the estuary, plume and nearshore ocean when making management decisions. Integrate the effects of future climate change into these decisions and develop adaptation strategies to address these effects.

Rationale: It is important to have a basic understanding of ocean survival in order to better understand freshwater survival and eventual adult returns. Understanding how, where and which anadromous fish experience both growth and mortality in the ocean can provide insights to freshwater management and can test commonly held assumptions about the river conditions for fish. For example, if a particular stock is demonstrating strong abundance, is it due to freshwater habitat restoration actions or specific ocean conditions? A thorough evaluation of the success of freshwater management actions (e.g., freshwater habitat improvements) requires that we know the effects of the ocean on Columbia River anadromous fish. This is consistent with the first Fish and Wildlife Program principle mentioned above; i.e., that the Council views the Columbia River ecosystem to include the estuary, plume, and nearshore ocean environments.

Measure 3: Optimize forecasts of adult returns.

Rationale: Through ocean research, project sponsors have begun to use ocean data to improve forecasting of adult returns. Fisheries managers have several methods for forecasting adult returns (e.g., age structure models, stock-recruit models, ocean indicators). Research has demonstrated that ocean condition indicators can provide helpful information that can be utilized to improve run forecasting accuracy. Forecasting of adult returns can be utilized to trigger conservation actions, set broodstock collection expectations and harvest seasons. In river forecasters typically use a sibling regression for forecasting annual adult returns. Until about ten years ago, this methodology was reasonably accurate for Chinook salmon. Recently, however, this methodology has not been very reliable. Researchers believe that changes in the age structure (age at maturation) of Chinook salmon may be behind the change. Managers are beginning to utilize other methods, often in combination, to more accurately predict adult run size. The NOAA and DFO ocean indicators (stop light chart and multivariate analysis), developed and populated with data from the two ocean research projects, are being used to further salmon run forecasting.

Measure 4: Explore and implement adaptive management experiments to improve survival of anadromous fish.

Rationale: The Council has been interested for some time in ways in which managers can use the results of the ocean research to change/alter freshwater habitat and production management to improve overall survival. It has been suggested that there may be applications such as changing the timing of hatchery releases or changing migration methods (transport and in-river) to take advantage of optimal plume or ocean conditions and subsequently, to improve survival for these fish. Presently hatchery fish release timing is set by hatchery managers that are considering water temperature, readiness of the fish to migrate and to take advantage of in river flow. It is unclear, however, if potential management strategies are realistic or practical and if the potential survival benefits would outweigh other risks. Further discussions are warranted between researchers and freshwater fisheries and hatchery managers to explore the practical potential of these concepts. There are specific experiments that can be conducted using individual hatcheries that are already investigating variable release timing. Stock-specific information about growth and survival in the ocean should be better linked to stock management in the freshwater.

Measure 5: Continue to research direct and indirect effects of anthropogenic freshwater management on marine ecological attributes affecting anadromous fish habitat, life histories and productivity.

Rationale: Management of the Columbia River Basin hydropower system directly affects the ocean environment by changes in the natural hydrograph and ecological processes caused by development and operation of the hydro-system, and through changes to the estuary and plume habitats due to the timing, quantity and quality of river flows. There is much more to be learned about how to improve conditions and thus survival for anadromous fish in the estuary and plume.

Measure 6: The Program should address the uncertainty regarding the effectiveness of estuarine restoration projects and different types of habitat and whether they contribute to increased juvenile survival and hence increased adult returns.

Rationale: The primary critical uncertainty regarding estuarine restoration projects and different types of habitat is whether they contribute to increased juvenile survival and hence increased adult returns. Good estimates of residence time in rearing habitat, and the quantity and quality of the habitat that will likely influence survival, are generally lacking. Also, how fish move between rearing habitats and the importance of habitat connectivity and spatial distribution are poorly understood. Along these lines, a general understanding of the quantity of available habitat, quality of fish habitat, how fish use them, and how they are distributed throughout the migration and rearing reaches of the Lower Columbia River and estuary are not well known. Another critical uncertainty is to identify status and trends of the ecosystem processes in the lower Columbia River and estuary to better understand the ecosystems processes and the effects on restoration and mitigation efforts.

Measure 7: Research is needed on forage fish in the lower estuary and nearshore area. The Fish and Wildlife Program should promote projects on forage fish in the lower estuary and nearshore area through the following measures:

- Identify spawning and rearing life history attributes of forage fish in the estuary
- Determine the role of forage fish as alternate prey for birds in the lower estuary
- Elucidate the role eulachon may have as an alternative prey for sea lions
- Determine how restoration projects in the estuary may contribute to reproductive success and rearing of forage fish
- Identify the relation between Columbia River flow and forage fish abundance in the estuary
- Identify role forage fish have in survival of juvenile Chinook salmon, coho, and steelhead
- Determine how climate change, ocean acidification, salinity, estuary turbidity maximum (ETM), and localized hypoxia are likely to affect forage fish in the coming decades

Rationale: The proposed amendment will update the Program to reflect a move toward ecosystem management approach to provide salmon with their total life cycle needs including an adequate food web to support growth and improve survival. Forage fish in the lower estuary include a broad group of species including surf smelt, Pacific sand lance, Pacific herring, eulachon, and juvenile American shad. These species have diverse reproductive strategies but all

species can occur in the lower estuary during their life histories. For example, surf smelt and Pacific sand lance may use beaches for spawning while Pacific herring may spawn on nearshore macro-algae. Eulachon and American shad are anadromous and can produce large numbers of juveniles that disperse downstream and enter the estuary. The Fish and Wildlife Program places an emphasis on salmon restoration and forage fish are a major link between habitat and environmental conditions and the survival of salmon.

7.2 Reduce Toxic Contaminants

Current Program: Page 42-44, Water Quality

Both the Independent Scientific Advisory Board (2013) and the Independent Scientific Review Panel (2013) recommend that the Program take a more active role in ensuring that toxic contamination be addressed. BPA should act on these recommendations and fund the following actions to mitigate for the effects of toxic contamination on fishery resources that are exacerbated in a river system heavily altered by the federal hydropower system:

Recommendation: Insert the following language into the Fish and Wildlife Program that recognizes fishery resources are clearly affected by toxics that have accumulated due to the development and operation of the federal hydropower system:
"Fishery resources are clearly affected by the development and operation of the federal hydropower system. Dam presence can be associated with the accumulation of contaminated sediment (Colas et al., 2013) and the presence of reservoirs and their operations can be a controlling factor on the chemical conditions such as anoxia which impact the distribution and bioavailability of toxics in the system. An example of a specific impact caused by the dams is to sturgeon; once anadromous, sturgeon are now blocked in reservoirs and subjected to contaminants year-around at contaminant levels exacerbated by the reservoirs."

Measure 1: BPA should fund a programmatic review and assessment of how hydropower projects exacerbate any problems associated with the effects of toxic substances and if any such correlation exists, the Council shall identify opportunities for operational changes or other activities to help mitigate these impacts and reduce toxic contamination. Determine how seasonal anoxia in dam reservoirs controls the release of toxics and other pollutants from the sediments to the water column and how the uptake and transfer of these toxics and pollutants transfer up the food web and negatively impact fish. Evaluate how environmental toxicants impact the reproductive fitness of fish that are impounded behind dams.

Rationale: Feist et al. (2005) evaluated whether evidence of reproductive endocrine disruption could be correlated to specific areas within the Columbia River system and found that fish residing in the reservoirs behind the oldest dams had the highest contaminant loads and incidence of reproductive abnormalities. Their data suggest that endocrine-disrupting chemicals may be accumulating behind dams over time and that the exposure of fish to these chemicals may be affecting the growth and reproductive physiology of fish in impounded areas of the Columbia River.

The ecological risk of mercury toxicity is directly related to the production of the bio-accumulative and toxic organic form, methylmercury, which is driven by specific

biogeochemical parameters. Importantly, many of those parameters are directly linked to factors associated with water management activities such as water inundation and wetting and drying cycles, organic carbon and nutrient cycling and inputs from upland terrestrial habitats. Reservoirs are among the most common managed hydrological features on the western landscape with a high likelihood for enhancing methylmercury production, transport, bioaccumulation, and risk to fish, wildlife, and human health. Thus, a better understanding of linkages between reservoir management and mercury risk is needed in order to develop approaches to minimize the environmental risks due to mercury while still meeting critical water needs in the Columbia River Basin.

Although it is generally well documented that mercury concentrations in some organisms in aquatic ecosystems and reservoirs of the Columbia River Basin exceed those considered safe for ecosystem and human health, little is still known about which factors are most important in driving variation in mercury concentrations among reservoirs, and what management options present the most effective opportunities for controlling mercury risk. Therefore, a research focus that addresses the following items will better inform resource managers and facilitate future amelioration opportunities:

- Levels of mercury and variation in bio-indicator taxa across reservoirs in the Columbia River Basin.
- Influence of seasonal drawdown and flood-up patterns on methylmercury cycling and bioaccumulation in Columbia River Basin reservoirs.
- Influence of lake stratification, dissolved oxygen, and primary production on mercury cycling and bioaccumulation in Columbia River Basin reservoirs.
- The influence of fish growth, condition, and energetics on mercury bioaccumulation rates and fish mercury concentrations in Columbia River Basin reservoirs.
- The influence of food quality and energy content on mercury bioaccumulation rates and fish mercury concentrations in Columbia River Basin reservoirs.
- The role that variation in littoral versus pelagic foraging reliance plays in driving mercury bioaccumulation pathways in Columbia River Basin reservoirs.
- The influence of prey/forage fish community structure and species assemblages on mercury exposure in top predator fishes in Columbia River Basin reservoirs.
- Biochemical, behavioral, and reproductive effects of mercury in fishes and aquatic dependent wildlife in Columbia River Basin reservoirs.

Measure 2: BPA should fund collaborative partnerships through a forum where governmental entities and co-managers can discuss and develop regional toxic-reduction strategies. In addition to whatever priorities are identified at this forum, components of the strategy should include:

- Identification of the principal sources of toxic substances that impact the Basin;
- A coordinated process for identifying emerging contaminants of concern; and
- A 30-year implementation schedule to achieve toxic reduction objectives, with decadal benchmarks, that could be used to inform a state or federal legislative response.

Rationale: Toxic contamination is a complex issue, and a coordinated, common approach by all co-managers is needed to mitigate the threat to fishery resources. The Council is in a position to

provide leadership on this issue and to collaborate with ongoing efforts to reduce toxics in the Columbia River Basin. In September 2010, EPA and the Columbia River Basin Toxics Reduction Working Group released the Columbia River Basin Toxics Reduction Action Plan with 5 initiatives and 61 actions to reduce toxics in the Columbia River Basin (EPA, 2010). Collaboration in the past has produced significant advancements in toxics monitoring of fishery resources. In 2007, BPA, the Lower Columbia Estuary Partnership, NOAA Fisheries, and USGS produced the only robust sampling of toxics in juvenile salmon in the Columbia Basin (LCREP, 2007).

Measure 3: Fund studies to determine which toxic contaminants most limit the restoration success of anadromous and resident fish and in particular determine how contaminants interfere with the reproduction and/or rearing success of key species such as white sturgeon and Pacific lamprey that are known to be vulnerable to bioaccumulation of toxins. The footprint of existing contamination and the location of known toxic discharges should be mapped in relationship to fish and wildlife populations and habitat restoration efforts and monitored as part of a basin-wide monitoring program. Assess foodweb transfer, sediment transport, and biological effects of emerging and legacy organic contaminants under current management regimes, and how those processes affect key Columbia River species and the success of restoration projects within the basin.

Rationale: Various stressors threaten native fishes and other wildlife in the Columbia River basin. Urbanized large aquatic ecosystems are experiencing increasing contamination of water and sediment and ultimately foodwebs. Contaminants of concern include both legacy compounds such as DDT and PCBs that are still present in the system, as well as chemicals of emerging concern (CECs) such as pharmaceuticals and personal care products. Use and release into the environment of CECs is increasing, although little is known about their harmful levels and effects. Several interdisciplinary studies have been carried out in recent years to assess impacts of different classes of contaminants in several levels of the foodweb in the Columbia River.

The USGS Columbia River Contaminants and Habitat Characterization (ConHab) project investigated transport pathways, chemical fate and effects of endocrine disrupting chemicals in the foodweb in the lower Columbia River and found that bio-magnification of multiple contaminants occurred in resident fish and osprey eggs, environmental quality benchmarks were exceeded in some cases, and reproductive parameters showed impairment at some sites and were significantly negatively correlated with various contaminant concentrations (Nilsen et al., in press; Nilsen and Morace, in press). In some species of vertebrates, these chemicals alter thyroid function, reduce sperm counts, and delay sperm maturation (Kuriyama et al., 2005) among other impacts. NOAA researchers found from studies on juvenile chinook salmon that exposure to urban contaminants was linked to an increase in disease susceptibility (Arkoosh et al., 1998). Better understanding of these effects on key first foods species is needed.

Critical uncertainties in understanding impacts of contaminants on key species and foodwebs in the Columbia River basin include:

- Chemicals of emerging concern (CECs) levels of concern to the health of key species including Pacific lamprey, white sturgeon, and salmonids.

- Impacts of CECs on the carrying capacity of the Columbia River ecosystem for juvenile salmonids and other key species.
- Impacts of contamination on habitat restoration success: Contaminants of concern should be assessed and monitored as part of current and future river restoration programs.
- Role of contamination in reduced rearing success of white sturgeon in impounded pools: Impacts of contaminants on sturgeon reproduction and rearing success within areas of known high productivity. Comparison of potential contaminant impacts on impounded versus unimpounded populations.
- Role of contamination on Pacific lamprey declines compared to threats from hydropower operations, such as dam passage. Assess levels of concern and effects of chemical mixtures.
- Investigate impacts of different hydrologic scenarios and management actions on contaminant distributions and foodweb transfer.
- Distributions, levels, and spatial patterns of contaminants of emerging concern (CECs) in the Columbia River basin including the estuary and coastal ocean.
- Impacts of contamination from abandoned vessels: Abandoned vessels should be inventoried and mapped in relation to potential impacts to aquatic species.

Measure 4: Investigate the cumulative and/or synergistic effects of multiple toxic contaminants particularly pesticides on riparian insects and other organisms that impact the carrying capacity of the Columbia River ecosystem.

Rationale: Mixtures of organophospate and carbamate pesticides are commonly detected in fresh water habitat that supports key species of interest to the Fish and Wildlife program. These pesticides interfere with behaviors that are essential for salmon survival. Some pesticides interact to produce synergistic toxicity in salmon (Laetz et al., 2009) and showed greater degree of synergism at higher exposure concentrations. Several combinations of organophosphates were lethal at concentrations that were sublethal in single-chemical trials. Single chemical risk assessments are likely to underestimate the impacts of insecticides in river systems where mixtures occur.

Measure 5: Recommend, support and fund actions that prevent toxic contamination from entering the Columbia River Basin.

Rationale: The fish and wildlife actions identified in the Columbia Basin Toxics Reduction Action Plan (2010) stresses that measures including pollution prevention and green chemistry need to be supported to achieve a reduction of toxic contaminants in the Columbia River watershed. Pollution prevention measures are less expensive and more effective, efficient and reliable than treating, recycling, or cleaning up pollutants after use. Toxics reduction efforts will contribute to the survival of key species, will complement other activities underway to restore stocks, and will enhance the effectiveness of habitat restoration efforts.

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7.3 Integrate Climate Change

Current Program: Page 51 – 52, Climate change planning considerations

Measure: Develop a comprehensive strategic plan to address the potential impacts of climate change on the entire system, including the estuary and the ocean and develop a suite of strategies within the amended Program and fund implementation of strategies. (ISAB 2013-1)

Recommendation 1: Review current restoration or habitat projects to ensure their resiliency under predicted future climate scenarios to ensure that investments made today are effective into the future.

Recommendation 2: Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty. (ISAB Program Review, March 7, 2013)

Mainstem Measures: BPA and the Corps of Engineers and the Bureau of Reclamation, in consultation and with and approval from the basin's tribes and the Council should expand

funding of climate change related projects and actions that were highlighted in the 2009 Program by including the following:

- Supporting the advancement and implementation of runoff forecasting techniques through the use of advanced statistical methods (e.g. Wood and Lettenmaier 2006; Moradkhahi and Meier 2010) and the use of the most recent hydrological and meteorological data;
- Encourage, monitor, and promote public awareness of pertinent climate change research and adaptation planning to climate change futures;
- Develop and implement a qualitative and quantitative systematic framework to analyze changes in river operations to adapt to climate change. Collaborate with regional (e.g. Oregon Climate Impacts Consortium), national (National Drought Information Center) and international climate science networks (e.g. Pacific Climate Impacts Consortium). Include the following steps:
  - Update and process meterological and hydrological data,
  - Use appropriate downscaled GCMs for regional use,
  - Collect appropriate hydrological data and conduct hydrological modeling using multiple models,
  - Generate streamflow forecasts and bias correct these data,
  - Develop appropriate post processing tools to assess performance,
  - Combine climate models and resulting hydrological models into hydro-regulation models,
  - Assess impacts to ecosystem function using biological and other physical habitat models,
  - Adapt and modify river operations (e.g.flood risk management and hydro-generation) to protect ecosystem functions, and
  - Reassess impacts to ecosystem function from modification of flood risk management and hydro-generation using appropriate models;
- Assess whether climate change effects are altering or likely to alter critical river flows or other habitat attributes in a way that could significantly affect fish or wildlife important to this Program, with critical focus on climate scenarios that project much warmer and drier summer periods;
- Evaluate whether alternative water management scenarios, including changes in flood risk management operations, and hydro generation loads could minimize the potential effects of climate change on mainstem hydrology and ecosystem function;
- Develop engineering plans to install temperature control structures on appropriate federal high head dams (ISAB 2007) i.e. Grand Coulee) as climate change adaptation tools to reduce water temperatures and actively pursue other adaptation actions such as floodplain restoration (e.g. Battin et al. 2006)to create or protect cool water refugia in mainstem reaches or reservoirs;
- Through the use of automated hydrologic and biological models, investigate the feasibility of mitigating climate change impacts in the estuary and plume through changes in river operations, including changes in flood control and hydro-generation management.
- Support climate change impact assessment and adaptation planning for ecosystem function linkages between the mainstem, estuary and ocean (e.g. salmon life history linkages; Fabry et al. 2008);

- Determine how climate change impacts to ecosystem function may be influenced by regional energy capacity versus peak capacity scenarios for basinwide hydro generation. Create adaptation measures to address potential impacts; and
- We recommend amending the Program to include the ISAB recommendations for addressing climate change (p 16, Independent Science Advisory Board (ISAB) Review of the 2009 Columbia River Basin Fish and Wildlife Program. 2013 -1; March 7, 2013).

Rationale: Considerable efforts have been made in the Columbia Basin to develop, implement and evaluate strategies to protect and restore populations of salmon, Pacific lamprey, and resident fish and wildlife, but most of these efforts have generally not addressed climate change impacts and adaptation to these impacts. Climate change is expected to significantly alter the ecology and economy of the Pacific Northwest during the 21st century (Mantua et al. 2009; Schnorbus et al. 2011). Rising air temperatures and erratic changes in precipitation patterns are expected to decrease snowfall and increase rainfall during the winter months, leading to shifts in the timing and quantity of runoff, including increased flooding during the winter when water is already in ample supply, and decreased flows during the summer when water demands are high. These changes will have significant impacts for freshwater and marine fisheries, hydropower production, flood risk management and water supply for agriculture and municipal uses. The impacts from climate change affect fish and wildlife in a number of ways. Some examples include migration patterns being altered, spawning and rearing grounds degraded, dramatic increases in poor habitat and loss of water quality and the increase of predators, aquatic contaminants and invasive species (Mantua et al. 2010). Any of these factors could, if not addressed, lead to species extinction.

In addition, particularly in the summer, other human water uses will create intense competition for limited water supply and will thus tax fish populations that are already in a precarious status. Thus, the human dimensions of climate change must be integrated into consideration of climate change impacts and adaptation on basin ecosystem function (Miles et al. 1999).

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7.4 Implement Predator Control

Current Program: Page 52, Piscivorous predator control

The Program should strive to measure the effects of predation and express them in common terms such as salmon adult equivalents to facilitate comparison and evaluation against other limiting factors. Predator evaluations should include salmon adult equivalent metrics in their reports.

Measure 1: BPA should continue to implement annually the base piscivorous predator-control program and expand northern pikeminnow (*Ptychocheilus oregonensis*) removals to other mainstem dams in the lower Columbia River ie, expand program to include northern pikeminnow removals at McNary and Bonneville dams. The action agencies should evaluate the effectiveness of focused pikeminnow removals for these expanded efforts and implement as warranted.

Rationale: The construction and operation of the hydrosystem has altered historical habitats and have created habitats more suitable for native and non-native piscivorous fish species. Disorientated salmonids that pass over or through the hydrosystem are easy prey for native northern pikeminnow in dam tailraces. The northern pikeminnow angler reward program has been successful in reducing the prey rates on native salmonids, but public access in boat restricted zones at hydropower projects is not feasible. The Predator Control Program's dam angling effort by contracted fishers should be expanded in all tailraces where elevated northern pikeminnow predation rates are known to occur.

- Predation by northern pikeminnow and their relative abundance are assessed annually throughout the lower Columbia and Snake rivers and continue to remain lower than those observed prior to the implementation of the Predator Control program
- To date, it is not evident that compensation in predation, growth, or reproduction by surviving northern pikeminnow, or by other resident fish predators has occurred system-wide in response to Predator Control program fisheries, however, continued implementation emphasizes the need for continued evaluation efforts to monitor piscivore community dynamics and locally occurring compensatory mechanisms.
- Relative abundance of smallmouth bass has nearly doubled in areas of John Day Reservoir in recent years and may indirectly influence juvenile salmonid predation. Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation

- From 1990-2012, Predator Control fisheries have harvested more than 4 million northern pikeminnow, with annual exploitation for fish ≥ 250 mm averaging 13.7% (range: 8.5–19.5%) since 1991. The minimum goal of 10% exploitation has been exceeded every year since 1998 with a mean of 17.2%. Modeling efforts to describe northern pikeminnow annual exploitation, while assuming all other variables are constant, suggest a reduction in median percent predation by northern pikeminnow on juvenile salmon of 28% to 40%, as compared to pre-program levels since 1996. On average, the reduction of slightly over 5 million consumption events (minimum, 1.6 million; maximum, 8.5 million) annually could be attributed to predator removals.

Measure 2: BPA (and action agencies) should work cooperatively with NOAA Fisheries, USFWS, states, tribes and the Council to develop and implement system wide strategies to manage and reduce non-native fishes that compete and feed on native fish in mainstem and in tributaries. This also applies to section II.D.2 Non-Native Species Strategies, page 18.

Rationale: The Program, as currently implemented by BPA, is anadromous fish centric should more strongly consider impacts to native resident fish. The program seems to call out or emphasize focus on several non-native species, but this focus should not de-emphasize the need to address other non-native species in the Basin that have an effect on native fish populations (ie. northern pike, white crappie, yellow perch, etc…).

- Non-native fish have significant impact to native resident fish species
- Northern pike have greatly reduced native fish populations in the Pend Oreille system
- Walleye and smallmouth bass have reduced native resident populations in Lake Roosevelt
- Relative abundance of smallmouth bass have nearly doubled in areas of John Day Reservoir in recent years and may indirectly influence juvenile salmonid predation
- Competitive interactions with northern pikeminnow, which may shift their diets and habitat selection in the presence of smallmouth bass, could exacerbate juvenile salmonid predation
- The decades of emphasis on northern pikeminnow control has narrowed piscivorous predation to a singular focus with very little emphasis on baseline studies on populations, habitat use, and diets in the mainstem and major tributaries
- White crappie predation on juvenile spring Chinook salmon in Lookout and Hills Creek reservoirs may significantly increase mortality rates
- Lake trout threaten bull trout and other native trout in areas where lake trout have been introduced into native trout habitat
- The Program should support, and BPA should fund, additional research into the overall magnitude of the impacts of non-native predators including abundance, diel and temporal distributions, and food web interactions in order to help guide improved management of non-natives.

Current Program: Page 52, Avian predator control

Measure: The Council should adopt into the Program, and BPA and the action agencies should fund, the management plans that have been developed through USACE and other processes for piscivorous avian species in the Columbia Basin and estuary. Incorporate any management plans

that have been developed for double-crested cormorants, Caspian terns, and other avian species in the mid-Columbia River area and prioritize actions for implementation.

Rationale: The 2009 program called for the development of management plans for avian populations that have significant effect to native fish populations. The results of these efforts need to be included in the next iteration of the Program. Avian predators in the basin must be reduced in number and held to a level that promotes a greater survival of listed and non-listed salmonids and Pacific lamprey.

- Annual combined losses of out-migrating juvenile salmonids from Caspian terns and double crested cormorants nesting at East Sand Island have exceeded 15 million smolts since 2009. These losses equate to 15-20% of the basin's entire annual juvenile outmigration.
- East Sand Island is host to the largest colony of Caspian terns in world, despite efforts to reduce the overall size of the colony to a management goal of ~3,355 pairs, the population in 2012 was double this goal.
- Double crested cormorants on East Sand Island form the largest colony in North America. Since 2003 it has exceeded the 1997-2011 average of ~10,000 breeding pairs. Annually since 2010, the colony has consumed a minimum of 19 million smolts.
- A relatively small colony (~300 pairs) of Caspian terns nesting on Goose Island in Potholes Reservoir travel over 30 miles to the Columbia River to prey on out-migrating Upper Columbia steelhead. Impacts in recent years average 10-15% of the entire outmigration.

Current Program: Page 52-53, Pinniped predator control

Measure: Identify opportunities to reduce fish losses through pinniped predator management.

Recommendation: Program language should be added to establish funding responsibility: ***"The Corps [or Bonneville] should fund federal, tribal and state agencies to evaluate the extent of pinniped predation on salmonids, sturgeon, and Pacific lamprey in the lower Columbia River from Bonneville Dam to the mouth of the river. The Corps should take action to improve the exclusion of sea lions at all main adult fish ladder entrances and locks at Bonneville Dam."***

Measure: Implement and fund strategies resulting from evaluation.

Rationale: The current program identifies a need for a river-wide assessment of pinniped predation, but it does not identify BPA or the Corps as having a funding responsibility.

7.5 Prevent Establishment of Aquatic Invasive Species

Current Program: Page 18, Non-Native Species Strategies

Measure: In order to protect the federal Columbia River Power System assets, the Northwest Power and Conservation Council's Fish and Wildlife Program should direct the Bonneville Power Administration (BPA) to provide proportionate funding for prevention activities that are known to be effective at stopping the invasion and spread of zebra and quagga mussels, and

invasive aquatic plants such as Eurasian milfoil and flowering rush. Funding should be equally provided through the Program and Operations and Maintenance budgets from Power Operations within BPA. These activities include, but are not limited to, inspection and decontamination of boats moored in infested waters and then transported on our roadways in the region.

Recommendation: The Northwest Power and Conservation Council should continue to play a regional leadership role in coordinating stakeholder groups around the issue of aquatic invasive species, particularly those that pose the greatest risk to the Columbia River Basin ecosystem and industries. In particular, the Fish and Wildlife Program should include specific language supporting the work of the 100th Meridian Initiative Columbia River Basin Team, which is coordinated by the Pacific States Marine Fisheries Commission. This group has provided strong, successful leadership on invasive species prevention efforts in the region. We recommend the Council ask for regular reports from 100th Meridian Initiative Columbia River Basin Team on the following items:

1. Current efforts for inspection and decontamination
2. Research priorities relative to invasive species control and prevention
3. Opportunities for collaboration and lessons learned

Rationale: The Council must shift its current BPA funds from population control research to infestation prevention. It is imperative that the Region prevent further degradation of ecosystem function and to ensure protections for species recovery investments, water delivery infrastructure, and hydropower production from the potentially devastating impacts of invasive species, such as the infectious salmon anemia virus, zebra and quagga mussels, etc.. Our recommendations relate to increased funding for enhanced inspection and decontamination efforts in the region, stronger measures to prevent the inadvertent spread of invasive species resulting from habitat research and restoration activities, and maintaining the Council's leadership role as the key convener and coordinator in the Columbia Basin for science, policy and outreach.

7.6 Reintroduction of Anadromous Fish into Blocked Areas

Current Program: Page 56, Strategies in Specific areas

The language regarding restoration of anadromous fish passage should be moved to it's own section under Section II, Basinwide Provisions, II-D. Basinwide Strategies entitled "Reintroduction of Anadromous Fish into Blocked Areas." Include the following measures:

Measure: BPA should fund collaboration with the sovereigns and other responsible partners and managers of hydropower projects (investor owned, non-federal, and publically-owned) to explore the feasibility of and development of new programs for reintroduction of anadromous fish, and fund reintroduction of adult and juvenile life stages, into historical but currently blocked habitat.

Rationale: The coordinated development and operation of the Columbia River Basin by the U.S. and Canada has directly and indirectly decimated species of anadromous and resident fish and blocked access to substantial portions of their historical range. This outcome similarly decimated the culture, health, economy and spirituality of many Native American tribes. Decisions to block

fish passage were made without the prior and informed consent or involvement of the Columbia Basin tribes.

The 2009 Fish & Wildlife Program includes language (page 56) to investigate "Reintroduction of anadromous fish into blocked areas." With innovative passage techniques completed and/or under development and testing throughout the US (e.g., Round Butte on the Deschutes River and several Willamette River Basin projects in Oregon; Howard Hanson Dam and Swift Reservoir, in Washington) it is timely to fully define this aspect of the Council's Program to require more active collaboration of the Bonneville Power Administration with the sovereigns and other responsible partners of hydro projects (investor owned, non-federal, and publically-owned) creating blockages to anadromous fish in the Columbia River Basin, to explore the feasibility of and to develop and implement new programs for the reintroduction of anadromous fish, include passage of adult and juvenile life stages, into these historical but currently blocked habitats.

Passage and reintroduction of anadromous fish is a key element of a truly integrated watershed approach to the Columbia River Basin and to the NPCC's Fish and Wildlife Program. For example, at each blocked area of the basin, reintroduction of anadromous fish would be assessed and if feasible, reintroduction and passage would proceed in an incremental, phased approach (planning and design, testing, construction, evaluation and adaptation), progressing to later phases upon successful conclusions or outcomes from previous phases. These types of assessments would determine the feasibility of anadromous fish reintroductions, including costs, partnership opportunities among responsible parties and potential timelines for initiation of these programs.

8.0 Implementation Provisions

8.1 Clarify BPA In-lieu Restrictions

Current Program: Page 7, Planning Assumptions

Recommendation: The Council should establish the in-lieu funding policy which shall be applied by BPA, and add it to the Program. In-lieu decisions by BPA should be reviewed by Council through a public process. Input from the Council is needed as the Fish and Wildlife Program is reviewed and updated to ensure that critical FCRPS mitigation efforts receive the necessary funding from BPA for successful and timely implementation.

Rationale: Section 4(h)(10)(A) of the Northwest Power Act requires BPA to protect, mitigate and enhance fish and wildlife to the extent affected by the development and operation of the hydropower projects of the Federal Columbia River Power System (FCRPS) in a manner consistent with Council's fish and wildlife program and the purposes of the Act. The "in Lieu" provision of section 4(h)(10)(A) states that "Expenditures of the Administrator pursuant to this paragraph shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of Law."

BPA has interpreted this "In Lieu" provision of the Act by drafting an In Lieu Policy (June 2007) and assigning ratings to both new and ongoing projects. Since establishing this policy, BPA has made decisions not to initiate new efforts deemed as in lieu while ramping back on funding levels for other ongoing efforts (e.g., Burns Paiute Tribe - Malheur River Resident Fish Project No. 1997-019).

With this call for policy guidance from the Council, we recognize the critical need to focus ratepayer funding on fish and wildlife mitigation efforts that address FCRPS impacts and that this funding not supplant another entities legal responsibility for funding and implementation of fish and wildlife efforts. However, there are numerous permutations and interpretations of funding responsibility of entities for fish and wildlife efforts as well as the reality of what, if any specific funding has been required, made available, or appropriated for these efforts.

We also understand Congress' intent for the Northwest Power Act, in general, as filling the gaps among the myriad of fish and wildlife and environmental programs and laws currently within the extent of the Columbia River Basin.

8.2 Review Implementation of Program Measures

Current Program: Page 63, Program Reporting

Recommendation 1: The Council should work with fish and wildlife managers and partners to provide a periodic review of implementation of Fish and Wildlife Program measures and provide an annual report of the measures that were implemented and those which were not. In addition, because of the importance of Subbasin plans, progress towards implementation of these plans should be reported on periodically. This could be as simple as documenting which measures are currently funded and those which have not been funded.

Rationale: We recommend that the Council reassert their role, as described in the Power Act, to provide direction regarding funding levels to BPA. In addition, the Council should use existing tracking tools to report on which elements of the Program are funded (and at what level) and which are currently unfunded. As new measures are added to the Program, funding mechanisms need to be identified. To address the need for new funding, we recommend that the Council use their convening role to coordinate and leverage funding for new and existing measures in the Program.

- The Council's Program, though tied to ESA listed species, is broader than recovery of those species.
- Effort and funding needs to be balanced within the Program to ensure that all aspects of the Program move forward within the foreseeable future, though perhaps not within the next five years.
- The Council can uniquely address the needs of the ecosystem from the sub basin or basin wide perspective.
- BPA has large discretion regarding funding levels, but the measures listed in the Program are presumed to be funded, at some level. Tracking of these measures needs to be transparent.
- In addition, it is critical that the cost of administering the Program be kept low. It is important that in an annual review of implementation, an accounting for Program administration costs be reviewed, as well.

Recommendation 2: The Council should work with fish and wildlife managers and land and water management entities to identify opportunities to coordinate BPA project funding with other funding sources as appropriate to accomplish shared goals. Fish and Wildlife Program funds could leverage shared investments that support implementation of subbasin plans, recovery plans, salmon strongholds, and other mitigation and conservation strategies. The Fish and Wildlife Program and Council should:

- Create a liaison position to assist project sponsors in identifying complimentary (cost-share) grants, and
- Develop complimentary or shared grant application formats to standardize and simplify proposal development and submission. Standard formats would also facilitate proposal review and consideration by local watershed partnerships.

Rationale: The ISAB Report "Using a Comprehensive Landscape Approach for More Effective Conservation and Restoration" provides several case histories of programs that that employ socioeconomic engagement, a landscape perspective, governance and collaboration to work across traditional boundaries, leverage limited resources, and foster adaptive management (ISAB 2011-4). Among the reported lessons learned is that local organizations can be challenged to identify and generate funds needed to sustain investments, subbasin social engagement, integrated collaborative science and governance, and adaptive management. Tasking Council staff to reach out and coordinate with local watershed partnerships to help identify additional grant opportunities could better leverage BPA investments. Simplified or standardized formats for on the ground work could allow sponsors to efficiently and effectively communicate integrated project objectives and strategies to granting entities and facilitate proposal review by local watershed partnerships.

8.3 Re-Establish a Regional Coordination Forum

Current Program: Page 64, Program Coordination

Recommendation 1: Council should continue as a regional convener of issues related to the Columbia Basin mitigation. Council should create an annual forum for states, tribes and partners to coordinate and discuss annual work priorities. The forum would result in the creation of an annual work plan to ensure that we are collectively engaged in discussions on what is most important to the Council and the region. Through the five years of this program, we recommend the following priority topics, as others as they arise, for Council engagement:

- Monitoring and Evaluation – In order to get a handle on M&E costs within the Program, specific information needs at each level of Program reporting should be clearly identified and incorporated to ensure cost effective and efficient data collection, data management, and data sharing.
- Research - What are the critical questions we need to answer? How do we improve reporting and integration into decision making? How can we improve funding mechanisms such that research projects are finished and new projects are identified?
- Wildlife Mitigation – moving into the future, how do we ensure continued value of BPA investments?
- Zebra and Quagga Mussels – focus on prevention.
- Habitat Restoration – How can we leverage existing projects to understand effectiveness of habitat restoration on populations?
- Science/Policy forums – variety of topics including climate change, toxics, eulachon
- BPA funded assets – What are the long term challenges of maintaining BPA funded infrastructure and how can we begin addressing them?
- Non-native species – suppression and eradication; where successful, where not: need to keep lines of communication open
- Coordinated Assessments – identify additional species for process

Rationale:

- The role of the Council has evolved over time to meet the needs of the Basin and to address endangered species listings in concert with BPA.
- The disbanding of CBFWA leaves a gap in regional coordination as no one state or tribe can play a regional coordinating role, with the consequence that States and Tribes work more directly with Council Members.
- As such, it falls to the Council and Council staff to play a greater coordinating role that meets the needs of all regional partners in serving and informing Council decisions.
- An annual work plan would provide sufficient advance notice to improve preparation and participation, ensuring that all parties benefit fully from the exchanges.

Recommendation 2: We recommend that the Council continue the inclusion of Fish and Wildlife Program Coordination funding in the updated program amendment process. Program Coordination funding is important to the region's fish and wildlife managers, particularly for the Columbia River Basin's Tribes. The lack of any Columbia River Basin fish and wildlife entity

to provide this basis for coordination makes it more critical to provide funding directly to those individual state and tribal managers who can provide their time and expertise. This coordination funding is also important for many of the tribes because it helps build capacity and levels the playing field, particularly for smaller tribes across the basin. It allows for important avenues for participation and travel to meetings, efforts that would not occur without this level of funding support.

Rationale: The current 2009 Council Fish and Wildlife Program describes the need for coordination funding provided by BPA for the purpose of various activities that support Program implementation. Activities range from activities such as data management and reporting, monitoring and evaluation, facilitating and participating in focus workgroups on Program issues, review of technical documents and processes, and information dissemination.

The Council in 2012 reviewed coordination projects and provided a decision on BPA coordination funding. In that decision document the Council included a table of detailed coordination activities appropriate for BPA funding. Those coordination tasks were designated by the Council as meeting priority needs for program coordination for the next two years, FY2013-2014. With this decision the Council indicated that these activities were well suited for program-level regional coordination funding and recognized that they would need the assistance from partners throughout the region. In addition the Council stated that all of the work was intended to be of benefit at a basinwide or regional scale and should inform the Council for policy, program performance evaluation, and implementation decisions. The Council also recommended that this work should be accomplished by the appropriate fish and wildlife agencies and tribes recognized in the program and other entities such as Tribal Consortia that have the experience and capacity to coordinate this work at a basinwide scale.

NPA. Section 839b(h)(2)(C). [The Council shall request…] fish and wildlife management coordination and research and development (including funding) which, among other things, will assist protections, mitigation, and enhancement of anadromous fish at, and between, the region's hydroelectric dams.

8.4 Streamline ISRP Scientific Review

Current Program: P 65-66, Independent Scientific Review Panel

Recommendation: Modify the current language in the Program as follows:

- First bullet at the top of p. 65, add "new" to read, *"Review **new** projects proposed for Bonneville funding to implement the Council's Program."*
- Add a second bullet: ***"The Council, Action Agencies, and co-managers should jointly develop a new ISRP review process for mature projects, long-term projects, and Fish Accords projects."***
- Additionally, the Program should continue to support the existing strategic frameworks developed by the umbrella projects that have developed review processes for selection, prioritization and technical and science review of projects in coordination with local stakeholders, tribes and agencies.

Rationale: The existing ISRP review process is inefficient, labor-intensive, needlessly duplicative, and extremely frustrating for all involved. In the absence of clear guidance by the Council, the ISRP has been left to develop or modify its review process. The proposed recommendation would put process development under policy guidance and would allow the relevant parties to develop new review protocols that 1) keep the ISRP focused on what is necessary by law, 2) allow the parties to develop alternative review processes that take advantage of annual science and management conferences, and 3) could result in reviews that add value to proposed and ongoing projects.

For ongoing projects, consider an entirely different review regime that would make the reviewers partners in the local basins (as opposed to distant adversaries) with the mutual goal of improving subbasin programs and making them more successful. For example, four (or more) regional review panels – one each for the upper Columbia, Snake, mid-Columbia, and lower Columbia - might be composed of two at-large members nominated by the subbasin co-managers, one or two representatives from NOAA-Fisheries, a tribal representative, and maybe two members assigned to the subbasin by the ISRP. Members of these regional review panels would be required to attend project review conferences to thoroughly understand the sub-basins, co-manager objectives, and the existing spectrum of implementation projects. Following the annual conference, a day would be dedicated to address concerns, discuss progress and ideas for making the program better, review recovery implementation issues, etc. Action items and a formal record would be kept and would become part of the review the following year. This type of review could be used to satisfy all of the legal review requirements for ongoing projects, including ESA permit compliance. A review panel so constituted would have a baseline understanding of local basin issues, advance knowledge of their respective concerns, and could come to reviews prepared to ask the questions needing answers. This informed dialogue would eliminate misunderstandings and the lost time that goes into the back-and-forth of the present review response loop.

Attachment 3 to

The State of Oregon's Recommendations for Amendment of the Northwest Power and Conservation Council's Fish and Wildlife Program.

Priority fish and wildlife management actions to be funded by the Bonneville Power Administration in Oregon Columbia and Snake river subbasins

September 17, 2013

Tabulated here are specific projects recommended by Oregon to be funded by the Bonneville Power Administration to implement the Northwest Power and Conservation Council's Fish and Wildlife Program. Project numbers and titles reference proposals submitted to the Council during various NPCC solicitations, geographic and categorical project reviews. These are available at www.cbfish.org. All proposals, as originally submitted, described and proposed work that substantively addressed the associated Oregon recommendations. The proposals include work that is now funded, partially funded, or currently unfunded by Bonneville Power Administration.

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
1987-127-00	Smolt Monitoring by Non-Federal Agencies	2.0	Program Performance Objectives
1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	2.0	Program Performance Objectives
1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	2.0	Program Performance Objectives
1994-033-00	Fish Passage Center	2.0	Program Performance Objectives
1996-020-00	CSS Oversight and PIT tagging	2.0	Program Performance Objectives
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	2.0	Program Performance Objectives
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	2.0	Program Performance Objectives
2010-035-00	Abundance, Productivity and Life History of Fifteenmile Creek Winter Steelhead	2.0	Program Performance Objectives
2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	2.0	Program Performance Objectives
1988-108-04	StreamNet	2.1	Restructure the Program to Better Support Implementation of Adaptive Management
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	2.1	Restructure the Program to Better Support Implementation of Adaptive Management
2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	2.1	Restructure the Program to Better Support Implementation of Adaptive Management
1982-013-01	Coded Wire Tag	2.2	Biological Objectives in the Program

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
1982-013-02	Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW)	2.2	Biological Objectives in the Program
1987-127-00	Smolt Monitoring by Non-Federal Agencies	2.2	Biological Objectives in the Program
1989-024-01	Evaluate Umatilla Juvenile Salmonid Outmigration	2.2	Biological Objectives in the Program
1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	2.2	Biological Objectives in the Program
1990-080-00	Columbia Basin PIT tag information	2.2	Biological Objectives in the Program
1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	2.2	Biological Objectives in the Program
1994-033-00	Fish Passage Center	2.2	Biological Objectives in the Program
1996-020-00	CSS Oversight and PIT tagging	2.2	Biological Objectives in the Program
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	2.2	Biological Objectives in the Program
2010-035-00	Abundance, Productivity and Life History of Fifteenmile Creek Winter Steelhead	2.2	Biological Objectives in the Program
2010-036-00	Coded Wire Tag Recovery	2.2	Biological Objectives in the Program
2010-082-00	Integrated Status and Trends Monitoring (ISTM) Demonstration Project	2.2	Biological Objectives in the Program
2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	2.2	Biological Objectives in the Program
1987-127-00	Smolt Monitoring by Non-Federal Agencies	2.3	Coordinated Assessments Monitoring and Reporting
1988-108-04	StreamNet	2.3	Coordinated Assessments Monitoring and Reporting
1989-024-01	Evaluate Umatilla Juvenile Salmonid Outmigration	2.3	Coordinated Assessments Monitoring and Reporting
1992-026-04	Grande Ronde Early Life History of Spring Chinook and Steelhead	2.3	Coordinated Assessments Monitoring and Reporting
1994-033-00	Fish Passage Center	2.3	Coordinated Assessments Monitoring and Reporting
1996-020-00	CSS Oversight and PIT tagging	2.3	Coordinated Assessments Monitoring and Reporting

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	2.3	Coordinated Assessments Monitoring and Reporting
2010-035-00	Abundance, Productivity and Life History of Fifteenmile Creek Winter Steelhead	2.3	Coordinated Assessments Monitoring and Reporting
1988-108-04	StreamNet	2.4	Data Management
1994-033-00	Fish Passage Center	2.4	Data Management
2010-082-00	Integrated Status and Trends Monitoring (ISTM) Demonstration Project	2.4	Data Management
2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	2.4	Data Management
1982-013-01	Coded Wire Tag	2.5	Hatchery Effectiveness Monitoring
1982-013-02	Coded Wire Tag-Oregon Department of Fish and Wildlife (ODFW)	2.5	Hatchery Effectiveness Monitoring
2007-299-00	Investigation of Relative Reproductive Success of Stray Hatchery & Wild Steelhead & Influence of Hatchery Strays on Natural Productivity in Deschutes	2.5	Hatchery Effectiveness Monitoring
2010-036-00	Coded Wire Tag Recovery	2.5	Hatchery Effectiveness Monitoring
2010-082-00	Integrated Status and Trends Monitoring (ISTM) Demonstration Project	2.5	Hatchery Effectiveness Monitoring
2000-021-00	Ladd Marsh Wildlife Mitigation	3.1	Wildlife Operational Impacts
2000-021-00	Ladd Marsh Wildlife Mitigation	3.2	Adequately Fund Wildlife Projects
2000-021-00	Ladd Marsh Wildlife Mitigation	3.3	Adequately Fund Wildlife M&E
1986-050-00	Evaluate Sturgeon Populations in the Lower Columbia River	4.3	Define Resident Fish Substitution for Anadromous Fish Losses
1986-050-00	Evaluate Sturgeon Populations in the Lower Columbia River	4.4	Resident Fish Loss Assessments
1986-050-00	Evaluate Sturgeon Populations in the Lower Columbia River	5.4	White Sturgeon
2007-155-00	Develop a Master Plan for a Rearing Facility to Enhance Selected Populations of White Sturgeon in the Columbia River Basin	5.4	White Sturgeon
2007-515-00	Elemental analysis of fin spines: A potential tool for assessing	5.4	White Sturgeon

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
	movement of white sturgeon within the Lower and Mid-Columbia River basin		
2007-517-00	Estimating abundance of white sturgeon by using visual strip-transects; an alternative to mark-recapture population estimates	5.4	White Sturgeon
2008-504-00	Sturgeon Genetics	5.4	White Sturgeon
1984-021-00	John Day Habitat Enhancement	7.0	Habitat
1984-025-00	Blue Mountain Fish Habitat Improvement	7.0	Habitat
1987-100-02	Umatilla Anadromous Fish Habitat-Oregon Department of Fish and Wildlife (ODFW)	7.0	Habitat
1992-026-01	Grande Ronde Model Watershed	7.0	Habitat
1993-040-00	Fifteenmile Creek Habitat Improvement	7.0	Habitat
1993-066-00	Oregon Fish Screens Project	7.0	Habitat
1994-042-00	Trout Creek Operations and Maintenance (O&M)	7.0	Habitat
1998-016-00	Escapement and Productivity of Spring Chinook and Steelhead	7.0	Habitat
2010-035-00	Abundance, Productivity and Life History of Fifteenmile Creek Winter Steelhead	7.0	Habitat
2010-082-00	Integrated Status and Trends Monitoring (ISTM) Demonstration Project	7.0	Habitat
2011-006-00	Columbia Habitat and Monitoring Program - Pilot (CHaMP-P)	7.0	Habitat
1990-077-00	Northern Pikeminnow Management	7.4	Implement Predator Control
2007-402-00	Snake River Sockeye Captive Propagation	7.6	Reintroduction of Anadromous Fish into Blocked Areas
2007-404-00	Spring Chinook Captive Propagation-Oregon	7.6	Reintroduction of Anadromous Fish into Blocked Areas

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
1996-020-00	CSS Oversight and PIT tagging	7.7	Endorse Experimental Spill Management
2012-002-00	Oregon Regional Coordination	8.3	Re-Establish a Regional Coordination Forum
1988-053-04	Hood River Production Monitor and Evaluation (M&E)-Oregon Department of Fish and Wildlife (ODFW)	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1988-053-08	Hood River Production Operations and Maintenance (O&M) and Powerdale	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1989-035-00	Umatilla Hatchery Operations and Maintenance (O&M)	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1989-096-00	Genetic Monitoring and Evaluation (M&E) Program for Salmon and Steelhead	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1990-005-00	Umatilla Hatchery Monitoring and Evaluation (M&E)	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1993-060-00	Select Area Fisheries Enhancement	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
1998-007-04	Grande Ronde Spring Chinook on Lostine/Catherine Creek/ Upper Grande Ronde Rivers	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
2007-299-00	Investigation of Relative Reproductive Success of Stray Hatchery & Wild Steelhead & Influence of Hatchery Strays on Natural Productivity in Deschutes	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
2007-402-00	Snake River Sockeye Captive Propagation	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
2007-404-00	Spring Chinook Captive Propagation-Oregon	9.1	Mitigate for lost fisheries opportunities while reducing negative effects of hatchery fish
2007-186-00	Middle Fork Willamette River Bull Trout Passage and Habitat Restoration	9.2	Implement Willamette Basin Mitigation
2007-229-00	Development of protocols/priorities to re-establish naturally	9.2	Implement Willamette Basin Mitigation

BPA number	Project Title	Oregon Recommend	Oregon NPCC Fish and Wildlife Program Amendments
	reproducing populations of U. Willamette R. Chinook Salmon above USACE dams/Willamette		
2007-272-00	Conservation and Recovery of Endangered Species Act Listed Floodplain Fishes in the Willamette Basin, with Emphasis on Oregon Chub	9.2	Implement Willamette Basin Mitigation
2009-012-00	Willamette Bi-Op Habitat Restoration	9.2	Implement Willamette Basin Mitigation
2010-082-00	Integrated Status and Trends Monitoring (ISTM) Demonstration Project	9.2	Implement Willamette Basin Mitigation
2011-003-00	Willamette Wildlife Fund (WWF)	9.2	Implement Willamette Basin Mitigation
2011-004-00	ODFW Operations & Maintenance (O&M)	9.2	Implement Willamette Basin Mitigation
2011-010-00	Willamette River Operations Administration	9.2	Implement Willamette Basin Mitigation

End of Table.